



WISCONSIN PROFESSIONAL BASEBALL PARK DISTRICT

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ADDENDUM #1

Date: September 21, 2026

Addendum #1 adds the attached Project Manual to the Scope of Work documents in **Appendix A**.

PROJECT MANUAL



Field Level Restrooms

American Family Field
One Brewers Way
Milwaukee, WI 53214

September 4, 2026

RAMLOW/STEIN Architecture + Interiors - Project No. 26-112



OWNER:

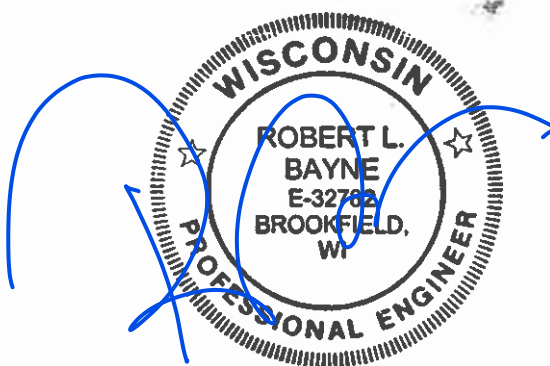
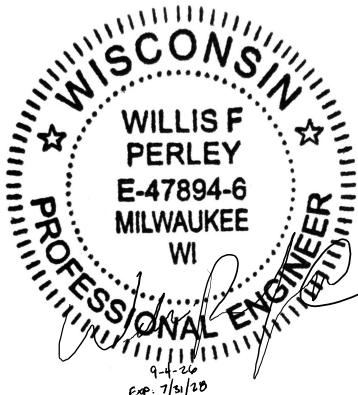
Wisconsin Professional Baseball Park District
American Family Field
One Brewers Way
Milwaukee, WI 53214

ARCHITECT:

RAMLOW/STEIN Architecture + Interiors
322 E. Michigan St.
Milwaukee, WI 53202
P: 414-271-8899

PLUMBING, HVAC, ELECTRICAL:

Grumman | Butkus Associates



09/04/2026

EXPIRES 7/31/2028

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**SECTION 01 1000
SUMMARY**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Work covered by the Contract Documents.
 - 2. Type of the Contract.
 - 3. Work under other contracts.
 - 4. Owner-furnished products.
 - 5. Use of premises.
 - 6. Owner's occupancy requirements.
 - 7. Work restrictions.
- B. Related Sections include the following:
 - 1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.03 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Field Level Restrooms
 - 1. Project Location: American Family Field, One Brewers Way, Milwaukee, WI 53214
- B. Owner: WI Professional Ballpark District.
 - 1. Owner's Representative: Brian Dworak.
- C. Architect: Ramlow/Stein, Inc.
- D. The Work consists of the following:
 - a. The project includes the renovation of the existing Field Level Restrooms on the Field Level Concourse.
 - b. The Work includes, but is not limited to the following: Selective demolition, sealants, resilient base and accessories, countertops, painting, tile, toilet partitions, washroom accessories, plumbing, HVAC (transfer grille replacement), lighting, and electrical.

1.04 TYPE OF CONTRACT

- A. The Owner reserves the right to group one or more projects together under a single prime contract.

1.05 WORK UNDER OTHER 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. Coordinate the Work of this Contract with work performed under separate contracts.
 - 1. Specialty Signage.
 - 2. Security Devices and Installation.
 - 3. Telephone Equipment and Wiring.

1.06 OWNER-FURNISHED PRODUCTS

- A. Owner will furnish products indicated. The Work includes providing support systems to receive Owner's equipment, and making plumbing, mechanical, and electrical connections].
 - 1. Owner will arrange for and deliver Shop Drawings, Product Data, and Samples to Contractor.
 - 2. Owner will arrange and pay for delivery of Owner-furnished items according to Contractor's Construction Schedule.
 - 3. After delivery, Owner will inspect delivered items for damage. Contractor shall be present for and assist in Owner's inspection.
 - 4. If Owner-furnished items are damaged, defective, or missing, Owner will arrange for replacement.
 - 5. Owner will arrange for manufacturer's field services and for delivery of manufacturer's warranties to Contractor.
 - 6. Owner will furnish Contractor the earliest possible delivery date for Owner-furnished products. Using Owner-furnished earliest possible delivery dates, Contractor shall designate delivery dates of Owner-furnished items in Contractor's Construction Schedule.
 - 7. Contractor shall review Shop Drawings, Product Data, and Samples and return them to Architect noting discrepancies or anticipated problems in use of product.
 - 8. Contractor is responsible for receiving, unloading, and handling Owner-furnished items at Project site.
 - 9. Contractor is responsible for protecting Owner-furnished items from damage during storage and handling, including damage from exposure to the elements.
 - 10. If Owner-furnished items are damaged as a result of Contractor's operations, Contractor shall repair or replace them.
 - 11. Contractor shall install and otherwise incorporate Owner-furnished items into the Work.
- B. Owner-Furnished Products:
 - 1. Audio / Visual Equipment.
 - 2. Security Devices such as cameras.
 - 3. Telephone Equipment and wireless antennae.

1.07 USE OF PREMISES

- A. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.
- B. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Owner Occupancy: Allow for Owner occupancy of Project site and use by the public.
 - 2. Driveways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
 - c. Bus drop off lane must remain active for game days.
- C. Use of Existing Building: Maintain existing building in a weathertight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.
- D. Additional information about game-day restrictions for the site and building will be discussed with the Owner at the preconstruction meeting.

1.08 OWNER'S OCCUPANCY REQUIREMENTS

- A. Full Owner Occupancy: Owner will occupy site and existing building during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits.
 - 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 Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
 - 1. Before partial 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 building.
 - 2. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

1.09 WORK RESTRICTIONS

- A. On-Site Work Hours: Work shall be generally performed inside the existing building during normal business working hours of 7 a.m. to 5 p.m., Monday through Friday, except otherwise indicated.
 - 1. Weekend Hours: Weekend work shall be approved by owner 2 days ahead of time. Hours of operations during the weekend shall be from 7am – 5pm
 - 2. Hours for Utility Shutdowns: Shutdowns should not interrupt normal business operation including Stadium Restaurant, NML Legends Club, X-Golf, and Brewers Offices.
 - 3. Hours for Any activity (e.g. pile driving, concrete saw-cutting, concrete coring, etc.) that may adversely affect the operation of activities at American Family Field, in the vicinity of the project, should reported to the Owner ahead of time and, when possible, scheduled during non-business hours. The Owner will provide a schedule of events that may be affected and assist the contractor(s) in the scheduling of such adverse activities to minimize any disruption of activities.
 - 4. Work anticipated outside of hours specified herein are to be reported to the Owner no later than 2 days prior.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than three days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner's written permission.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

**SECTION 01 23 00
ALTERNATES AND VOLUNTARY ALTERNATES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for alternates.

1.3 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. 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.
- B. Voluntary Alternate: An amount proposed by bidders and stated on the Bid Form for certain work not 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. 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.

1.4 PROCEDURES

- A. Coordination: Modify 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 modifications to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - SCHEDULE OF ALTERNATES

1. **Alternate No. 1** – Provide cost for concrete floor resealing in all restrooms in scope.
2. **Alternate No. 2** – Provide cost for eliminating CT-2 in all locations. Add MTS-2 edge and epoxy paint finish instead. See Typical Elevation on A161.
3. **Alternate No. 3** – Provide cost for electric hand dryers as keynoted in Architectural and Electrical plans.
4. **Alternate No. 4** – Provide unit cost to remove existing stainless-steel counter/supports and replace with SS-1 counter as detailed on A161 per restroom.

END OF SECTION

**SECTION 01 2600
CONTRACT MODIFICATION PROCEDURES**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include the following:
 - 1. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.03 MINOR CHANGES IN THE WORK

- A. Architect will issue through General Contractor supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.04 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. Within 10 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 costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

1.05 CHANGE ORDER PROCEDURES

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

1.06 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Owner 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 2900
PAYMENT PROCEDURES**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
 - 1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 2. Division 01 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.03 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.

1.04 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittals Schedule.
 - c. Contractor's Construction Schedule.
 - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than twenty days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Submit draft of AIA Document G703 Continuation Sheets
 - 3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.

- c. Name of subcontractor.
- d. Name of manufacturer or fabricator.
- e. Name of supplier.
- f. Change Orders (numbers) that affect value.
- g. Operation and Maintenance Manuals (O&M)
- h. Closeout
- i. Dollar value.
 - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
- 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
- 5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
- 6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.
- 7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
- 8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
- 9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.05 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and General Contractor and paid for by Owner.
 - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: Progress payments shall be submitted to Architect by the tenth of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
- D. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.
- E. Payment Application Forms: Use forms provided by Owner for Applications for Payment. Sample copies are included at end of this Section.
- F. 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 of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- G. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit 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 final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- 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. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Products list.
 5. Submittals Schedule (preliminary if not final).
 6. List of Contractor's staff assignments.
 7. List of Contractor's principal consultants.
 8. Copies of building permits.
 9. Report of preconstruction conference.
 10. Certificates of insurance and insurance policies.
 11. Performance and payment bonds.
 12. Data needed to acquire Owner's insurance.
 13. Initial settlement survey and damage report if required.
- J. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- K. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.

8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final, liquidated damages settlement statement.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

**SECTION 01 3100
PROJECT MANAGEMENT AND COORDINATION**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination Drawings.
 - 2. Administrative and supervisory personnel.
 - 3. Project meetings.
 - 4. Requests for Interpretation (RFIs).
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.
- C. Related Sections include the following:
 - 1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
 - 2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.03 DEFINITIONS

- A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.
- B. ACR: Architect Clarification Response to the RFI.

1.04 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
- B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with 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 with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

- C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's Construction Schedule.
 - 2. Preparation of the Schedule of Values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Preinstallation conferences.
 - 7. Project closeout activities.
 - 8. Startup and adjustment of systems.
 - 9. Project closeout activities.
- E. Conservation: Coordinate construction activities to ensure that 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.

1.05 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
 - 1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate required installation sequences.
 - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 - 2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
 - 3. Electronic Submittal to the Architect: Files must be submitted in Adobe .PDF file format.
 - a. All electronic submittals shall be posted to the project FTP site, which will be established by the Architect. Contractor shall notify Architect via email when submittal has been posted to the FTP site.
 - b. Submittals with multiple pages must be put into a single .PDF file.
 - c. A transmittal on the Contractor's letterhead in .PDF format needs to accompany the submittal.
 - d. Architect will review and return the approved digital submittal to the Contractor and will post copy to the project FTP site. Architect will notify Contractor when approved submittal has been posted to the FTP site.
 - 4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

- B. Key Personnel Names: Within 5 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 and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
 - 1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.
- C. Submittals Schedule: Within 5 days of starting construction operations, submit a schedule of submittals in compliance with Division 01 Section "Construction Progress Documentation".

1.06 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1.07 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 times.
 - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within 3 days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner, General Contractor, and Architect, but no later than 5 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
 - 1. Attendees: Authorized representatives of Owner, General Contractor, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for RFIs.
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Distribution of the Contract Documents.
 - j. Submittal procedures.
 - k. Preparation of Record Documents.
 - l. Use of the premises and existing building.
 - m. Work restrictions.
 - n. Owner's occupancy requirements.
 - o. Responsibility for temporary facilities and controls.
 - p. Construction waste management and recycling.
 - q. Parking availability.
 - r. Office, work, and storage areas.
 - s. Equipment deliveries and priorities.

- t. First aid.
 - u. Security.
 - v. Progress cleaning.
 - w. Working hours.
 - 3. Minutes: Record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
 - 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Owner 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. The Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility problems.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written recommendations.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
 - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.
 - 1. Attendees: In addition to representatives of Owner, General Contractor, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at

- these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Status of correction of deficient items.
 - 14) Field observations.
 - 15) RFIs.
 - 16) Status of proposal requests.
 - 17) Pending changes.
 - 18) Status of Change Orders.
 - 19) Pending claims and disputes.
 - 20) Documentation of information for payment requests.
 3. Minutes: Record the meeting minutes.
 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 - 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.
- E. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner, General Contractor, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

- a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
- b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
- c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.08 REQUESTS FOR INTERPRETATION (RFIS)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
 1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
 1. Project name.
 2. Date.
 3. Name of Contractor.
 4. Name of Architect.
 5. RFI number, numbered sequentially.
 6. Specification Section number and title and related paragraphs, as appropriate.
 7. Drawing number and detail references, as appropriate.
 8. Field dimensions and conditions, as appropriate.
 9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 10. Contractor's signature.
 11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

- a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.
- C. Hard-Copy RFIs: Form at end of this Section. Facsimile RFI's will be accepted.
 1. Identify each page of attachments with the RFI number and sequential page number.
- D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.
 1. Attachments shall be electronic files in Adobe Acrobat PDF format and may be emailed to the Architect.
- E. Architect's and General Contractor's Action: Architect and General Contractor will review each RFI, determine action required, and return it. Allow seven working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
 1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or RFIs with numerous errors.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and General Contractor in writing within 10 days of receipt of the RFI response.
- F. On receipt of Architect's and General Contractor's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and General Contractor within seven days if Contractor disagrees with response.
- G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
 1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number including RFIs that were dropped and not submitted.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.
 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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**SECTION 01 3200
CONSTRUCTION PROGRESS DOCUMENTATION**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Preliminary Construction Schedule.
 - 2. Contractor's Construction Schedule.
 - 3. Submittals Schedule.
 - 4. Daily construction reports.
 - 5. Material location reports.
 - 6. Field condition reports.
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for submitting the Schedule of Values.
 - 2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
 - 3. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
 - 4. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.03 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the Schedule of Values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.
- C. 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.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. 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.
- G. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- H. Major Area: A story of construction, a separate building, or a similar significant construction element.
- I. Milestone: A key or critical point in time for reference or measurement.
- J. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.
- K. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.04 SUBMITTALS

- A. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:
 - 1. Scheduled date for first submittal.
 - 2. Specification Section number and title.
 - 3. Submittal category (action or informational).
 - 4. Name of subcontractor.
 - 5. Description of the Work covered.
 - 6. Scheduled date for Architect's and General Contractor's final release or approval.
- B. Preliminary Construction Schedule: Submit three printed copies.
 - 1. Approval of cost-loaded preliminary construction schedule will not constitute approval of Schedule of Values for cost-loaded activities.
- C. Contractor's Construction Schedule: Submit three printed copies of initial schedule, large enough to show entire schedule for entire construction period.
 - 1. Submit an electronic copy of schedule, using software indicated, on CD-R, and labeled to comply with requirements for submittals. Include type of schedule (Initial or Updated) and date on label.
- D. CPM Reports: Concurrent with CPM schedule, submit three copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, 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 all activities sorted by activity number and then early start date, or actual start date if known.
- E. Daily Construction Reports: Submit three copies at monthly intervals.
- F. Field Condition Reports: Submit three copies at time of discovery of differing conditions.
- G. Special Reports: Submit three copies at time of unusual event.

1.05 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting.

1.06 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from parties involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 PRODUCTS

2.01 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule to the Architect no later than 5 days after Contractor receipt of Notice to Proceed. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
 - 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
 - 2. 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.
 - a. Show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.
 - 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.02 PRELIMINARY CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within 5 days of date established for commencement of the Work.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.03 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, 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 10 days after date established for commencement of the Work.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 - 2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 - 3. Use "one workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.
- C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary 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.
 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- D. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
 1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Principal events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.
 9. Dollar value of activity (coordinated with the Schedule of Values).
- E. 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.

2.04 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. Equipment at Project site.
 5. Material deliveries.
 6. High and low temperatures and general weather conditions.
 7. Accidents.
 8. Meetings and significant decisions.
 9. Unusual events (refer to special reports).
 10. Stoppages, delays, shortages, and losses.
 11. Meter readings and similar recordings.
 12. Emergency procedures.
 13. Orders and requests of authorities having jurisdiction.
 14. Change Orders received and implemented.

15. Construction Change Directives received and implemented.
 16. Services connected and disconnected.
 17. Equipment or system tests and startups.
 18. Partial Completions and occupancies.
 19. Substantial Completions authorized.
- B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.05 SPECIAL REPORTS

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

PART 3 EXECUTION

3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION

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**SECTION 01 3300
SUBMITTAL PROCEDURES**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
 - 2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
 - 3. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
 - 4. Division 01 Section "Quality Requirements" for submitting test and inspection reports and for mockup requirements.
 - 5. Division 01 Section "Closeout Procedures" for submitting warranties.
 - 6. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 7. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 8. Divisions 02 through 49 Sections for specific requirements for submittals in those Sections.

1.03 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.04 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings may be provided by Architect for Contractor's use in preparing submittals.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

- C. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow 10 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 3. Resubmittal Review: Allow 10 days for review of each resubmittal.
 - 4. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
- E. Identification: Place a permanent label or title block on each submittal for identification.
 - 1. Indicate name of firm or entity that prepared each submittal on label or title block.
 - 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 - 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect and General Contractor.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06100.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06100.01.A).
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Other necessary identification.
- F. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.
- G. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
 - 1. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.
- H. Transmittal: Identify or package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form (digital transmittal when applicable). Architect will return submittals, without review, received from sources other than Contractor.
 - 1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.

2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
- I. 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.
- J. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

PART 2 PRODUCTS

2.01 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
 1. Electronic Submittal to the Architect: Files must be submitted in Adobe .PDF file format.
 - a. All electronic submittals shall be posted to the project FTP site, which will be established by the Architect. Contractor shall notify Architect via email when submittal has been posted to the FTP site.
 - b. Submittals with multiple pages must be put into a single .PDF file.
 - c. A transmittal on the Contractor's letterhead in .PDF format needs to accompany the submittal.
 - d. Architect will review and return the approved digital submittal to the Contractor and will post copy to the project FTP site. Architect will notify Contractor when approved submittal has been posted to the FTP site.
- 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 printed 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 written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Mill reports.
 - j. Standard product operation and maintenance manuals.
 - k. Compliance with specified referenced standards.
 - l. Testing by recognized testing agency.
 - m. Application of testing agency labels and seals.
 - n. Notation of coordination requirements.
 4. Submit Product Data before or 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.
 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.

- d. Roughing-in and setting diagrams.
- e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
- f. Shopwork manufacturing instructions.
- g. Templates and patterns.
- h. Schedules.
- i. Design calculations.
- j. Compliance with specified standards.
- k. Notation of coordination requirements.
- l. Notation of dimensions established by field measurement.
- m. Relationship to adjoining construction clearly indicated.
- n. Seal and signature of professional engineer if specified.
- o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
- 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
 - 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of appropriate Specification Section.
 - 3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 - 4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit 3 full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
 - 5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit 3 sets of Samples.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
- E. Submittals Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- F. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."

- G. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."
- H. 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, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.

2.02 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
 - 1. Certificates and Certifications: Provide a notarized 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.
 - 2. Test and Inspection Reports: Comply with requirements specified in Division 01 Section "Quality Requirements."
- B. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."
- C. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- F. Installer Certificates: Prepare 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.
- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- J. Material Test Reports: Prepare 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.
- K. Product Test Reports: Prepare 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.
- L. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.

4. Product and manufacturers' names.
 5. Description of product.
 6. Test procedures and results.
 7. Limitations of use.
- M. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."
- N. Preconstruction Test Reports: Prepare 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.
- O. Compatibility Test Reports: Prepare 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.
- P. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, 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.
- Q. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- R. Design Data: Prepare 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.
- S. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
1. Preparation of substrates.
 2. Required substrate tolerances.
 3. Sequence of installation or erection.
 4. Required installation tolerances.
 5. Required adjustments.
 6. Recommendations for cleaning and protection.
- T. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory-authorized service 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.
- U. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

PART 3 EXECUTION

3.01 CONTRACTOR'S REVIEW

- A. 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. 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.

3.02 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it (either hardcopy or via project FTP site depending on the type of submittal). Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
 - 1. Conforms as Submitted.
 - 2. Conforms as Noted.
 - 3. Does not Conform.
 - 4. Revise and Resubmit.
 - 5. Review not Required.
- C. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION

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SECTION 01 4000 QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
 - 1. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
 - 2. Division 01 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
 - 3. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.03 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.
- C. Mockups: Full-size, physical assemblies that are constructed on-site. 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. Approved mockups establish the standard by which the Work will be judged.
- D. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- J. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of 5 previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.04 REFERENCE STANDARDS

- A. 29 CFR 1910 - Occupational Safety and Health Standards.

1.05 CONFLICTING REQUIREMENTS

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

1.06 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Description of test and inspection.
 - 3. Identification of applicable standards.
 - 4. Identification of test and inspection methods.
 - 5. Number of tests and inspections required.
 - 6. Time schedule or time span for tests and inspections.
 - 7. Entity responsible for performing tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- C. Reports: Prepare and submit certified written reports that include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.

4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.07 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 1. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

- I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
 - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect 7 days in advance of dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - a. Allow 7 days for initial review and each re-review of each mockup.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 6. Demolish and remove mockups when directed, unless otherwise indicated.

1.08 QUALITY CONTROL

- A. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 - 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

- B. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 - 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 - 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 - 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 - 6. Do not perform any duties of Contractor.
- E. 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.
- F. 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.
- G. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for commencement of the Work.
 - 1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.09 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:
 - 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 - 2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 - 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.

4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 TEST AND INSPECTION LOG

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

3.02 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
 2. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 4200 REFERENCES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 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.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."
- D. "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."
- E. "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.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.03 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.
- D. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

**SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Sections include the following:
 - 1. Division 01 Section "Summary" for limitations on utility interruptions and other work restrictions.
 - 2. Division 01 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
 - 3. Division 01 Section "Execution" for progress cleaning requirements.
 - 4. Divisions 02 through 49 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.03 DEFINITIONS

- A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.04 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.05 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. 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 Service: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service: 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.

1.06 SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.07 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.

1.08 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Installer of each permanent service shall 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

2.01 MATERIALS

- A. Gypsum Board: Minimum 1/2 inch thick by 48 inches wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36/C 36M.
- B. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
- C. Paint: Comply with requirements in Division 09 painting Sections.

2.02 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack board.
 - 3. Drinking water and private toilet.
 - 4. Coffee machine and supplies.
 - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
 - 6. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
- C. 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.

2.03 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. 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 testing agency acceptable to authorities having jurisdiction, and marked for intended use.
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.

PART 3 EXECUTION

3.01 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.

3.02 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Water Service: Use of Owner's existing water service 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.
 1. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with 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 not be permitted unless authorized by Owner.
- D. Heating and cooling: Provide temporary heating and cooling 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.
- E. 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.
- F. Electric Power Service: Use of Owner's existing electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner.
- G. 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.
 2. Install lighting for Project identification sign.
- H. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install 1 telephone line(s) for each field office.
 1. Provide additional telephone lines for the following:
 - a. Provide a dedicated telephone line for each facsimile machine and computer in each field office.

2. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Architect's office.
 - e. Engineers' offices.
 - f. Owner's office.
 - g. Principal subcontractors' field and home offices.
3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.
- I. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail, in common-use facilities.
 1. Provide T-1 line in primary field office.

3.03 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
 2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
 3. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- B. Parking: Contractor and Subcontractor parking shall be in the "Miller Lot", which is the lot adjacent to the North Dock, and is subject to change per Owner's schedule.
- C. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."
- D. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- E. Existing Elevator Use: Use of Owner's existing elevators will be permitted, as long as elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.
 1. Do not load elevators beyond their rated weight capacity.
 2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.
- F. Existing Stair and Ramp Usage: Use of Owner's existing stairs will be permitted, as long as stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs and ramps to condition existing before initial use.
 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If, despite such protection, stairs become damaged, restore damaged areas so no evidence remains of correction work.
- G. Temporary Use of Permanent Stairs: Cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.

3.04 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that 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 Division 01 Section "Summary."
- B. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- C. 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 not complete, insulate temporary enclosures.
- D. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
 - 1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant plywood on construction operations side.
 - 2. Construct dustproof partitions with 2 layers of 3-mil polyethylene sheet on each side. Cover floor with 2 layers of 3-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant plywood.
 - a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.
 - 3. Insulate partitions to provide noise protection to occupied areas.
 - 4. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
 - 5. Protect air-handling equipment.
 - 6. Weather strip openings.
 - 7. Provide walk-off mats at each entrance through temporary partition.
- E. 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.
 - 1. Prohibit smoking in all areas adequate for construction operations.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - 3. 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.
 - 4. 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.

3.05 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. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed

because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION

**SECTION 01 6000
PRODUCT REQUIREMENTS**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. Related Sections include the following:
 - 1. Division 01 Section "References" for applicable industry standards for products specified.
 - 2. Division 01 Section "Closeout Procedures" for submitting warranties for Contract closeout.
 - 3. Divisions 02 through 49 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.03 DEFINITIONS

- A. Products: Items purchased 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, or where indicated as a product substitution, 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. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.04 SUBMITTALS

- A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
 - 1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
- B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and

Drawing numbers and titles. Refer to A201 General Conditions Article 3.4.2 for additional requirements.

1. Substitution Request Form: Use form provided at end of this Section.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information, including a list of changes or modifications 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. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. 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 lack of availability or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 10 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
- C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.05 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be 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.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

- B. Delivery Location: All deliveries shall be via the North Dock of the Stadium unless otherwise directed by Owner.
- C. 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 ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
- D. Storage: Confirm with Owner that materials may be stored on the Field Level Concourse adjacent to project area.
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.
 - 2. Store materials in a manner that will not endanger Project structure.
 - 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 4. Store cementitious products and materials on elevated platforms.
 - 5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 - 6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 - 7. Protect stored products from damage and liquids from freezing.
 - 8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.07 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.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final 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 appropriate form properly executed.
 - 3. Refer to Divisions 02 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 PRODUCTS

2.01 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that 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. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
 7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
 - a. Substitutions may be considered, unless otherwise noted.
 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
 - a. Substitutions may be considered, unless otherwise noted.
 3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
 - a. Substitutions may be considered, unless otherwise noted.
 4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
 - a. Substitutions may be considered, unless otherwise noted.
 5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
 6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
 7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
 8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified 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 provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
 9. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.

- b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.02 PRODUCT SUBSTITUTIONS

- A. Timing:
 - 1. Pre-Bid Substitutions:
 - a. Architect will consider requests for substitution if received no later than 2 calendar weeks prior to the bid due date.
 - 2. Post Notice to Proceed / Contract:
 - 3. a. Architect will consider requests for substitution if received within 30 days after the Notice to Proceed. Requests received after that time may be considered or rejected at the discretion of the Architect.
- B. 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:
 - 1. Requested substitution offers Owner a substantial advantage in cost, 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.
 - 2. Requested substitution does not require extensive revisions to the Contract Documents.
 - 3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - 4. Substitution request is fully documented and properly submitted.
 - 5. Requested substitution will not adversely affect Contractor's Construction Schedule.
 - 6. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - 7. Requested substitution is compatible with other portions of the Work.
 - 8. Requested substitution has been coordinated with other portions of the Work.
 - 9. Requested substitution provides specified warranty.
 - 10. 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.

2.03 COMPARABLE PRODUCTS

- A. Conditions: Architect will consider Contractor's request for comparable product 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:
 - 1. Evidence that the proposed product does not require extensive 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.

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 7300 EXECUTION

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.02 RELATED DOCUMENTS

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

1.03 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. General installation of products.
 - 3. Progress cleaning.
 - 4. Protection of installed construction.
 - 5. Correction of the Work.
- B. Related Sections include the following:
 - 1. Division 01 Section "Project Management and Coordination".
 - 2. Division 01 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation of the Work.
 - 3. Division 01 Section "Closeout Procedures".

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EXAMINATION

- A. Existing Conditions: The existence and location of utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utility services.
- B. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Examine roughing-in for electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 3. Examine walls and floors for suitable conditions where products and systems are to be installed.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.02 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. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.03 CONSTRUCTION LAYOUT

- A. Building Lines and Levels: Locate and lay out control lines and levels for structures, column grids, and floor levels, including those required for electrical work. Transfer survey markings and elevations for use with control lines and levels.

3.04 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 conduit, wiring in finished areas, unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings and directions for installing anchorages, including sleeves, concrete inserts, and anchor bolts that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.05 PROGRESS CLEANING

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

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
- 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. 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. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- F. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- G. 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.
- H. 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.
- I. 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.

3.06 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.

3.07 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."
 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

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**SECTION 01 7329
CUTTING AND PATCHING**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
 - 1. Divisions 2 through 49 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.03 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 surfaces to original conditions after installation of other Work.

1.04 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
 - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
 - 3. Products: List products to be used and firms or entities that will perform the Work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
 - 6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
 - 7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.05 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio without written approval from Structural Engineer to be obtained by Architect.

1. Pre cast concrete walls, floors, beams, and risers that have not been identified on Structural Drawings.
2. Steel trusses, beams, columns, and decking that has not been identified on Structural Drawings.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:
 1. Primary operational systems and equipment.
 2. Air or smoke barriers.
 3. Fire-suppression systems.
 4. Mechanical systems piping and ducts.
 5. Control systems.
 6. Communication systems.
 7. Conveying systems.
 8. Electrical wiring systems.
 9. Operating systems of special construction in Division 13 Sections.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:
 1. Water, moisture, or vapor barriers.
 2. Membranes and flashings.
 3. Exterior curtain-wall construction.
 4. Equipment supports.
 5. Piping, ductwork, vessels, and equipment.
 6. Noise- and vibration-control elements and systems.
 7. Scoreboards or other electronic visual display systems in the Stadium.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.06 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

2.01 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials 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 match the visual and functional performance of in-place materials.

PART 3 EXECUTION

3.01 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 in-place finishes or primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.03 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.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
 - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 6. Proceed with patching after construction operations requiring cutting are complete.
- 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 possible. Provide materials and comply with installation requirements specified in other Sections.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 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.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION

**SECTION 01 7419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
 - 1. Disposing of nonhazardous demolition and construction waste.
- B. Related Sections include the following:
 - 1. Division 01 Section "Temporary Facilities and Controls" for environmental-protection measures during construction, and location of waste containers at Project site.

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

1.04 PERFORMANCE GOALS

- A. Salvage/Recycle Goals: Owner's goal is to salvage and recycle as much nonhazardous demolition and construction waste as possible including the following materials:
 - 1. Demolition Waste:
 - a. Concrete.
 - b. Concrete reinforcing steel.
 - c. Wood studs.
 - d. Plywood and oriented strand board.
 - e. Structural and miscellaneous steel.
 - f. Rough hardware.
 - g. Metal studs.
 - h. Gypsum board.
 - i. Acoustical tile and panels.
 - j. Carpet.
 - k. Equipment.
 - l. Cabinets.
 - m. Plumbing fixtures.
 - n. Piping.
 - o. Supports and hangers.
 - p. Valves.
 - q. Mechanical equipment.

- r. Electrical conduit.
 - s. Copper wiring.
 - t. Lighting fixtures.
 - u. Lamps.
 - v. Ballasts.
 - w. Electrical devices.
 - x. Switchgear and panelboards.
- 2. Construction Waste:
 - a. Lumber.
 - b. Wood sheet materials.
 - c. Metals.
 - d. Insulation.
 - e. Gypsum board.
 - f. Piping.
 - g. Electrical conduit.
 - h. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Plastic pails.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until installation.
 - 4. Protect items from damage during transport and storage.
 - 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Owner's Use:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.
- C. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

3.02 DISPOSAL OF WASTE

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

END OF SECTION

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**SECTION 01 7700
CLOSEOUT PROCEDURES**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Warranties.
 - 3. Final cleaning.
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
 - 2. Division 01 Section "Execution" for progress cleaning of Project site.
 - 3. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 4. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 5. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.03 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
 - 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 8. Complete startup testing of systems.
 - 9. Submit test/adjust/balance records.
 - 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 11. Complete final cleaning requirements, including touchup painting.

12. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect 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: Architect will only re-inspect the work once. Additional visits by Architect and/or Consulting Engineers will be charged to the Contractor.
 2. Results of completed inspection will form the basis of requirements for Final Completion.

1.04 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
 1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect 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: Architect will only re-inspect the work once. Additional visits by Architect and/or Consulting Engineers will be charged to the Contractor.

1.05 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit electronic copy of list in .PDF format and email to the Architect. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 1. Organize list of spaces in sequential order, starting with exterior areas first]and[proceeding from lowest floor to highest floor.
 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.
 - d. Name of Contractor.
 - e. Page number.

1.06 WARRANTIES

- A. Submittal Time: 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.

- 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 the Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch 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.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 PRODUCTS

2.01 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

3.01 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a 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. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - c. 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.
 - d. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - e. Remove labels that are not permanent.
 - f. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

- g. Wipe surfaces of mechanical and electrical equipment, lift equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - h. Replace parts subject to unusual operating conditions.
 - i. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - j. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - k. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - l. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - m. Leave Project clean and ready for occupancy.
- C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION

**SECTION 01 7823
OPERATION AND MAINTENANCE DATA**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This 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. Maintenance manuals for the care and maintenance of products, materials, and finishes systems and equipment.
- B. Related Sections include the following:
 - 1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
 - 2. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
 - 3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
 - 4. Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.03 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.

1.04 REFERENCE STANDARDS

- A. ASHRAE Guideline 4 - Preparation of Operations and Maintenance Documentation for HVAC&R Systems.

1.05 SUBMITTALS

- A. Initial Submittal: Submit 2 draft copies of each manual at least 45 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return 1 copy of draft and mark whether general scope and content of manual are acceptable.
- B. Final Submittal: Submit 3 copies of each manual in final form at least 15 days before Substantial Completion inspection. Architect will return copy with comments within 15 days after final inspection.
 - 1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.

1.06 COORDINATION

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

PART 2 PRODUCTS**2.01 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY**

- A. Organization: Include a section in the directory for each of the following:
 - 1. List of documents.
 - 2. List of equipment.
 - 3. Table of contents.
- B. 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.
- C. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- D. 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."

2.02 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. 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, address, and telephone number of Contractor.
 - 6. Name and address of Architect.
 - 7. 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.
 - 1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other

- binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
- b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
- 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
- 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
- 4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
- 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.03 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - 1. Piped system diagrams.
 - 2. Precautions against improper use.
 - 3. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Equipment identification with serial number of each component.
- C. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.04 PRODUCT MAINTENANCE MANUAL

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. 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.

PART 3 EXECUTION

3.01 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
- E. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

**SECTION 01 7839
PROJECT RECORD DOCUMENTS**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record Product Data.
- B. Related Sections include the following:
 - 1. Division 01 Section "Closeout Procedures" for general closeout procedures.
 - 2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Divisions 02 through 49 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.03 SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Final Submittal: Submit 1 set of marked-up Record Prints, 3 set(s) of Record CAD Drawing files, 3 set(s) of Record CAD Drawing plots, and 3 copies printed from record plots. Plot and print each Drawing, whether or not changes and additional information were recorded.
 - 1) Electronic Media: CD-R.
- B. Record Product Data: Submit 3 copies of each Product Data submittal.
 - 1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 PRODUCTS

2.01 RECORD DRAWINGS

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
 - 1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the 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 understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - 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. Revisions to routing of piping and conduits.
 - d. Locations of concealed internal utilities.
 - e. Changes made by Change Order or Construction Change Directive.
 - f. Changes made following Architect's written orders.
 - g. Details not on the original Contract Drawings.
 - h. Field records for variable and concealed conditions.
 - i. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Mark important additional information that was either shown schematically or omitted from original Drawings.
5. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record CAD Drawings: 30 Days before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect. When authorized, prepare a full set of corrected CAD Drawings of the Contract Drawings, as follows:
 1. Format: Same CAD program, version, and operating system as the original Contract Drawings.
 2. Format: DWG, operating in Microsoft Windows operating system.
 3. Incorporate changes and additional information previously marked on Record Prints. Delete, redraw, and add details and notations where applicable.
 4. Refer instances of uncertainty to Architect for resolution.
 5. Architect will furnish Contractor one set of CAD Drawings of the Contract Drawings for use in recording information.
 - a. Architect makes no representations as to the accuracy or completeness of CAD Drawings as they relate to the Contract Drawings.
 - b. CAD Software Program: The Contract Drawings are available in AutoCAD 2018.
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
 1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Record Transparencies: Organize into unbound sets matching Record Prints. Place transparencies in durable tube-type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.
 3. Record CAD Drawings: Organize CAD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CAD file.
 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect..
 - e. Name of Contractor.

2.02 RECORD PRODUCT DATA

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

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

2.03 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.

PART 3 EXECUTION

3.01 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION

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**SECTION 02 4100
DEMOLITION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Selective demolition of building elements for alteration purposes.
 - 1. As indicated in Drawings, selective demolition of items as indicated in Drawings. Remove all accessory components to the selected demolished items.

1.02 DEFINITIONS

- A. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be reinstalled.
- B. Existing to Remain: Designation for existing items that are not to be removed.

1.03 SUBMITTALS

- A. Demolition Plan: Submit demolition plan as required by OSHA and local AHJs.
 - 1. Indicate extent of demolition, removal sequencing.
 - 2. Summary of safety procedures.
- B. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.04 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Company specializing in the type of work required.
 - 1. Minimum of three years of documented experience.

PART 3 EXECUTION

2.01 DEMOLITION

- A. As indicated on Drawings, selective demolition and removal from site of existing construction elements as indicated in Drawings.
 - 1. Associated accessories, fasteners, etc. removal as shown in Drawings to achieve clear, base structure.

2.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Provide, erect, and maintain temporary barriers and security devices.
- B. Do not begin removal until receipt of notification to proceed from Architect.
- C. Protect existing structures and other elements to remain in place and not removed.
- D. Minimize production of dust due to demolition operations.
- E. Comply with requirements of Section 01 7419 - Construction Waste Management and Disposal.

2.03 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
 - 1. Verify construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Separate areas in which demolition is being conducted from areas that remain occupied.
 - 1. Provide, erect, and maintain temporary dustproof partitions of construction
- C. Remove existing work as indicated and required to accomplish new work.
 - 1. Remove items indicated on drawings.
- D. Protect existing work to remain.
 - 1. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
 - 2. Repair adjacent construction and finishes damaged during removal work.
 - 3. Patch to match new work.

2.04 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Remove materials not to be reused on site; comply with requirements of Section 01 7419 - Waste Management.
- C. Leave site in clean condition, ready for subsequent work.
- D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

**SECTION 07 9200
JOINT SEALANTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Acoustical joint sealants
- C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 09 3000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.03 REFERENCE STANDARDS

- A. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
- B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- D. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
- E. ASTM C1193 - Standard Guide for Use of Joint Sealants.

1.04 SUBMITTALS

- A. See Section 01 3300 Submittal Procedures.
- B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Backing material recommended by sealant manufacturer.
 - 4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 5. Substrates the product should not be used on.
 - 6. Substrates for which use of primer is required.
- C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
- D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
- E. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.
- F. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.
- G. Installation Plan: Submit at least four weeks prior to start of installation.
- H. Installation Log: Submit filled-out log for each length or instance of sealant installed.
- I. Executed warranty.

1.05 QUALITY ASSURANCE

- A. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.

1. Adhesion Testing: In accordance with ASTM C794.
 2. Compatibility Testing: In accordance with ASTM C1087.
 3. Allow sufficient time for testing to avoid delaying the work.
 4. Deliver sufficient samples to manufacturer for testing.
 5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
 6. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.
- B. Installation Plan: Include schedule of sealed joints, including the following:
1. Joint width indicated in Contract Documents.
 2. Installation Log Form: Include the following data fields, with known information filled out.
 - a. Date of installation.
 - b. Name of installer.
 - c. Actual joint width; provide space to indicate maximum and minimum width.
 - d. Actual joint depth to face of backing material at centerline of joint.
 - e. Air temperature.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Nonsag Sealants:
1. Dow: www.dow.com/#sle.
 2. Master Builders Solutions: www.master-builders-solutions.com/en-us/#sle.
 3. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com/#sle.
 4. Pecora Corporation: www.pecora.com/#sle.
 5. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.

2.02 JOINT SEALANT APPLICATIONS

- A. Scope:
1. Interior Joints:
 - a. Do not seal gaps and openings in gypsum board and suspended ceilings
 - b. Do not seal through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
 - c. Seal the following joints:
 - 1) Joints between door frames and window frames and adjacent construction.
 2. Do Not Seal:
 - a. Intentional weep holes in masonry.
 - b. Joints indicated to be covered with expansion joint cover assemblies.
 - c. Joints where sealant is specified to be furnished and installed by manufacturer of product to be sealed.
 - d. Joints where sealant installation is specified in other sections.
 - e. Joints between suspended ceilings and walls.
- B. Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.

2.03 JOINT SEALANTS - GENERAL

- A. Sealants and Primers: Provide products with acceptable levels of volatile organic compound (VOC) content.
- B. Colors: To be selected by Architect from manufacturer's full range.

2.04 NONSAG JOINT SEALANTS

- A. Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
 - 3. Color: To be selected by Architect from manufacturer's standard range.
 - 4. Service Temperature Range: Minus 20 to 180 degrees F.
 - 5. Products:
 - a. Dow; DOWSIL 795 Silicone Building Sealant, Carbon Neutral: www.dow.com/#sle.
 - b. Momentive Performance Materials, Inc/GE Silicones; SCS2000 SilPruf - Silicone Sealant and Adhesive: www.siliconeforbuilding.com/#sle.
 - c. Pecora Corporation; Pecora 895 NST (Non-Staining Technology): www.pecora.com/#sle.
 - d. Tremco Commercial Sealants & Waterproofing; Spectrem 1: www.tremcosealants.com/#sle.
- B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
 - 1. Color: White.
 - 2. Products:
 - a. Dow; 786-M White Silicone Sealant: www.dow.com/#sle.
 - b. Momentive Performance Materials, Inc/GE Silicones; SCS1700 Sanitary : www.siliconeforbuilding.com/#sle.
 - c. Tremco Commercial Sealants & Waterproofing; Tremsil 200 : www.tremcosealants.com/#sle.
- C. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Products:
 - a. Master Builders Solutions; MasterSeal NP1: www.master-builders-solutions.com/en-us/#sle.
 - b. Sika Corporation; Sikaflex-1A: usa.sika.com/#sle.
 - c. Tremco Commercial Sealants & Waterproofing; Dymonic FC : www.tremcosealants.com/#sle.

2.05 ACOUSTICAL JOINT SEALANTS

- A. Flexible Polyurethane Foam: Single component, gun grade, and low-expanding.
 - 1. Color: White.
 - 2. Products:
 - a. DAP Products Inc; DRAFTSTOP 812 Foam: www.dapspecline.com/#sle.
 - b. Tremco Commercial Sealants & Waterproofing; ExoAir LEF : www.tremcosealants.com/#sle.
 - 3. Products:
 - a. Hilti, Inc; CP 506 Smoke and Acoustical Sealant: www.us.hilti.com/#sle.
 - b. Momentive Performance Materials, Inc/GE Silicones; RCS20 Acoustical : www.siliconeforbuilding.com/#sle.

- c. Pecora Corporation; AIS-919: www.pecora.com/#sle.
- d. Tremco Commercial Sealants & Waterproofing; Smoke & Sound Sealant : www.tremcosealants.com/#sle.

2.06 ACCESSORIES

- A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.
- B. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- C. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- D. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

- A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Provide joint sealant installations complying with ASTM C1193.
- C. Install acoustical sealant application work in accordance with ASTM C919.
- D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- E. Install bond breaker backing tape where backer rod cannot be used.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements for additional requirements.

- B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
- C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION

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SECTION 09 30 13
CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Ceramic tile.
 - 2. Metal edge strips.
- B. Related Requirements:
 - 1. Section 07 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.2 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."
- C. Face Size: Actual tile size, excluding spacer lugs.
- D. Module Size: Actual tile size plus joint width indicated.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
 - 2. Full-size units of each type of trim and accessory for each color and finish required.
 - 3. Metal edge strips in 6-inch lengths.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 2 percent of amount installed for each type, composition, color, pattern, and size indicated.
 - 2. Grout: Furnish quantity of grout equal to 2 percent of amount installed for each type, composition, and color indicated.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer is a Five-Star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
 - 1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.

- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer: Metal edge strips.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

2.3 TILE PRODUCTS

- A. Tile:
 - 1. **Basis-of-Design Product:** Subject to compliance with requirements, provide product(s) indicated in schedule at end of Section, or substitution in accordance with requirements of 01 25 00 "Substitution Procedures."
 - 2. Tile Characteristics: Represented by product designations and descriptions in schedule, including, but not limited to composition, face size, module size, thickness, face pattern, edges, wearing surface, dynamic coefficient of friction, finish, color, pattern, and mounting.
- B. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide base coves, base caps, wainscot caps, external corners, internal corners, and tapered transition tiles indicated in schedule. Where not indicated, provide shapes selected by Architect from manufacturer's standard shapes.

2.4 SETTING MATERIALS

- A. Modified Dry-Set Mortar (Thinset): ANSI A118.4.
 - 1. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 - 2. Provide prepackaged, dry-mortar mix combined with acrylic resin liquid-latex additive at Project site.
 - 3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.5 GROUT MATERIALS

- A. Grout :
 - 1. **Basis-of-Design Product:** Subject to compliance with requirements, provide product(s) indicated in schedule at end of Section, or substitution in accordance with requirements of the Work, reviewed and approved by the Architect.
- B. High-Performance Tile Grout: ANSI A118.7.
 - 1. Polymer Type: Acrylic resin] or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.
 - 2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Bostik, Inc.
 - b. LATICRETE SUPERCAP, LLC.
 - c. MAPEI Corporation.

2.6 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A666, 300 Series exposed-edge material.
- C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- D. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

2.7 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION OF CERAMIC TILE

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors in wet areas.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges. If accent tile is used, verify tile thicknesses and retain first paragraph below if necessary. If difference in thickness is significant, consider providing a thicker substrate under thinner tile.
- E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - 1. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - 2. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- G. Joint Widths: Unless otherwise indicated, install tile with joint widths indicated in schedule at end of Section.
- H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- I. Grout: Use sanded grout for joints 1/8 inch or larger. Use unsanded grout for joints less than 1/8 inch.
- J. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- K. Metal Edge Strips: Install at locations indicated and/or where exposed edge of tile flooring meets carpet, wood, or other flooring.

3.4 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.5 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.6 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Interior Wall Installations, Masonry or Concrete:
 1. Ceramic Tile Installation W202: TCNA W202; thinset mortar.
 - a. Ceramic Tile Type: As indicated on Drawings.
 - b. Thinset Mortar:: Standard dry-set mortar.
 - c. Grout:: See Schedule

3.7 TILE SCHEDULE

TAG	DESCRIPTION	REMARKS / LOCATION
CT-1	Distributor: Daltile Collection: Color Wheel Linear Size: 4" x 12" x 3/8" thickness Color: Navy Finish: Matte Installation: Horizontal Stacked Bond Grout Joint Width: 1/16" Grout Style: Epoxy Grout Color: TBD	Restroom Wall Tile – See Interior Elevations
CT-2	Distributor: Daltile Collection: Color Wheel Linear Size: 4" x 12" x 3/8" thickness Color: Biscuit Finish: Matte Installation: Horizontal Stacked Bond Grout Joint Width: 1/16" Grout Style: Epoxy Grout Color: TBD	Restroom Wall Tile – See Interior Elevations
MTS-1	Manufacturer: Schluter Type: DILEX-AHKA	See Finish Plans

	Finish: AE New wall tile to existing floor transitions	
MTS-2	Manufacturer: Schluter Type: Jolly Finish: AE Exposed tile edge	See Finish Plans – Used if deduct alternate 2 is accepted.

END OF SECTION

SECTION 09 65 13
RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Thermoset-rubber base.

1.2 ACTION SUBMITTALS

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

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.5 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

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

PART 2 - PRODUCTS

2.1 RUBBER BASE (RB)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product(s) indicated in schedule at end of Section, or substitution in accordance with requirements of 01 25 00 "Substitution Procedures."
- B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset) or Type TP (rubber, thermoplastic), Group I (solid, homogeneous).
- C. Thickness: 0.125 inch.
- D. Lengths: Coils in manufacturer's standard length.
- E. Outside Corners: Job formed.
- F. Inside Corners: Job formed.
- G. Other Characteristics: As represented by product designations and descriptions in schedule, including, but not limited to style, location, height, and color.

2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 - 4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until materials are the same temperature as space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 8 inches in length.
 - a. Form without producing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Miter or cope corners to minimize open joints.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 1. Remove adhesive and other blemishes from surfaces.
 2. Sweep and vacuum horizontal surfaces thoroughly.
 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

3.5 SCHEDULE

TAG	DESCRIPTION	REMARKS / LOCATION
RB-1	Manufacturer: Johnsonite / Tarkett Style: Traditional DuraCove Rubber Base Size: 4"H Coved Color: Burnt Umber #63	<i>See general finish notes</i>

END OF SECTION

**SECTION 09 9123
INTERIOR PAINTING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 2. Mechanical and Electrical:
 - a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
 - b. In finished areas, paint shop-primed items.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Floors, unless specifically indicated.
 - 6. Glass.
 - 7. Concealed pipes, ducts, and conduits.

1.02 DEFINITIONS

- A. Comply with ASTM D16 for interpretation of terms used in this section.

1.03 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.
- D. SSPC-SP 1 - Solvent Cleaning.
- E. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning.
- F. SSPC-SP 13/NACE No.6 - Surface Preparation of Concrete.

1.04 SUBMITTALS

- A. See Section 01 3300 Submittal Procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
 - 2. Cross-reference to specified paint system products to be used in project; include description of each system.

3. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 1. Slip sheet between drawdowns to prevent sticking.
 2. Where sheen is specified, submit samples in only that sheen.
 3. Allow 30 days for approval process, after receipt of complete samples by Architect.
- D. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Provide lighting level of 80 fc measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Paints:
 1. Base Manufacturer: .
 2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.

2. Supply each paint material in quantity required to complete entire project's work from a single production run.
3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. Architectural coatings VOC limits of the State in which the Project is located.
 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- E. Colors: To be selected from manufacturer's full range of available colors.
 1. Selection to be made by Architect after award of contract.
 2. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

2.03 PAINT SYSTEMS - INTERIOR

- A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete masonry units, uncoated steel, shop primed steel, and galvanized steel.
 1. Two top coats and one coat primer.
 2. Top Coat Sheen:
 - a. Eggshell: MPI gloss level 3; use this sheen at all locations.
 3. Primer: As recommended by top coat manufacturer for specific substrate.

2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:

1. Gypsum Wallboard: 12 percent.
2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Concrete:
 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 2. Prepare surface as recommended by top coat manufacturer and in accordance with SSPC-SP 13/NACE No.6.
- F. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- G. Ferrous Metal:
 1. Solvent clean according to SSPC-SP 1.
 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

3.06 SCHEDULE

TAG	DESCRIPTION	REMARKS / LOCATION
P-1	Sherwin Williams SW7011 Natural Choice Finish: Eggshell Type: Epoxy	General Wall Field Paint – See Finish Plans
P-2	Sherwin Williams SW7069 Iron Ore Finish: Flat	Exposed Steel Deck, Structure, & Utilities – See Ceiling Plans
P-3	Sherwin Williams SW6244 Naval Finish: Eggshell Type: Epoxy	Wall Accent Paint – See Finish Plans

END OF SECTION

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SECTION 10 21 13.19

PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Solid-plastic toilet compartments configured as toilet enclosures and urinal screens.
- B. Related Requirements:
 - 1. Section 10 28 00 "Toilet and Bath Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories mounted on toilet compartments.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.
- B. Shop Drawings: For toilet compartments.
 - 1. Include plans, elevations, sections, details, and attachment details.
 - 2. Show locations of cutouts for compartment-mounted toilet accessories.
 - 3. Show locations of centerlines of toilet fixtures.
 - 4. Show locations of floor drains.
 - 5. Show ceiling grid, ceiling-mounted items, and overhead support or bracing locations.
- C. Samples for Verification: For the color finish of the panels.
- D. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents and source.
 - 1. Door Hinges: One hinge(s) with associated fasteners.
 - 2. Latch and Keeper: One latch(es) and keeper(s) with associated fasteners.
 - 3. Door Bumper with hook: One bumper(s) with associated fasteners.
 - 4. Door Pull: One door pull(s) with associated fasteners.
 - 5. Fasteners: Ten fasteners of each size and type.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with NFPA 286; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. 40 kW Exposure: No flame spread to ceiling.
 - 2. No flame spread to outer extremity of sample on any wall or ceiling.
 - 3. Flashover: Not permitted.
 - 4. Peak Release Rate: Maximum 800 kW.
 - 5. Total Smoke Released: Maximum 1,000 square meters.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

2.2 SOLID-PLASTIC TOILET COMPARTMENTS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Scranton Products; Hiny Hiders or a comparable product by one of the following:
 - 1. ASI Accurate Partitions.
 - 2. ASI Global Partitions.
 - 3. Hadrian Manufacturing Inc.
- B. Toilet-Enclosure Style: Floor Mounted, Overhead braced
- C. Urinal-Screen Style: Wall hung
- D. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, no-sightline system, and with homogenous color and pattern throughout thickness of material.
 - 1. Color and Pattern: See Schedule at end of Section.
 - 2. Door panel edge: No sightline design, ship-lap edge.
- E. Pilaster Sleeves (Caps): Manufacturer's standard design; Stainless Steel

2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.
 - 1. Hinges: Steel Helix: Fabricated in mount on inside of the toilet compartment on the door and pilaster. The door and pilaster is not to have exposed metal parts on the outside of the toilet compartment. Hinges operate with field adjustable nylon cams. Cams can be field adjusted to any degree. The pilaster and doors have to be fabricated to accept the hinge. .
 - 2. Recessed latch-operating devices that are accessible to people with disabilities are available. Verify requirements of authorities having jurisdiction.

3. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless-steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.
 4. Coat Hook: Manufacturer's heavy-duty combination cast-stainless-steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.
 5. Door Bumper: Manufacturer's heavy-duty rubber-tipped cast-stainless-steel bumper at out-swinging doors. Mount with through-bolts.
 6. Door Pull: Manufacturer's heavy-duty cast-stainless-steel pull at all doors. Mount on out-swinging doors complying with regulatory requirements for accessibility. Provide units on both sides of doors. Mount with through-bolts.
- B. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M.
- B. Aluminum Extrusions: ASTM B 221.
- C. Zamac: ASTM B 86, commercial zinc-alloy die castings.

2.5 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Door Size and Swings: Unless otherwise indicated, provide 24-inch-wide, in-swinging doors for standard toilet compartments and 36-inch-wide, out-swinging doors with a minimum 32-inch-wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch.
 - b. Panels and Walls: 1 inch.
 2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
 - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

3.4 SCHEDULE

TAG	DESCRIPTION	REMARKS / LOCATION
TP-1	Manufacturer: Scranton Products Style: Hiny Hiders Zero sightline -Floor Mounted Overhead Braced -Class A material -Steel Helix Hinge -Continuous aluminum brackets -Ship lap, stainless latch/keeper -Stainless Steel shoes -HDPE color: Shale Size: 82" panel and pilaster height, 66"h door height. Include occupancy indicator, BTB handles on all stalls and coat hooks	Compartment layout per drawings

END OF SECTION

SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Toilet Room accessories.
- B. Related Requirements:
 - 1. Section 10 21 13.19 "Plastic Toilet Compartments" for toilet and bath accessories provided with toilet compartments.

1.2 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.3 ACTION SUBMITTALS

- A. Product Data Submittals: For each product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify accessories using designations indicated.
- C. Delegated Design Submittal: For grab bars.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

1.6 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, visible silver spoilage defects.
 - 2. Warranty Period: 15 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace hand mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Design accessories and fasteners to comply with the following requirements:
 - 1. Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.

2.2 TOILET ROOM ACCESSORIES

- A. Source Limitations: Obtain each type of public-use washroom accessory from single source from single manufacturer.
- B. Grab Bar Assembly: Key 600, 601
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers, offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Specialties, Inc.
 - b. Bobrick Washroom Equipment, Inc.
 - c. Gamco Specialty Accessories, a division of Bobrick
 - 2. Mounting: Flanges with concealed fasteners.
 - 3. Material: Stainless steel, 0.05 inch thick.
 - a. Finish: Smooth, ASTM A480/A480M, Stainless Steel
 - 4. Outside Diameter: 1-1/2 inches.
 - 5. Configuration and Length: As indicated on Drawings.
- C. Sanitary-Napkin Disposal Unit Key 608:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Bradley; 4721-15 or comparable product by one of the following:
 - a. ASI-American Specialties, Inc.
 - b. Bobrick Washroom Equipment .
 - c. Gamco Commercial Restroom Accessories.
 - 2. Mounting: Partition mounted
 - 3. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
- D. Soap Dispenser, Key: 603 (OFCl)
- E. Toilet Tissue Dispenser, Key: 605 (OFCl)

- F. Automatic Paper towel dispenser, Key: 609 (OFCI)
- G. Changing Station, Key: 606
 - 1. Basis of Design Product: KoalaKare KB300-SS
- H. Hand Dryers , Key: 604
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Dyson Airblade V Handryer HU02 or approved equal by Architect.
 - 2. Mounting: Surface Mounted
 - 3. Material and Finish: Sprayed Nickel

2.3 MATERIALS

- A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.031-inch-minimum nominal thickness unless otherwise indicated.
- B. Galvanized-Steel Sheet: ASTM A653/A653M, with G60 hot-dip zinc coating.
- C. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.
- D. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper and theft resistant where exposed, and of stainless or galvanized steel where concealed.

2.4 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories in accordance with manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
 - 1. Remove temporary labels and protective coatings.
- B. Grab Bars: Install to comply with specified structural-performance requirements.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces in accordance with manufacturer's written instructions.

END OF SECTION

SECTION 12 36 61.16
SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Solid surface material countertops.
 - 2. Solid surface material apron fronts.

1.2 ACTION SUBMITTALS

- A. Product Data: For countertop materials.
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
 - 1. Show locations and details of joints.
 - 2. Show direction of directional pattern, if any.
- C. Samples for Verification: For the following products:
 - 1. Countertop material, 6 inches square.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

1.5 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements before countertop fabrication is complete.

1.6 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ISFA 2-01.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product(s) indicated in schedule at end of Section, or substitution in accordance with requirements of 01 25 00 "Substitution Procedures."
 - 2. Type: Provide Standard type unless Special Purpose type is indicated.
 - 3. Colors and Patterns: As represented by product designations and descriptions in schedule at end of Section.
- B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
 - 1. Grade: Custom.
- B. Countertops:
 - 1. 1/2-inch- thick, solid surface material with front edge built up with same material.
- C. Backsplashes: 1/2-inch- thick, solid surface material.
- D. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
 - 1. Install integral sink bowls in countertops in the shop.
- E. Joints:
 - 1. Fabricate countertops less than 72 inches long without joints.
 - 2. Fabricate countertops in sections for joining in field.
 - a. Joint Locations: Not within 18 inches of a sink or cooktop and not where a countertop section less than 36 inches long would result, unless unavoidable.
- F. Cutouts and Holes:

1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
 - a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.
2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.3 INSTALLATION MATERIALS

- A. Support Brackets:
 1. Basis-of-Design Product: Subject to compliance with requirements, provide RAKKS, Rangine Corporation, EVH Vanity Support Bracket, or substitution in accordance with requirements of 01 25 00 "Substitution Procedures."
- B. Adhesive: Product recommended by solid surface material manufacturer.
- C. Sealant for Countertops: Comply with applicable requirements in Section 07 92 00 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Where countertops are not supported by base cabinets, knee walls, or other means of support, install support brackets at spacing indicated on Drawings and in accordance with manufacturer's recommendations.
- C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form

seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

- E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
 - 1. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Pre-drill holes for screws as recommended by manufacturer.
- H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
 - 1. Seal edges of cutouts in particleboard subtops by saturating with varnish.
- I. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

3.3 SCHEDULES

TAG	DESCRIPTION	REMARKS / LOCATION
SS-1	Manufacturer : Dupont Corian Color : Grade C – TBD Thickness : ½”	Restroom Countertops

END OF SECTION 12 36 61.16

SECTION 20 0500
BASIC REQUIREMENTS FOR MECHANICAL, PLUMBING, AND FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Basic mechanical requirements specifically applicable to Divisions 20, 21, 22, and 23.

1.2 SCOPE OF WORK

- A. The following description is a general description of the HVAC, plumbing, and fire suppression work for this project. This work description is not all inclusive but is offered to give the Contractor a general idea of the scope of the project.
1. HVAC work includes but is not limited to the following:
 - a. Replacement of existing electric unit heaters in each restroom.
 - b. Replacement of existing grilles with new.
 2. Plumbing work includes but is not limited to the following:
 - a. Replacement of existing lavatory faucets, urinal flush valves and water closet flush valves through the field level restrooms.
 3. Fire suppression work includes but is not limited to:
 - a. Inspection of the existing fire suppression piping and sprinklers, with repairs as needed.

1.3 DEFINITIONS

- A. The following words or phrases have special meaning when used in the articles of this division and in any other requirements applicable to this division:
1. "Exposed to View" or "Exposed" — shall have reference to and mean that the pipes, ducts, etc., insulated or otherwise, in the completed structure are visible within any normally occupied space, room or area.
 2. "In Concealed Spaces", "Concealed" or "Not Exposed to View" — shall have reference to and mean that the pipes, duct, etc., insulated or otherwise are concealed and not exposed to view within furred spaces, above suspended ceilings, pipe chases, etc.
 3. "Unfinished Spaces" or "Unfinished Rooms" — shall have reference to areas such as Machine Rooms, Equipment Rooms, or similar areas. Where the words "In Finished Areas" or "Finished Rooms" are used, it shall have reference to rooms or spaces, such as, Reading rooms, Offices, Public Corridors, etc.
 4. "Finished Rooms or Spaces" shall refer to areas similar to offices, public corridors, and public toilet rooms.
 5. "Provide" — shall be taken to mean "furnish and install" meaning to purchase and deliver to the job site and the installation thereof.
 6. "Piping" — shall include, in addition to pipe all fittings, valves, hangers, and other supports, expansion compensators, anchors, and accessories related to such piping including associated insulation.

7. "Ductwork" — shall include, in addition to ducts, all fittings, transitions, dampers, hangers and other supports, fire dampers, access panels, associated insulation and accessories related to such ductwork.
8. "Contractor" in Specifications and Drawing refers to respective Contractor performing that portion of work.
9. "Invert Elevation" (I.E.) means elevation of inside bottom of pipe or duct.
10. "Mechanical Work" is work in Divisions 20, 21, 22, and 23.
NOTE: The words "Contractor shall" are implied and shall be so understood wherever the directions "furnish," "install" or "provide" are used.

1.4 SPECIAL CONDITIONS

- A. Minor items and accessories or devices reasonably inferable as necessary to the complete and proper operation of any system shall be provided by the Contractor for such system whether or not they are specifically called for by the specifications or drawings.
- B. Where work specified in other sections of the specifications connects to equipment specified in Divisions 20, 21, 22, and 23 Sections, check the required connection to such equipment.

1.5 PROJECT/SITE CONDITIONS

- A. Install Work in locations shown on drawings, unless prevented by Project conditions.
- B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Owner before proceeding.

1.6 CONTRACTOR USE OF PREMISES

- A. Refer to Division 01.
- B. Limit use of site and premises to allow:
 1. Owner occupancy.
 2. Use of premises by Owner to conduct normal activities.
 - a. Tie-ins to existing systems must be done in manner so as not to interfere with Owner's operations. All shut downs of existing services require a three day notice minimum in writing.
- C. Schedule the work to accommodate this requirement.
- D. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- E. The Owner will be responsible for the identification and abatement of all hazardous materials and asbestos associated with the project. Although great care will be taken to eliminate any risks, the Contractor must be aware that hazardous materials may exist on site. Therefore, the Contractor shall immediately suspend work and notify the Owner if asbestos or other hazardous material is suspected in the work area of the project.

1.7 REFERENCE STANDARDS

- A. Quality assurance

1. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
 2. Conform to reference standard by date of issue current on date of Contract Documents date for receiving bids date of Owner-Contractor Agreement when there are no Bid dates specified.
 3. Obtain copies of standards when required by Contract Documents.
 4. Maintain copy of applicable standard at job site during submittals, planning and progress of the specific work, until Substantial Completion.
 5. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
 6. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.
- B. Reference standards and specification abbreviations
1. Refer to Divisions 01, 20, 21, 22, and 23.

1.8 SUBMITTALS

- A. Shop drawings and samples shall be submitted in compliance with the Conditions of the Contract and General Requirements.
- B. Submittals shall contain outline dimensions, operating and maintenance clearances and sufficient engineering data to indicate compliance with the specifications. Each submittal shall be clearly labeled as indicated in the Conditions of the Contract and General Requirements.
- C. Each piece of equipment shall be identified by the number shown in the schedules and by specification article number pertaining to the item. Shop drawings shall as a minimum be ¼" equals 1'-0" scale, and shall be newly prepared by the Contractor and not reproduced from the Architect's drawings. Layouts shall be made for all floor plans including all ductwork, piping, electrical distribution and other mechanical equipment. Layouts shall show clearances of piping, ducts, etc., above floor.
- D. Contractor shall obtain Engineer's approval on all the work before any equipment is purchased, or any work installed. Contractor shall also secure approval of the Governmental Authorities having jurisdiction on all equipment and on the layout of the complete system.
- E. The Engineer's review and approval of shop drawings is a gratuitous assistance and in no way does it relieve the Contractor from responsibility for errors or omissions which may exist on the shop drawings. Where such errors or omissions are discovered later, they must be made good by the Contractor, without any additional cost to the Owner, irrespective of any approval by the Engineer.
 1. The Contractor shall incorporate with his shop drawings, a letter indicating all deviations from the plans and/or specifications. If in the opinion of the Architect, the deviations are not equal, the Contractor will be required to furnish the item as specified and as indicated on the drawings.
 2. Record documents shall be submitted in compliance with the requirements of the Specifications.

1.9 QUALITY CONTROL

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions and workmanship to product Work of specified quality.
- B. Comply fully with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes or specified requirements indicate higher standards or more precise workmanship.
- E. Work to be performed by persons qualified to produce workmanship of specified quality.
- F. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.
- G. Manufacturers' field services and reports
 - 1. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of installation, quality or workmanship, start-up of equipment, testing, adjusting and balancing of equipment and troubleshooting as applicable and to initiate instructions when necessary.
 - 2. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
 - 3. Submit report in duplicate within 10 days of observation to Architect for review.

1.10 CONTRACT CLOSEOUT

- A. Final cleaning
 - 1. Refer to Division 01.
 - 2. Execute final cleaning prior to final inspection.
- B. Adjusting
 - 1. Adjust operating products and equipment to ensure smooth and unhindered operation.
- C. Project Record Documents
 - 1. Refer to Division 01.
 - 2. Record documents and shop drawings: Legibly mark each item to record actual construction including:
 - a. Field changes of dimension and detail.
 - b. Details not on original Contract drawings.
 - 3. Delete Architect's title block and seal from all documents.
 - 4. Submit documents to Architect with claim for final application for payment.

1.11 SPARE PARTS AND MAINTENANCE DATA

- A. Provide products, spare parts, maintenance and materials in quantities specified in individual specification sections.

- B. Deliver to project site and place in location as directed; obtain receipt prior to final payment.

1.12 WARRANTIES

- A. Provide notarized copies.
- B. Execute and assemble documents from Subcontractors, suppliers and manufacturers.
- C. Provide table of contents and assemble in 3-D side ring binder with durable cover.
- D. Submit prior to final application for payment.
- E. For items of work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

1.13 REGULATORY REQUIREMENTS

- A. Conform to International Mechanical Code with Wisconsin Amendments, State of Wisconsin Plumbing Code, and NFPA 13, latest editions.
- B. Obtain permits and request inspections from City of Milwaukee.
- C. Conform to all other governing agencies and authorities.

PART 2 - PRODUCTS

2.1 MATERIAL AND EQUIPMENT

- A. Refer to Division 01.
- B. Products
 - 1. Products: Means new material, machinery, components, equipment, fixtures and systems forming Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of Work. Products may also include existing materials or components required for reuse.
 - 2. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.
 - 3. Provide interchangeable components of same manufacturer for similar components.
- C. Transportation and handling
 - 1. Transport and handle products in accordance with manufacturer's instructions.
 - 2. Promptly inspect shipment to assure that products comply with requirements, quantities are correct and products are undamaged.

2.2 STORAGE AND PROTECTION

- A. Refer to Division 01.
- B. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate-controlled enclosures.
- C. For exterior storage of fabricated products, place on sloped supports above ground.
- D. Provide off-site storage and protection when site does not permit on-site storage or protection.

- E. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
- F. Store loose granular materials on solid flat surfaces in a well-drained area. Provide mixing with foreign matter.
- G. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement or damage.
- H. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

2.3 PRODUCT OPTIONS

- A. Refer to Division 01.
- B. Products specified by reference standards or by description only: Any product meeting those standards or description.
- C. Products specified by naming one or more manufacturers: Products of manufacturers named and meeting specifications; no options or substitutions allowed.
 - 1. Documents have been prepared utilizing a single manufacturer as the basis of design. Contractor shall be responsible for coordinating any varying requirements (e.g. space requirements, electrical requirement) when utilizing the other acceptable manufacturers.

PART 3 - EXECUTION

3.1 SCOPE

- A. Work included under Divisions 20, 21, 22, and 23 shall include all labor, services, materials, and equipment and performance of all work required for installation of mechanical, plumbing, and fire suppression systems as shown on drawings and as herein specified in following sections.

3.2 INTERPRETATION OF CONTRACT DOCUMENTS

- A. Should there be discrepancy or a question of intent, refer matter to Engineer for decision before ordering any equipment or materials or before starting any related work.
- B. Drawings and specifications are to be taken together. Work specified and not shown or work shown and not specified shall be performed or furnished as though mentioned in both Specifications and drawings. If there is discrepancy between drawings and specifications as to quantity or quality to be provided, the greater quantity or better quality shall be provided.
- C. Minor items and accessories or devices reasonably inferable as necessary to complete and proper installation and operation of any system shall be provided by Contractor for such system whether or not specifically called for by specifications or drawings.
- D. Architect/Engineer may change location of any equipment 5' and any piping, ductwork, conduit, etc. 10' in any direction without extra charge, provided such changes are made before installation.
- E. Locations of items not definitely fixed by dimensions are approximate only and exact locations necessary to secure the best conditions and results shall be determined at the site and shall be subject to review and approval by Architect.

- F. Follow drawings in laying out work, check drawings of other trades to verify spaces in which work will be installed, and maintain maximum headroom and space conditions at all points.
 - 1. Where headroom or space conditions appear inadequate, notify Architect or Owner's field representative before proceeding with installation.
 - 2. Duct and pipe rerouting and duct size changes shall be made at no additional cost to the Owner.
- G. Furnish advance information on locations and sizes of frames, boxes, sleeves and openings needed for the work, and also furnish information and shop drawings necessary to permit installation of other work without delay.
- H. Where there is evidence that parts of the Work specified in Divisions 20, 21, 22, and 23 will interfere with other work, assist in working out space conditions to make satisfactory adjustments, revise and submit coordinated shop drawings.
- I. After review and without additional cost to the Owner, make minor modifications in the work as required by structural interferences, by interferences with work of other sections or for proper execution of the work.
- J. Work installed before coordinating with other work so as to cause interference with other work shall be changed and corrected without additional cost to the Owner.
- K. Drawings are diagrammatic in nature and are a graphic representation of requirements and shall be followed as closely as actual building construction will permit. All changes from the plans necessary to make the work conform to the building as constructed and to fit the work of other trades or to conform to rules of the Governmental Authorities having jurisdiction, NFPA, OSHA and the Owner's Insurance Underwriters, shall be made by the Contractor without extra cost to the Owner.
- L. The layout of the piping, ductwork, equipment, etc., as shown on the drawings shall be checked and exact locations shall be determined by the dimensions of the equipment approved and the Contractor shall obtain approval for the revised layout before the apparatus is installed. The Contractor shall field measure or consult existing record architectural and structural drawings if available for all dimensions, locations of partitions, locations and sizes of structural supports, foundations, etc.
- M. Omission in the drawings and/or specifications of any items necessary for the proper completion or operation of the work outlined in this specification shall not relieve the Contractor from furnishing same without additional cost to the Owner.
- N. The equipment shop drawings will be furnished to the Contractor before roughing-in. Contractor shall not install any piping or ductwork for said equipment until he has received approved shop drawings for same.

3.3 PROJECT/SITE CONDITIONS

- A. Each Contractor shall visit the site prior to bid submission to determine all existing conditions that may affect his work and shall make appropriate allowances for such conditions in his bid. Failure to visit the site shall not be cause for a request for additional compensation later in the project during construction.
- B. Install Work in locations shown on drawings, unless prevented by project conditions.
- C. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of Engineer before proceeding.

3.4 ALTERATIONS IN PRESENT BUILDING AND SYSTEMS

- A. Contractor shall take particular note of the revisions and alterations to the existing systems, facilities and equipment due to the new construction as indicated on the drawings and/or in specification. Contractor shall remove, reroute or alter all services, ductwork, etc., as required or as indicated on the drawings.
 - 1. The Contractor shall maintain all services in the existing building. In case, where new service connections are to be made to existing services and service interruptions can in no way be avoided, the service interruptions shall be with the minimum of inconvenience to the Owner and the work shall be done at such time of any day, Saturday and Sunday included, and only as directed by the Owner or the Architect.

3.5 ERECTION & WORKMANSHIP

- A. Contractor is to be responsible for all work fitting into place in satisfactory, neat and workmanlike manner in every particular, to approval of Architect/Engineer.
- B. Unless explicitly stated to contrary, each Contractor shall furnish and install each item of equipment or material hereinafter specified, complete with all necessary fittings, supports, trim, piping, insulation, etc., as required for complete and operating installation.
- C. Equipment and materials shall be installed according to manufacturer's instruction unless otherwise specifically directed by Contract Documents.
- D. Contractor shall provide all necessary OSHA approved rigging, scaffolding, tools, tackle, labor, etc., necessary for the complete installation of the equipment.
- E. Contractor shall adapt his work to job conditions and make such changes as required and permitted by the Architect such as moving his work to clear beams, joints, light fixtures, etc., adjusting risers, etc. avoiding interferences with windows and openings, etc. raising or lowering his work to permit the passing of ductwork or the work of other trades, etc., all as required or as job conditions dictate, without any additional costs to the Owner.
- F. All appliances and equipment shall be installed and connected with best engineering practices and in accordance with the manufacturer's best instructions and recommendations.
- G. Work done by Contractor at the site in the execution of this Project shall be performed only by skilled mechanics, recognized as such in their respective trades in the direct employ either of the Contractor proper or of affiliate firms which have a longstanding and continuing formal agreement with the Contractor for providing the rendered services on similar work of this type.

3.6 PROTECTION FROM INJURY

- A. All pipes, fixtures, traps, equipment, and other parts of the Work shall be protected against injury by freezing or exposure to the weather during construction while stored or installed in place.

3.7 MECHANICAL AND ELECTRICAL WORK COORDINATION

- A. Refer to Division 01.
- B. Provide coordination for type of mechanical and electrical work required for this project for duration of work.
- C. Submittals

1. Coordinate mechanical and electrical work of Divisions 20, 21, 22, 23, and 26 with work of each other and of other Divisions.
 2. Coordinate progress schedules, including dates for submittals and for delivery of products.
 3. Coordinate location and verify size of pipes, equipment, fixtures, conduit, ducts, openings, switches, outlets, fire sprinkler heads, fire hose cabinets, etc., in progress of the Work. Architectural drawings shall take precedence over mechanical and electrical drawings.
 4. Participate in progress meetings. Report on progress of work to be adjusted under coordination requirements and any required changes in schedules. Transmit minutes of meetings and reports to concerned parties.
- D. Coordination of Submittals
1. Review shop drawings, product data, and sample for compliance with Contract Documents and for coordination among work of all sections of Project Manual. Transmit to Architect.
 2. Check field dimensions and clearances and relationship to available space and anchors.
 3. Check compatibility with equipment and work of other sections, electrical characteristics and operational control requirements.
 4. Check motor voltages and control characteristics.
 5. Coordinate controls, interlocks, wiring of pneumatic switches and relays.
 6. Coordinate wiring and control diagrams.
 7. Review effect of any changes on work of other sections.
 8. Verify and coordinate maintenance of Record Documents.
- E. Coordination of substitutions and modifications
1. Review proposals and requests from subcontractors.
 2. Verify compliance with Contract Documents and for compatibility with work and products of other sections.
 3. Submit to Architect with recommendation for action.
- F. Observation of work
1. Observe work for compliance with Contract Documents.
 2. Maintain list of observed deficiencies and defects; promptly submit to Architect.
- G. Documentation
1. Observe and maintain a record of tests. Record:
 - a. Specification section number, product, and name of subcontractor
 - b. Name of testing agency and name of inspector
 - c. Name of manufacturer's representative present
 - d. Date, time, and duration of tests
 - e. Type of test, and results
 - f. Retesting required
 2. Assemble background documentation for dispute and claim settlement by Architect.

3. Submit copies of documentation to Architect upon request.
- H. Equipment start-up
 1. Verify utilities, connections and controls are complete and equipment is in operable condition.
 2. Observe start-up and adjustments; record time and date of start-up and results.
 3. Observe equipment demonstrations to Owner; record times and additional information required for Operation and Maintenance Manuals.
- I. Inspection and acceptance of equipment
 1. Prior to inspection, verify that equipment is tested and operational, and clean.
 2. Assist Architect with inspection. Prepare list of items to be completed and corrected.

3.8 CUTTING AND PATCHING

- A. Refer to Division 01.
- B. Submit written request in advance of cutting or alteration which affects:
 1. Structural integrity of any element of Project
 2. Integrity of weather-exposed or moisture-resistant element
 3. Efficiency, maintenance, or safety of any operational element
 4. Visual qualities of sight-exposed elements
 5. Work of Owner or separate contractor
- C. Include in request:
 1. Effect on work of Owner or separate contractor
 2. Written permission of affected separate contractor
 3. All items requested in Division 01
- D. Examination
 1. Inspect existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.
 2. After uncovering existing work, inspect conditions affecting performance of work.
 3. Beginning of cutting or patching means acceptance of existing conditions.
- E. Preparation
 1. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
 2. Provide protection from elements for areas which may be exposed by uncovering work.
 3. Maintain excavations free of water.
- F. Cutting and patching
 1. Execute cutting, fitting, and patching including excavation and fill to complete work.
 2. Fit products together to integrate with other work.

3. Uncover work to install ill-timed work.
 4. Remove and replace defective or non-conforming work.
 5. Remove samples of installed work for testing when requested.
 6. Provide openings in work for penetration of mechanical and electrical work.
- G. Performance
1. Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.
 2. Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
 3. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
 4. Restore work with new products in accordance with requirements of Contract Documents.
 5. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
 6. At penetrations of fire-rated walls, partitions, ceiling, or floor construction, completely seal voids with fire-rated fire resistant material to full thickness of the penetrated element.
 7. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

3.9 ACCESS PANELS

- A. Where control valves, shut-off valves, drip traps, heating coils, dampers, pull boxes or other specialties, which require service or adjustment, are installed above inaccessible type furred ceilings or within furred walls, Contractor whose equipment is involved shall furnish and install access panels as required.
- B. Access panels shall be of sufficient size to make possible servicing, adjustment, removal and replacement of concealed equipment through opening provided. Panels shall be sized as shown on drawings, or if sizes are not shown, shall be minimum of 16" x 24" in walls and 24" x 24" in ceilings.
- C. Contractor shall confer with other trades with respect to access panel locations, and shall wherever practical group valves, traps, dampers, etc. in such way as to be accessible from single panel and eliminate as many access panels as possible.
- D. Submit shop drawings for review before ordering panels. Where fire rating is required, furnish label doors compatible with fire rating of assembly.

3.10 SOUND CONTROL

- A. Conduits shall be grouted or sealed tightly in place.
- B. Piping, ductwork, etc. shall pass through sleeves. Pack sleeves tight with glass fiber or oakum and caulked on both sides with non-hardening acoustical sealant.

3.11 PROTECTION OF ELECTRICAL EQUIPMENT

- A. Contractor shall furnish and install sheet metal drain pans beneath piping that is routed above electrical equipment and/or above the 3' access space in front of such equipment. Electrical

equipment, for the purpose of addressing drain pan requirements, shall be defined as free-standing or wall-mounted switchgear, transformers, distribution boards or motor control centers. Piping includes, but is not limited to, plumbing, fire suppression, mains (not branch piping with sprinkler heads), hydronic heating or cooling, steam and condensate, and fuel systems.

1. Drain pans shall be 20 gauge galvanized sheet metal with a minimum 4" high turned up edge. Bottom of drain pan shall slope to a single drainage point at $\frac{1}{8}$ " per foot. A 1" diameter clear plastic tube shall allow collected fluid to drain to the nearest open site floor drain. Secure plastic tubing to building structure only.
 2. Drain pan shall be hung from building structure with angle iron trapeze hangers (no hanger shall penetrate the drain pan). Consider drain pan to be full of water for hanger load calculations.
 3. Drain pans shall include liquid detectors with alarms only if noted on the drawings.
- B. Provide sprinkler heads beneath drain pan only as required by NFPA.
- C. Contractor shall include provisions to adjust the local lighting layout, at no extra cost to Owner, in order to accommodate any detrimental effect the drain pan has on the illumination of the electrical equipment and access space.

3.12 STARTING SYSTEMS

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and Owner seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence or other conditions which may cause damage.
- D. Verify that tests, meter readings and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of responsible manufacturer's representative or Contractors' personnel in accordance with manufacturers' instructions.
- G. When specified in individual specification sections, require manufacturer to provide authorized representative to be present at site to inspect, check and approve equipment or system installation prior to start-up and to supervise placing equipment or system in operation.
- H. Submit a written report in accordance with paragraph 1.12 previously specified that equipment or system has been properly installed and is functioning correctly.

3.13 TESTING, ADJUSTING AND BALANCING

- A. Contractor shall appoint, employ and pay for services of independent firm to perform testing, adjusting and balancing.
- B. Independent firm will perform services specified in Division 01 and Division 23 Section 23 0593, "Testing, Adjusting, and Balancing for HVAC."
- C. Reports will be submitted by independent firm to Architect indicating observations and results of tests and indicating compliance or non-compliance with specified requirements and with requirements of Contract Documents.

3.14 REMODELING PROJECT PROCEDURES

- A. Refer to Division 01.
- B. Demolition
 - 1. Contractor shall remove existing equipment and materials pertaining to his contract as specified or as required, whether shown on drawings or not, to prepare for new work of all contracts.
 - 2. Where necessary, reroute piping, ducts, conduits, wiring, etc. from within walls, floors, ceilings, etc. being removed. Contractor involved with interrupted service shall be responsible for accomplishing required work whether shown on drawings or not.
 - 3. Cap all abandoned or terminated piping, conduit, etc. below floor, behind wall surface, above ceiling, etc. as required to be completely concealed after new work is complete.
 - 4. In general, mechanical remodeling work is shown on mechanical drawings but carefully study all drawings for all contracts for “demolition” and “remodeling” work in existing building and field check to verify locations where such work is being done to determine exact extent of work required. No extra will be allowed for additional work required because of demolition or remodeling whether or not work is specifically noted, itemized or shown on drawings.
 - 5. Contractor shall cap or plug all pipes, valves, fittings, etc. left open after demolition if they are not to be reused.

END OF SECTION

SECTION 20 0529
HANGERS AND SUPPORTS FOR MECHANICAL, PLUMBING AND FIRE SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Hangers and supports specifically applicable to Divisions 20, 21, 22, and 23, including:
 - 1. Equipment hangers and supports

1.2 CODES AND STANDARDS

- A. American Society of Mechanical Engineers (ASME)
 - 1. ASME B31.1: Power Piping
 - 2. ASME B31.5: Refrigeration Piping
 - 3. ASME B31.9: Building Services Piping
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM A1011: Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability (*Formerly ASTM A570*)
 - 2. ASTM A123: Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
 - 3. ASTM A36: Steel Plates, Shapes and Bars
 - 4. ASTM A653: Specification for Steel Sheet, Zinc-Coated by the Hot-Dip Process
 - 5. ASTM B633: Specification for Electrodeposited Coatings of Zinc on Iron and Steel
 - 6. ASTM C150: Portland Cement
 - 7. ASTM C404: Uniformly Graded Natural Sand
 - 8. ASTM E-814: Fire Tests of Through-Penetration Fire Stops
- C. American Welding Society (AWS)
 - 1. Specifications for Qualification of Welding Procedures and Welders
- D. American Water Works Association (AWWA)
- E. Building Officials and Code Administrators International (BOCAI)
 - 1. BOCA: National Building Code
 - 2. BOCA: National Mechanical Code
- F. International Conference of Building Officials (ICBO)
 - 1. ICBO: Uniform Building Code
- G. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS)
 - 1. MSS SP 58: Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation

- 2. MSS SP 89: Pipe Hangers and Supports - Fabrication and Installation Practices
- H. National Fire Protection Association (NFPA)
 - 1. NFPA 13: Standard for the Installation of Sprinkler Systems
 - 2. NFPA 14: Standard for the Installation of Standpipe and Hose Systems
 - 3. NFPA 101: Code for Safety to Life from Fires in Buildings and Structures
- I. Southern Building Code Congress International (SBCCI)
 - 1. SBCCI: Standard Building Code
- J. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - 1. SMACNA: HVAC Duct Construction Standards, Metal and Flexible
- K. Underwriters Laboratories, Inc. (UL)
 - 1. UL 1479: Fire Tests of Through Penetration Firestops and Building Joint Systems
- L. Factory Mutual (FM)

1.3 QUALITY ASSURANCE

- A. Supports for mechanical and plumbing piping: Provide products in compliance with MSS Standards:
 - 1. Provide pipe hangers and supports of which materials, design and manufacture comply with MSS SP-58.
 - 2. Select and apply pipe hangers and supports, complying with MSS SP-58.
 - 3. Fabricate and install pipe hangers and supports, complying with MSS SP-89.
 - 4. Terminology used in this section is defined in MSS SP-90.
- B. Supports for sprinkler piping: Provide products which are UL listed and FM approved and in conformance with NFPA 13.
- C. Supports for standpipes: Provide products which are UL listed and FM approved and in conformance with NFPA 14.
- D. Structural steel welding qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- E. Pipe welding qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

1.4 SUBMITTALS

- A. Preconstruction – Prior to construction provide the following in accordance with Division 01 and Specification 20 0500 – Basic Requirements for Mechanical, Plumbing, and Fire Suppression:
 - 1. Product data: Submit product data on all hanger and support devices, including shields and attachment methods. Product data to include, but not limited to materials, finishes, approvals, load ratings, and dimensional information.
- B. Contract Closeout – At contract closeout provide the following in accordance with Division 01 and Specification 20 0500 – Basic Requirements for Mechanical, Plumbing, and Fire Suppression:

1. Warranties

1.5 DELIVERY, STORAGE AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- B. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

PART 2 - PRODUCTS

MSS Types are shown in diagrams at end of document for reference.

2.1 EQUIPMENT HANGERS AND SUPPORTS

- A. Hanging equipment
 1. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.
 2. Structural steel: ASTM A36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
 3. Attachments: Equipment support shall be directly attached to the building structure utilizing an upper attachment or by utilizing a building structure attachment as indicated in the Pipe Hanger and Support MSS Types – Part 3 table as specified in Division 20 Section "Hangers and Supports for Mechanical, Plumbing, Medical Gas, and Fire Suppression."
 4. Hanging equipment shall be provided with vibration isolation hangers indicated in Division 20 Specification "Vibration Isolation for Mechanical, Plumbing, and Fire Suppression."

PART 3 - EXECUTION

3.1 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports. Ensure that lateral motion under equipment at start-up, shut-down or when unbalanced is no more than ¼ inch.
- D. Provide templates, anchor bolts and accessories for mounting and anchoring equipment.
- E. Provide rigid anchors for pipes after vibration isolation components are installed.
- F. Provide corrosion resistant mounting systems when exposed to the elements and other corrosive environments.
- G. repair paint to comply with ASTM A 780.

END OF SECTION

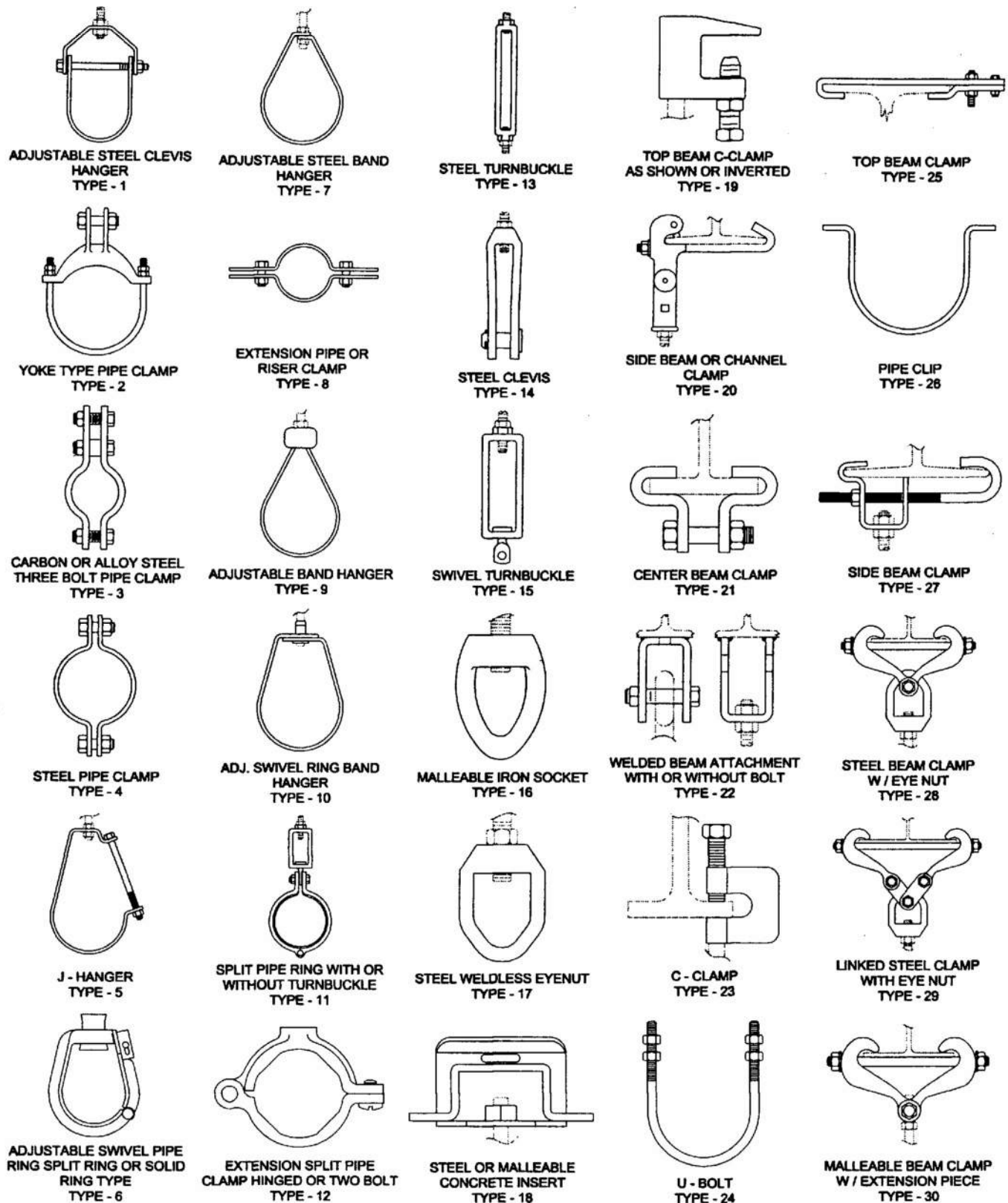


FIGURE 1. TYPE CHART

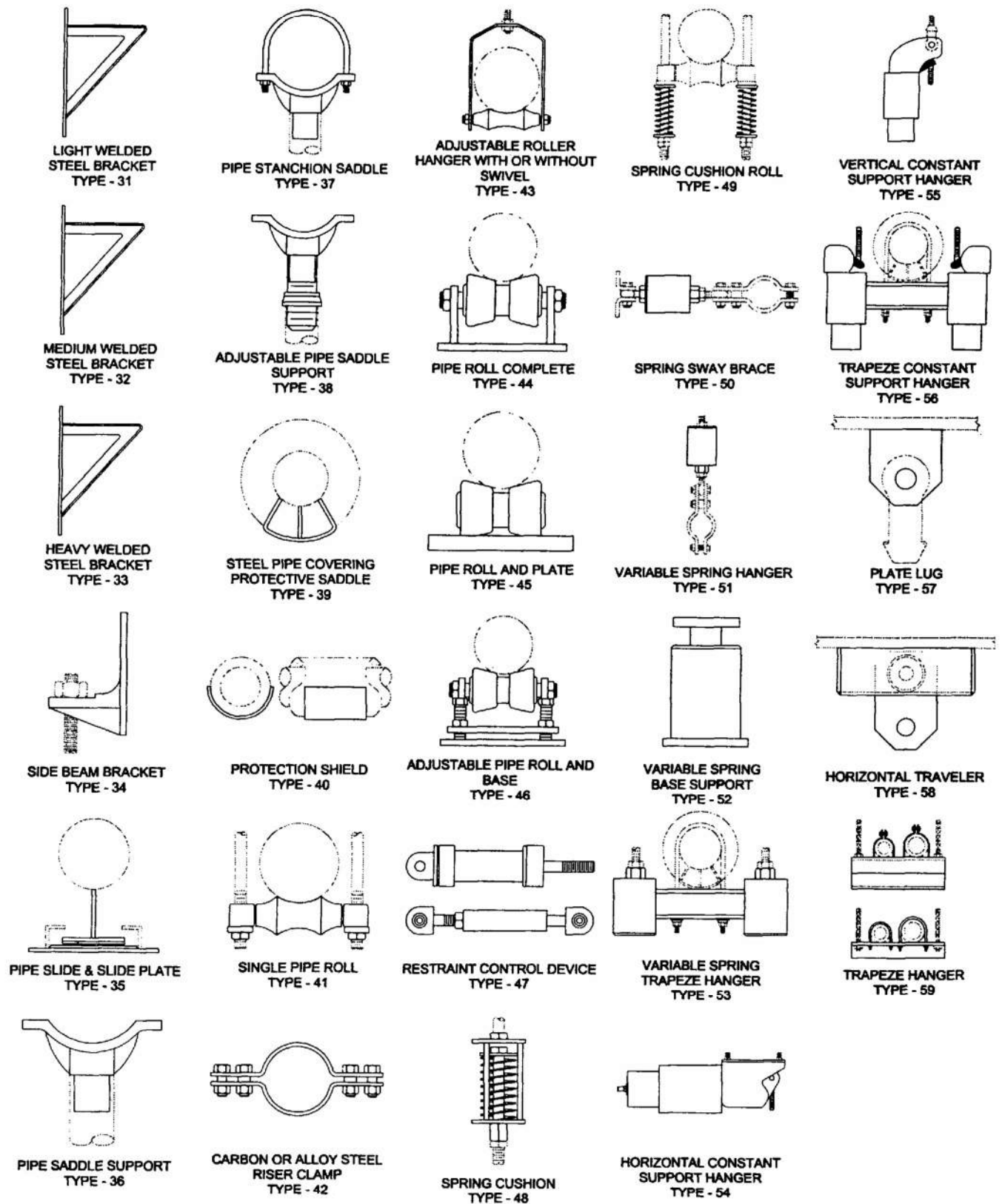


FIGURE 1. TYPE CHART

SECTION 20 0548
VIBRATION ISOLATION FOR MECHANICAL, PLUMBING, AND FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Vibration isolation devices specifically applicable to Divisions 20, 21, 22, and 23, including:
 - 1. Vibration isolators
 - a. Neoprene pads (Type VI-1)
 - b. Neoprene mounts (Type VI-2)
 - c. Free-standing spring isolators (Type VI-3)
 - d. Restrained spring isolators (Type VI-4)
 - e. Spring hangers (Type H-3)
 - f. Pre-compressed spring hangers (Type H-4)

1.2 DEFINITIONS

- A. ICC-ES: ICC-Evaluation Service.
- B. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.
- C. OSHPD: Office of Statewide Health Planning and Development for the State of California

1.3 CODES AND STANDARDS (USE LATEST EDITIONS)

- A. American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE)
 - 1. ASHRAE 2011 Applications Handbook Chapter 48, Noise and Vibration Control
- B. International Building Codes
 - 1. International Building Code (IBC)
- C. Manufacturers Standardization Society (MSS)
 - 1. MSS SP-58-02: Pipe Hangers and Supports – Materials, Design and Manufacture
- D. NSF International
 - 1. NSF/ANSI Standard 61 including Annex G: Drinking Water System Components – Health Effects
 - 2. NSF/ANSI Standard 372: Drinking Water System Components – Lead Content
- E. Occupational Safety and Health Administration (OSHA)
 - 1. 29CFR 1910.95: Occupational Noise Exposure

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

- B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code – Steel."

1.5 SUBMITTALS

- A. Preconstruction – Prior to construction provide the following in accordance with Specification 20 0500 – Basic Requirements for Mechanical, Plumbing, and Fire Suppression:
 - 1. Prior to submitting product data provide a complete set of shop drawings for all equipment to receive vibration isolation from which the Vibration Isolation Manufacturer's Representative shall base the selection of vibration isolators and design of supplementary bases. The drawings shall include locations of all mechanical equipment to receive vibration isolation devices, operating weight of the equipment to be isolated and the distribution of weight to the support points. Any information regarding the components, spacing, and design approaches comprising the structural systems supporting the equipment shall also be provided to the Vibration Isolation Manufacturer's Representative.
 - 2. Product data: For each type of product, including the following:
 - a. Manufacturer name
 - b. Isolator type and model number
 - c. Material and construction of finish
 - d. Dimensional data
 - e. Rated load, rated deflection, and overload capacity
 - f. For spring vibration isolation devices include:
 - (1) Spring diameters
 - (2) Static deflection
 - (3) Free height
 - (4) Compressed spring height and solid spring height
 - g. Drawings or schedule indicating which isolators are to be used on which equipment at a particular locations
 - 3. Provide a complete layout of piping to be isolated, including vertical risers, showing size or weight and support points of the piping system to the vibration isolation materials manufacturer for selection and layout of isolation hangers.
 - 4. Manufacturer's installation and operating manuals.
- B. Contract Closeout – At contract closeout provide the following in accordance with Specification 20 0500 – Basic Requirements for Mechanical, Plumbing, and Fire Suppression:
 - 1. Operating and Maintenance Data including:
 - a. Product data
 - b. Installation instructions
 - c. Assembly drawings
 - d. Replacement parts list
 - e. Maintenance and operation instructions
 - f. Minimum and maximum airflows

2. Test reports
 - a. Manufacturer Installation Inspection Report
3. Warranties

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

- A. Acceptable manufacturers
 1. Kinetics Noise Control
 2. Mason Industries
 3. Vibro-Acoustics
- B. General requirements applicable to all isolators:
 1. Outside spring diameter: Not less than 80% of the compressed height of the spring at rated load.
 2. Minimum additional travel distance to solid: 50% of the required deflection at rated load.
 3. Lateral stiffness: More than 80% of rated vertical stiffness.
 4. Overload capacity: Support 200% of rated load, fully compressed, without deformation or failure.
 5. Operating static deflection: Refer to the Applications table in Part 3.
 6. Materials:
 - a. Indoor: Housings and springs shall be powder coated steel and hardware shall be electro-galvanized.
 - b. Outdoor: Hot dip galvanized housings and cadmium plated spring elements in compliance with ASTM A123.
 7. Springs shall be color coded to indicate load capacity.
- C. Neoprene pads **(Type VI-1)**
 1. One layer of $\frac{3}{4}$ " thick neoprene pad of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates; factory cut to sizes that match requirements of supported equipment.
 2. Basis of Design: Mason Industries Type Super "W"
- D. Neoprene mounts **(Type VI-2)**
 1. Double-deflection neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. All metal surfaces shall be neoprene covered and have friction pads both top and bottom.
 2. Basis of Design: Mason Industries Type ND
- E. Free standing spring isolators **(Type VI-3)**
 1. Free standing, laterally stable open (without any housing)

2. Baseplates: Bonded to ¼" thick, neoprene acoustical friction pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig.
 - a. Baseplates shall be provided with bolt holes for any equipment which is to be mounted on framing or structural steel. Bolt holes are not required for equipment being mounted directly on the slab or on a concrete pad.
 3. Top plate and adjustment bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment. Adjustment bolts shall be rigidly bolted to the equipment. Installed and operating heights shall be equal.
 4. Basis of Design: Mason Industries Type SLF (without bolt holes) or SLFH (with baseplate bolt holes)
- F. Restrained spring isolators **(Type VI-4)**
1. Freestanding, steel, open-spring isolators with limit-stop restraint
 2. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; baseplate with factory drilled bolt holes for bolting to mounting surface, bonded to ¼" thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation. Vertical limit stops shall be out of contact during normal operation. Horizontal clearance on the sides between the spring assembly and the housing shall be a minimum of ½" to avoid bumping and interfering with the spring action.
 3. For equipment located outside, limit stops shall resist wind velocity up to 130 mph.
 4. Restraint: Limit stop as required for equipment. Restraining bolts shall have rubber grommets to provide cushioning in the vertical as well as horizontal directions. The hole through the bushing shall be a minimum of ¾" larger in diameter than the restraining bolt.
 5. Basis of Design: Mason Industries Type SLR
- G. Spring hangers **(Type H-3)**
1. Hangers shall consist of rigid steel frames containing minimum 1¼" thick neoprene elements at the top and a steel spring seated in a steel washer reinforced neoprene cup on the bottom. The neoprene element and the cup shall have neoprene bushings projecting through the steel box. In order to maintain stability, the boxes shall not be articulated as clevis hangers nor the neoprene element stacked on top of the spring. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30° arc from side to side before contacting the cup bushing and short circuiting the spring.
 - a. Elastomeric element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
 - b. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.
 2. Basis of Design: Mason Industries Type 30N
- H. Pre-compressed spring hangers **(Type H-4)**
1. Hanger specification shall be the same as Type H-3 Spring Hangers, but they shall be pre-compressed and locked at the rated deflection by means of a resilient up-stop to keep the piping or equipment at a fixed elevation during installation. The hangers shall be designed with

a release mechanism to free the spring after the installation is complete and the hanger is subjected to its full load. Deflection shall be clearly indicated by means of a scale.

2. Basis of Design: Mason Industries Type PC30N

PART 3 - EXECUTION

3.1 EXAMINATION

- A. The Contractor shall consult with the local representative of the vibration isolation materials manufacturer, prior to installing any devices, in order to obtain guidance for this project's specific installation requirements.

3.2 APPLICATION

- A. Provide vibration isolation devices for equipment per the following schedule.
 1. The base type defined below indicates that bases independent of the equipment are required; the base type is not intended to define an equipment-specific factory base. Where "none" is indicated, the equipment and its integral factory-provided base shall be mounted directly on the defined isolators.

ISOLATED EQUIPMENT			SLAB-ON-GRADE OR BASEMENT			UPPER FLOORS (SPANS UP TO 30 FT.)			COMMENT
Type	HP or Size	RPM	Base Type	Vibration Isolator		Base Type	Vibration Isolator		
				Type	Min. Defl. Rating		Type	Min. Defl. Rating	
In-line Centrifugal or Axial, Cabinet Fan, Utility Sets									
Up to 22 in. diameter	All	All	None	Note 1	1"	Base-C	Note 1	1"	1. VI-3 for floor-mounted; H-3 for suspended 2. Provide horizontal thrust restraints
≥24 in. diameter	≤2 in. sp	≤300	Base-B	Note 1	3"	Base-C	Note 1	4"	
		301 to 500	Base-B	Note 1	1"	Base-C	Note 1	3"	
		≥501	Base-B	Note 1	1"	Base-B	Note 1	2"	
≥24 in. diameter	≥2.1 in. sp	≤300	Base-C	Note 1	3"	Base-C	Note 1	4"	
		301 to 500	Base-C	Note 1	2"	Base-C	Note 1	3"	

3.3 INSTALLATION

A. General vibration isolation requirements:

1. The vibration isolator manufacturer or the manufacturer's representative shall:
 - a. Supply isolators and other related equipment including rails, resilient pipe supports, fan and motor bases and structural steel forms for concrete inertia blocks wherever required.
 - b. Be responsible for proper isolator sizing to accomplish the uniform static deflection according to distribution of weight based on factory certified manufacturer's drawings of equipment to be isolated and available information regarding the existing or proposed structural design of the building.
 - c. Select springs to operate at $\frac{2}{3}$ maximum compression or provide alternate recommendation.
2. Refer to Applications Table for base type, isolator type and required deflection for each type of equipment.
3. All motor-driven mechanical equipment shall be isolated from the building structure by means of vibration isolators. If specific equipment type is not listed in the Application Table, the Contractor shall notify Engineer in writing and obtain specification from Engineer or provide vibration isolation per 2011 ASHRAE Handbook HVAC Applications Table 47.
4. No rigid connections between isolated equipment and building structure shall be made that degrades the vibration isolations systems; electrical conduit connections to isolated equipment shall be looped to allow free motion of isolated equipment. Coordinate with Electrical Contractor and Division 26 Specifications.

B. Requirements for vibration isolation of equipment with spring type vibration isolators:

1. Vibration isolators shall be of such design so that the limit stops are out of contact during normal operation. Should the isolator mounts be "driven solid" leaving no gap for normal isolator operation, the Contractor shall correct the installation by adding vibration isolation hangers to support connected pipe and/or duct or replacing the vibration isolator with a properly selected isolator.
2. For restrained spring isolators with vertical limit stops (to prevent spring extension when weight is removed), provide temporary steel spacers between the upper and lower housings. Housings shall serve as blocking during erection. When the equipment is at full operating weight, the springs shall be adjusted to assume the weight and the spacers removed without changing the installed and operating heights.
3. All equipment shall be adjusted level.

C. Requirement for bases:

1. Set structural steel bases to have 1" clearance between housekeeping pad and base.
2. Steel and concrete bases fabrication: Fabricate steel templates to hold equipment anchor-bolt sleeves and anchors in place during placement of concrete. Obtain anchor-bolt templates from supported equipment manufacturer.
3. Concrete shall be 3000 psi at 28 days unless noted otherwise. Forms shall be furnished with steel templates to hold the anchor bolt sleeves and anchor bolts while concrete is being poured.

4. Inertia bases shall have frame or pouring form placed on roofing felt or plastic sheeting and filled with concrete. After the equipment is set, mounting adjustment bolts are to be used to both raise and level base to achieve proper operating height.
 5. Support pipe elbows entering and leaving pumps from the inertia base.
- D. On completion of installation of all isolation materials and before start-up of isolated equipment all debris shall be cleared from areas surrounding and from beneath all isolated equipment, leaving equipment free to move on the isolation supports.

3.4 TESTING

- A. Manufacturer Installation Inspection Report - Provide report prepared by manufacturer's representative, stating that systems installed and services provided under this Section are in accordance with manufacturer's recommendations and are properly operating.

END OF SECTION

SECTION 22 0100
COMMON WORK REQUIREMENTS FOR PLUMBING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Basic requirements applicable to all Division 22 work.

1.2 RELATED SECTIONS

- A. All specification sections in Division 20 are applicable to Division 22. It is the responsibility of the Division 22 Contractor to obtain all Division 20 specifications and conform to all applicable requirements. Division 20 Sections included are:
 - 1. Section 20 0500: Basic Requirements for Mechanical, Plumbing, and Fire Suppression
 - 2. Section 20 0529: Hangers and Supports for Mechanical, Plumbing and Fire Suppression Systems
 - 3. Section 20 0548: Vibration Isolation for Mechanical, Plumbing and Fire Suppression

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.1 SCOPE

- A. Work included under Divisions 20 and 22 shall include all labor, services, materials, and equipment and performance of all work required for installation of plumbing systems as shown on drawings and as specified.

END OF SECTION

**SECTION 22 1119
PLUMBING SPECIALTIES**

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Included in this section:
 - 1. Thermostatic mixing valves
 - 2. Hose bibbs

1.2 REFERENCES

- A. American Society of Sanitary Engineers (ASSE)
 - 1. ASSE 1070: Performance Requirements for Water Temperature Limiting Devices

1.3 QUALITY ASSURANCE

- A. Manufacturer: For each product specified, provide components by same manufacturer throughout.
- B. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 "Drinking Water System Components – Health Effects."

1.4 SUBMITTALS

- A. Include component sizes, rough in requirements, service sizes and finishes.

PART 2 - PRODUCTS

1.5 THERMOSTATIC MIXING VALVES

- A. Acceptable manufacturers
 - 1. Armstrong
 - 2. Bradley
 - 3. Lawler
 - 4. Symmons
 - 5. Speakman
 - 6. Powers
- B. Point of use thermostatic mixing valve (TMV-1)
 - 1. ASSE 1070; lead free certified to NSF/ANSI 372, brass construction, thermostatic mixing valve, reliable wax-filled thermostat, adjustable set point, check valves on supply inlets, 125 psi maximum operating pressure.

1.6 HOSE BIBBS

- A. Acceptable manufacturers
 - 1. Chicago Faucet

2. Jay R. Smith
3. Josam
4. Mifab
5. Prier
6. Watts
7. Woodford
8. Zurn

B. Restroom hose bibb (HB-1) if replacement is required:

1. All brass construction, chrome plated where exposed to interior, loose tee key operation (no wheel handle furnished), $\frac{3}{4}$ " hose thread spout, 125 psig. Model 21 ($\frac{3}{4}$ " P inlet, CH finish) manufactured by Woodford Manufacturing Company, fitted with a non-removable ASSE 1011 hose connection vacuum breaker with breakaway tamper-resistant set screw.

PART 3 - EXECUTION

2.1 INSTALLATION AND APPLICATION

- A. Install specialties in accordance with manufacturer's instructions to permit intended performance.

2.2 TESTING

- A. Test operation and adjust settings of thermostatic mixing valves in accordance with the manufacturer's recommendations.

END OF SECTION

**SECTION 22 4000
PLUMBING FIXTURES**

PART 1 - GENERAL

1.1 WORK INCLUDES

- A. Water closets
- B. Urinals
- C. Lavatories

1.2 REFERENCES

- A. Americans with Disabilities Act (ADA) Guidelines
- B. American Society of Mechanical Engineers (ASME)
 - 1. ASME A112.6.1M: Supports for Off the Floor Plumbing Fixtures for Public Use
 - 2. ASME A112.18.1: Plumbing Supply Fittings
 - 3. ASME A112.18.2: Plumbing Waste Fittings
 - 4. ASME A112.19.1: Enameled Cast Iron and Enameled Steel Plumbing Fixtures
 - 5. ASME A112.19.2: Ceramic Plumbing Fixtures
 - 6. ASME A112.19.3: Stainless Steel Plumbing Fixtures
 - 7. ASME A112.19.4: Porcelain Enameled Formed Steel Plumbing Fixtures
 - 8. ASME A112.19.5: Flush Valves and Spuds for Water Closets, Urinals, and Tanks
- C. American Society of Sanitary Engineers (ASSE)/ American National Standards Institute (ANSI)
 - 1. ASSE 1037/ASME A112.1037: Performance Requirements for Pressurized Flushing Devices for Plumbing Fixtures
- D. California Health and Safety Code 116875 (AB 1953), for 0.25 % low lead content of piping, pipe fittings, and faucets for water intended for human consumption.
- E. International Association of Plumbing and Mechanical Officials (IAPMO)
 - 1. IAPMO IGC 1569: Wash Fountains and Lavatory Systems with or without Water Closet
- F. International Association of Plumbing and Mechanical Officials (IAPMO)/ American National Standards Institute (ANSI)
 - 1. IAPMO/ANSI Z124.5: Plastic Toilet Seats
- G. International Code Council (ICC)
 - 1. ICC A117.1: Accessible and Usable
- H. National Sanitation Foundation (NSF)/ American National Standards Institute (ANSI)
 - 1. NSF/ANSI Standard 61, Including Annex G - Drinking Water System Components- Low Lead Content Requirement
 - 2. NSF/ANSI Standard 372: Low Lead Content Verification Requirement

1.3 QUALITY ASSURANCE

- A. Fixtures:
 - 1. By same manufacturer for each product specified throughout.
 - 2. Comply with the California Health and Safety Code 116875 (AB 1953), for 0.25 % low lead content of piping, pipe fittings, and faucets for water intended for human consumption and NSF/ANSI Standard 61, Including Annex G – Drinking Water System Components - Low Lead Content Requirement.
- B. Trim: By same manufacturer for each product specified throughout.

1.4 SUBMITTALS

- A. Preconstruction – Prior to construction provide the following in accordance with Specification 20 0500 – Basic Requirements for Mechanical, Plumbing, and Fire Suppression:
 - 1. Product Data: Submit product data for each type of the products listed in Part 2 including:
 - a. Product description
 - b. Model
 - c. Dimensions
 - d. Rough in requirements
 - e. Service sizes
 - f. Finishes
- B. Contract closeout – At contract closeout provide the following in accordance with Specification 20 0500 – Basic Requirements for Mechanical, Plumbing, and Fire Suppression:
 - 1. Operation and Maintenance Data including:
 - a. Product data
 - b. Installation instructions
 - c. Assembly views
 - d. Replacement parts list
 - e. Maintenance and operation instructions
 - 2. Warranties

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver plumbing fixtures individually wrapped in factory-fabricated containers.
- B. Handle plumbing fixtures carefully to prevent breakage, chipping and scoring fixture finish. Do not install damaged plumbing fixtures; replace and return damaged units to equipment manufacturer.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS FIXTURES

- A. Water closets, urinals, lavatories, sinks (vitreous china/enameled cast iron).
 - 1. American Standard

2. Kohler
3. Sloan Valve Company
4. Zurn

2.2 ACCEPTABLE MANUFACTURERS - FAUCETS AND DRAINS

- A. American Standard
- B. Chicago Faucets
- C. Kohler
- D. Sloan Valve Company
- E. Zurn Industries

2.3 ACCEPTABLE MANUFACTURERS - P-TRAPS

- A. Engineered Brass Company
- B. Dearborn Brass
- C. McGuire Manufacturing Co.
- D. Proflo

2.4 ACCEPTABLE MANUFACTURERS - STOP AND SUPPLY FITTINGS

- A. Chicago Faucets
- B. Engineered Brass Company
- C. McGuire Manufacturing Co.
- D. T&S Brass

2.5 ACCEPTABLE MANUFACTURERS - FLUSH VALVES

- A. American Standard
- B. Sloan Valve Company
- C. Zurn Industries
- D. Kohler

2.6 ACCEPTABLE MANUFACTURERS - WATER CLOSET SEATS

- A. Beneke Corporation
- B. Bemis Manufacturing Company
- C. Centoco
- D. Church
- E. Olsonite

2.7 ACCEPTABLE MANUFACTURERS - FIXTURE CARRIERS

- A. Jay R. Smith Manufacturing Company
- B. Josam Company
- C. Wade
- D. Watts
- E. Zurn Industries

2.8 GENERAL REQUIREMENTS FOR PLUMBING FIXTURES

- A. All fixtures shall comply with their respective standards listed under section 1.2 of this specification, entitled References.
- B. All plumbing fixture water supplies shall be low lead compliant with NSF/ANSI Standard 61 or NSF/ANSI Standard 372.
- C. Refer to Plumbing Fixture Schedule on drawings for specific make and models.
- D. Plumbing Fixture Schedule selections based on Owner preference for consistency throughout stadium.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough in and installation. Special attention shall be given to cabinet recessed openings for foot valve faucets. Coordinate these openings with Millwork Contractor by providing exact dimensions for proper mounting.
- B. Verify adjacent construction is ready to receive rough in work of this Section.
- C. Examine floors and substrates and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping and other unsatisfactory conditions for installation of plumbing fixtures. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer.
- D. Inspect fixtures and accessories that are to be removed and relocated. Damaged or blemished items shall be brought to Architect's/Engineer's attention before reinstalling.

3.2 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Piping exposed to view shall be chrome plated.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall carriers where they have been included in the Plumbing Fixture Schedule found on the drawings.
- E. Seal fixtures to wall and floor surfaces with sealant as specified in Division 07 Section 07 9200, "Joint Sealants," color to match fixture.
- F. Refer to architectural drawings for mounting height of fixtures above finished floor.

- G. Protect installed fixtures from damage during remainder of construction period.
- H. ADA installation:
 - 1. Install protective shielding pipe covers and enclosures on exposed supplies of accessible lavatories where not fully concealed by a shroud or guard.

3.3 ADJUSTING AND CLEANING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise or overflow.
- B. At completion clean plumbing fixtures and equipment.
- C. Adjust or replace washers to prevent leaks at faucets and stops.
- D. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.
- E. Where lavatory faucets are fed from a thermostatic mixing valve, adjust mixing valve to limit the water temperature discharging from the fixture such that it does not exceed 105°F.

3.4 FIELD QUALITY CONTROL

- A. Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.
- B. Inspect each installed unit for damage to finish. If feasible, restore and match finish to original at site; otherwise, remove fixture and replace with new unit. Feasibility and match to be judged by Architect/Engineer. Remove cracked or dented units and replace with new units.

END OF SECTION

SECTION 23 0100
COMMON WORK REQUIREMENTS FOR MECHANICAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Basic requirements applicable to all Division 23 work.

1.2 RELATED SECTIONS

- A. All specification sections in Division 20 are applicable to Division 23. It is the responsibility of the Division 23 Contractor to obtain all Division 20 specifications and conform to all applicable requirements. Division 20 Sections included are:
 - 1. Section 20 0500: Basic Requirements for Mechanical, Plumbing, and Fire Suppression
 - 2. Section 20 0529: Hangers and Supports for Mechanical, Plumbing and Fire Suppression Systems
 - 3. Section 20 0548: Vibration Isolation for Mechanical, Plumbing and Fire Suppression

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.1 SCOPE

- A. Work included under Divisions 20 and 23 shall include all labor, services, materials, and equipment and performance of all work required for installation of mechanical systems as shown on Drawings and as specified.

END OF SECTION

SECTION 23 0593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This Section includes testing, adjusting, and balancing to produce design objectives for the following:
 - 1. Air systems

1.2 DEFINITIONS

- A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.
- B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to indicated quantities.
- C. Barrier or boundary: Construction, either vertical or horizontal, such as walls, floors, and ceilings that are designed and constructed to restrict the movement of airflow, smoke, odors, and other pollutants.
- D. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.
- E. NC: Noise criteria.
- F. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.
- G. RC: Room criteria.
- H. Report forms: Test data sheets for recording test data in logical order.
- I. Smoke-control system: An engineered system that uses fans to produce airflow and pressure differences across barriers to limit smoke movement.
- J. Smoke-control zone: A space within a building that is enclosed by smoke barriers and is a part of a zoned smoke-control system.
- K. Stair pressurization system: A type of smoke-control system that is intended to positively pressurize stair towers with outdoor air by using fans to keep smoke from contaminating the stair towers during an alarm condition.
- L. Static head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.
- M. Suction head: The height of fluid surface above the centerline of the pump on the suction side.
- N. System effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
- O. System effect factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

- P. TAB: Testing, adjusting, and balancing.
- Q. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.
- R. Test: A procedure to determine quantitative performance of systems or equipment.
- S. Testing, adjusting, and balancing firm: The entity responsible for performing and reporting TAB procedures.

1.3 CODES AND STANDARDS (USE LATEST EDITIONS)

- A. ASHRAE 111: Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems.
- B. Associated Air Balance Council (AABC): National Standards for Total System Balance.
- C. ANSI S12.1: Physical Measurement of Sound
- D. National Environmental Balancing Bureau (NEBB): Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
- E. National Environmental Balancing Bureau (NEBB): Procedural Standard for Fume Hood Performance Testing.
- F. National Environmental Balancing Bureau (NEBB): Procedural Standards for Certified Testing of Cleanrooms.
- G. National Environmental Balancing Bureau (NEBB): Procedural Standards for Measurement of Sound and Vibration.
- H. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA): TAB Procedural Guide.
- I. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA): HVAC Sound and Vibration Manual

1.4 QUALITY ASSURANCE

- A. Qualifications
 - 1. Testing agency shall be a certified member of AABC, NEBB, and/or TABB.
 - 2. Testing and Balancing shall be performed by a testing agency who specializes in testing, adjusting, and balancing of heating, ventilating, air-moving equipment, air-conditioning systems and hydronic systems and has a minimum of one year experience.
 - 3. Testing agency shall have successfully completed a minimum of five projects, similar in size and scope.
- B. Certifications - TAB Technician shall be certified by a nationally recognized certifying agency.
- C. Instrumentation type, quantity, and accuracy: As described in AABC's "National Standards for Total System Balance," NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification," or the TABB Instrument List.
- D. Instrumentation calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.

1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

1.5 SUBMITTALS

- A. Preconstruction – Prior to construction provide the following in accordance with Specification 20 0500 – Basic Requirements for Mechanical, Plumbing, and Fire Suppression:
 1. Qualification data: Within 30 days from Contractor's Notice to Proceed, submit evidence that TAB firm and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
 2. TAB contract document examination report: Within 30 days from Contractor's Notice to Proceed.
 3. Strategies and procedures plan: Within 60 days from Contractor's Notice to Proceed.
- B. During Construction – During construction provide and maintain the following in accordance with Specification 20 0500 – Basic Requirements for Mechanical, Plumbing, and Fire Suppression:
 1. Deficiency report
 2. Preliminary TAB reports
- C. Contract Closeout – At contract closeout provide the following in accordance with Specification 20 0500 – Basic Requirements for Mechanical, Plumbing, and Fire Suppression:
 1. Certified TAB reports
 2. Warranties

1.6 PROJECT CONDITIONS

- A. Full owner occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

- A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.
- B. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.
- C. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.
- D. Coordinate the following with the Temperature Control Contractor to verify calibration of installed equipment and devices:
- E. Include a summary of the above results in the test and balance report.

1.8 WARRANTY

- A. Provide one of the following performance guarantees:
 1. AABC National Project Performance Guarantee
 2. NEBB Certificate of Conformance Certification

3. TABB Quality Assurance Program Guarantee
- B. Guarantee shall include the following provisions:
 1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
 2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS

2.1 TESTING SCOPE

- A. The following systems shall be tested in accordance with the procedures defined in Part 3 of this specification:
 1. Air systems

PART 3 - EXECUTION

3.1 GENERAL

- A. Provide sufficient time before completion date to complete balancing operations.
- B. Note changes made to the system during construction.
- C. Install required test holes complete with removable and replaceable plugs.
- D. Make and document revisions to controls, dampers, fan and pump drives, and consult with equipment manufacturers as required to achieve the specified system's performance.
- E. Take and report testing and balancing measurements in inch-pound (IP) units.
- F. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.
- G. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.2 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to review system designs for deficiencies that may prevent proper TAB.
- B. Examine approved submittal data of HVAC systems and equipment.
- C. Examine equipment performance data including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems,;" or in SMACNA's "HVAC Systems – Duct Design, ". Compare this data with the design data and installed conditions.

3.3 PREPARATION

- A. Prepare a Strategies and Procedures Plan that includes TAB strategies and step-by-step procedures as specified in Part 3 of these specifications.
- B. Prior to commencing the TAB verify the following conditions. If deficiencies are evident, submit Deficiency Report to Owner. Do not begin TAB until deficiencies have been remedied.
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed, complete, and operable.
 - 3. Thermal overload protection is in place for fans, pumps, chillers, and other equipment.
 - 4. Duct and fan systems are clean.
 - 5. Fans are rotating correctly.
 - 6. Fire and volume dampers are in place and open.
 - 7. Air coil fins are cleaned and combed.
 - 8. Air outlets are installed and connected.

3.4 TOLERANCES

- A. Air systems
 - 1. Air handling systems: Adjust to within +10% of outlet total plus allowable leakage rate.
 - 2. Air outlets and inlets: Adjust total to within $\pm 10\%$ of design for each space.

3.5 EXISTING AIR SYSTEMS PROCEDURES

- A. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused.
 - 1. Coils are clean and fins combed.
 - 2. Fans are clean.
 - 3. Bearings and other parts are properly lubricated.
 - 4. Deficiencies noted in the preconstruction report are corrected.
- B. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work. Procedures shall be as specified for new air systems.
 - 1. Compare the indicated airflow of the renovated work to the measured fan airflows to determine the new fan speed and filter and coil face velocities.
 - 2. If calculations increase or decrease the airflow rates by more than 5%, make equipment adjustments to achieve the calculated airflow and water flow rates. If increase or decrease is 5% or less, equipment adjustments are not required.
 - 3. Balance airflow of the duct distribution system and each air outlet in renovated areas and where noted on the plans.
 - 4. Balance airflow to areas not included in the renovation to match preconstruction airflow rates.

3.6 REPORTING

- A. At project start: The TAB contractor shall examine the Contract Documents as specified in "Examination" Article and prepare a report on the adequacy of design for systems' balancing devices. The report should recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing and recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Upon initial examination of installed system: Prior to balancing, submit report indicating system deficiencies that would prevent proper testing, adjusting, and balancing of systems and equipment to meet specified performance.
- C. Certified TAB reports: Submit reports prepared, as specified in this Section, on forms certified by TAB firm using standard forms from AABC, NEBB or TABB/SMACNA with the following minimum requirements.
 - 1. Report Title and Identification:
 - a. Project Name and Address
 - b. Engineer Name
 - c. HVAC Contractor Name
 - d. NEBB/AABC/TABB Certified TAB Firm Name, Address, and Certification Number
 - e. Report Date
 - 2. Report Certification:
 - a. A certification page bearing the stamp of the Certified TAB Professional.
 - b. The signature on the stamp, indicating they have reviewed the report and assume responsibility for all work, test methods, and observed conditions documented within.
 - 3. Table of Contents:
 - a. A table of contents with page numbers or clickable links for digital reports, serving as a guide to the report's organization. Bookmarks can be used in digital reports if every data page has a consecutive and unique page number.
 - 4. Report Summary / Remarks:
 - a. A narrative description of system set-up conditions established prior to testing, adjusting, and balancing. This should explain the rationale for how the system was configured for testing (e.g., full flow conditions, control configuration).
 - b. A listing of deficiencies identified during the TAB process in the summary, with references to the specific pages in the report where these deficiencies are detailed.
 - c. A clear indication of any variances from design quantities that exceed specified tolerances. These deviations should be noted in the Project Summary and often also in the remarks section of the relevant data pages.
 - 5. All Report Pages:
 - a. Project name on every page.
 - b. Sequentially numbered pages.
 - c. A remarks section on each data page to record pertinent information observed during testing and balancing.

- d. If a measured TAB value is also measured by the BAS include these values on the report page and compare them to the design values..
 - e. The name of the individual who reported the information and the date the data was collected on each data form.
- 6. Instrument Calibration:
 - a. A report detailing the calibration of all instruments used for testing and balancing, ensuring the accuracy of the measurements.
- 7. Abbreviation List:
 - a. A comprehensive list defining all abbreviations and acronyms used throughout the report.
- 8. Drawings and Schematics:
 - a. Pertinent contract drawings, schematics, sketches, or other mechanical plans (where permissible) that clearly identify the area, location, and equipment being tested and balanced. All tested items must be clearly identified with a unique designation that corresponds to the data forms.

END OF SECTION

SECTION 23 3713
AIR INLETS AND OUTLETS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Products covered in this section include:
 - 1. General use diffusers, registers and grilles
 - a. Return and exhaust grille or register
 - b. Ceiling or wall transfer air grille

1.2 DEFINITIONS

- A. Diffusers: Elements arranged to deflect air through a large angle and to create local high-ratio mixing; typically located in ceilings.
- B. Grilles: Louvered or perforated coverings for openings in air passages, which can be located in sidewalls, ceilings, or floors.
- C. Registers: Combination grille and damper assemblies over air openings.

1.3 CODES AND STANDARDS (USE LATEST EDITIONS)

- A. American Architectural Manufacturers Association (AAMA)
 - 1. AAMA 605.2: High Performance Organic Coatings on Architectural Extrusions and Panels
- B. Air Movement & Control Association International, Inc. (AMCA)
 - 1. AMCA 210: Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating
 - 2. AMCA 511: Certified Ratings Program for Air Control Devices
- C. American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE)
 - 1. ASHRAE 70: Method of Testing for Rating the Performance of Air Outlets and Inlets
- D. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - 1. SMACNA: HVAC Duct Construction Standards-Metal and Flexible
- E. Underwriters Laboratory (UL®)
 - 1. UL 94: Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances

1.4 QUALITY ASSURANCE

- A. Verification of performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."
- B. Louver ratings shall be based on tests and procedures performed in accordance with AMCA 511. Louvers shall be provided with an AMCA Certified Rating Seal for air performance and water penetration.

1.5 SUBMITTALS

- A. Preconstruction – Prior to construction provide the following in accordance with Specification 20 0500 – Basic Requirements for Mechanical, Plumbing, and Fire Suppression:
 - 1. Diffusers, registers, and grilles
 - a. Product data: For each type of product provide the following product data:
 - (1) Materials of construction
 - (2) Finish with specific color
 - (3) Mounting details
 - (4) Performance data including throw and drop, static-pressure drop, and noise ratings.
 - b. Schedule: Provide a diffuser, register, and grille schedule indicating drawing designation, room location, quantity, model number, size, material and color, accessories furnished.
- B. Contract closeout – At contract closeout provide the following in accordance with Specification 20 0500 – Basic Requirements for Mechanical, Plumbing, and Fire Suppression:
 - 1. Operating and maintenance data including:
 - a. Product data
 - b. Installation instructions
 - c. Assembly drawings
 - d. Replacement parts list
 - e. Maintenance and operation instructions
 - 2. Warranties

PART 2 - PRODUCTS

2.1 GENERAL USE DIFFUSERS, REGISTERS AND GRILLES

- A. Acceptable manufacturers
 - 1. Greenheck
 - 2. Krueger
 - 3. Metalaire
 - 4. Nailor Industries, Inc.
 - 5. Price Industries
 - 6. Raymon-Donco
 - 7. Titus
- B. General
 - 1. Diffuser color shall be standard white or black as indicated in drawings. Color to be provided by manufacturer.
 - 2. Unless otherwise noted diffusers, registers and grilles shall be fabricated of heavy gauge extruded aluminum.
 - 3. Contractor to provide type of frame compatible with grille replacement required.

4. Refer to drawing schedule for opposed blade damper requirements in supply diffusers. If damper is required by the drawing schedule, provide radial opposed blade damper operable from diffuser face.
- C. Square perforated face diffuser
 1. Flush perforated face shall have $\frac{3}{16}$ " diameter holes on $\frac{1}{4}$ " staggered centers.
 2. The diffuser shall be capable of being field adjusted to change the airflow pattern without a significant increase in pressure drop or sound level, and shall also be adjustable for vertical airflow.
 3. The diffuser shall have an 16" round neck as indicated on drawings.
 4. Basis of Design: Titus PAR-AA for return/exhaust
- D. Return and exhaust grille
 1. Grilles shall have fixed deflection blades with $\frac{3}{4}$ " spacing and shall be of sizes shown on the drawings. Blades shall be parallel to long direction.
 2. Border shall be $1\frac{1}{4}$ " with countersunk screw holes.
 3. Basis of Design: Titus Model 350FL
- E. Ceiling or wall transfer air grilles
 1. Return registers shall have fixed deflection blades with $\frac{3}{4}$ " spacing and shall be of sizes shown on the drawings. Blades shall be parallel to long direction
 2. Border shall be $1\frac{1}{4}$ " with countersunk screw holes.
 3. Basis of Design: Titus Model 350FL

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install items level and plumb.
- B. Clean/repair damaged surfaces in accordance with manufacturer's instructions.
- C. Additional requirements for all diffusers, registers and grilles:
 1. Check location of ceiling mounted diffusers, registers and grilles and make necessary adjustments in position to conform to architectural reflected ceiling plans. Where architectural features or other items conflict with installation, notify Architect/Engineer for a determination of final location.
 2. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers. Seal all seams in accordance with ductwork construction requirements.
 3. Provide balancing dampers on every duct take off to each diffusers, register or grille regardless of whether dampers are specified as part of the diffuser, or grille and register assembly.
 4. Frames for diffusers, grilles and registers located in plaster walls or ceilings shall be set prior to plastering.

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

END OF SECTION

SECTION 23 8219
HEATING TERMINAL UNITS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Fan coil units and associated devices in this section include:
 - 1. Electric Unit Heaters

1.2 DEFINITIONS

- A. ETL – Electrical Testing Laboratories

1.3 CODES AND STANDARDS (UTILIZE LATEST EDITION)

- A. Air Conditioning and Refrigeration Institute (ARI)
 - 1. ARI 210: Standard for Unitary Air-Conditioning Equipment
 - 2. ARI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils.
- B. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
 - 1. ASHRAE 33: Methods of Testing Forced Circulation Air Cooling and Heating Coils (ANSI)
 - 2. ASHRAE 52.1: Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter (ANSI)
 - 3. ASHRAE 52.2: Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size (ANSI)
 - 4. ASHRAE 62.1: Ventilation for Acceptable Indoor Air Quality (ANSI) International Energy Conservation Code (IECC)
- C. ASTM International (ASTM)
 - 1. ASTM E 84: Test Method for Surface Burning Characteristics of Building Materials
- D. National Fire Protection Association (NFPA)
 - 1. NFPA 70: National Electrical Code
 - 2. NFPA 90A: Installation of Air Conditioning and Ventilation Systems
- E. Underwriters Laboratories (UL®)
 - 1. UL 723: Tests for Surface Burning Characteristics of Building Materials
 - 2. UL 1995: Heating and Cooling Equipment
 - 3. UL 507: Electric Fans.

1.4 QUALITY ASSURANCE

- A. Products in this section shall be tested and approved and comply with the most current editions of the following standards:

1. Unit performance shall be determined in strict accordance with AHRI 440 in a qualified laboratory and certified by AHRI. All units shall be tagged with the AHRI label.
2. Units shall be UL or ETL Listed indicating that the units are in compliance with UL 1995.
3. Products requiring electrical connection shall be listed and classified by UL.

1.5 SUBMITTALS

- A. Preconstruction – Prior to construction provide the following in accordance with Specification 20 0500 – Basic Requirements for Mechanical, Plumbing, and Fire Suppression:
 1. Product data: Provide product data for the following:
 - a. Drawings indicating configuration, general assembly and materials used in fabrication.
 - b. Performance schedule to including the following:
 - (1) Fan performance, airflow, static pressure, discharge, and radiated sound power level
 - (2) Cooling and heating coil performance
 - c. Motors for fan coil units: Indicate motor efficiency
 - d. Electrical characteristics and connection requirements
 - e. Furnished specialties and accessories
 - f. Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."
 - g. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - h. Wiring diagrams: For power and control wiring.
 2. Manufacturer's installation and operating manuals.
- B. Contract closeout – At contract closeout provide the following in accordance with Specification 20 0500 – Basic Requirements for Mechanical, Plumbing, and Fire Suppression:
 1. Operating and maintenance data including:
 - a. Product data
 - b. Installation instructions
 - c. Assembly drawings
 - d. Replacement parts list
 - e. Maintenance and operation instructions
 2. Test reports
 - a. Manufacturer installation inspection report
 - b. Start up test report
 3. Warranties

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site in containers with manufacturer's and UL stamp affixed.
- B. Protect units from physical damage during shipping.

- C. Protect products against physical damage before, during and after installation. Damage to products prior to final acceptance of the Work shall be repaired or replaced at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 ELECTRIC UNIT HEATERS

- A. Acceptable manufacturers
 - 1. Berko
 - 2. Chromalox
 - 3. Markel
 - 4. Trane
- B. Construct cabinets of 20 gauge steel. Furnish exposed cabinets with a baked enamel finish in a black or very dark color, approved by Architect/Engineer.
- C. Use corrosion resistant heating elements, designed and spaced for even distribution of air across the heating element, and installed to prevent noise of expansion and contraction.
- D. Provide units with necessary overheat protection, reset devices, air flow interlock switch, contactors, transformers, local non-fused disconnect switch that is prewired, and other controls as may be required by codes.
- E. Fan powered units must be provided with thermostat and controls to maintain fan operation until residual heat in the heating elements has been dissipated. The fans and motors shall be balanced and mounted for vibration free operation.
- F. Controls
 - 1. Control scheme to match operation of existing strategy.
 - 2. Provide relay associated with current building operation system to control ON/OFF status of unit heater.
 - 3. Provide integral thermostat with unit heater to locally set and control temperature of space.

PART 3 - EXECUTION

3.1 UNIT HEATER INSTALLATION

- A. Install units where indicated on the drawings and details.
- B. Suspended units: Suspend from structure above. Provide vibration isolation hangers as specified in Division 20 Section 20 0548, "Vibration Isolation for Mechanical, Plumbing and Fire Suppression." Match height of existing units.
- C. Install units in accordance with manufacturer's installation instructions.
- D. After installation, provide protective covers to prevent accumulation of dirt on units during balance of construction.
- E. Units will be wired by the Electrical Contractor.

3.2 TESTING

- A. Start-up test report: Submit documentation of start-up testing and submit test result reports within two weeks of testing.

END OF SECTION

**SECTION 26 0500
BASIC ELECTRICAL REQUIREMENTS**

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This Section includes general administrative and procedural requirements for electrical installations, and shall apply to all phases of the work specified, indicated on the drawings, or required to provide for complete installation of electrical systems for this project. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 01:
1. Submittals
 2. Record documents
 3. Maintenance manuals
 4. Rough-ins
 5. Electrical installations
 6. Cutting and patching
 7. Warranties
 8. Temporary
 9. Coordination with local utilities

1.2 DEFINITIONS

- A. The following definitions shall apply throughout the contract documents:
1. Architect/Engineer: Architect or Engineer
 2. Code: All applicable local, state, and national codes - latest edition
 3. Contractor: Any contractor performing work required by the Contract Documents
 4. Electrical: All electrical work required by the contract documents
 5. Furnish: Supply and deliver to the site ready for installation
 6. Indicated: Noted, scheduled, or specified
 7. Installed: Erected, mounted, secured, connected, and ready for use
 8. Mechanical: All mechanical work required by the contract documents
 9. Provide: Furnish, install, and connect, complete and ready for use

1.3 CODES AND STANDARDS

- A. The electrical system shall comply with the following codes, and all other state, local, municipal, and national bureaus and departments which have authority over this project: anything in these contract documents notwithstanding. This shall not be construed as waiving compliance with any requirements of the plans and specifications that may be in excess of any requirements of any applicable code.
1. National Fire Protection Association (NFPA)

2. American National Standards Institute (ANSI)
 3. Occupational Safety and Health Administration (OSHA)
 4. Factory Mutual Research Corporation (FM)
 5. Underwriters Laboratories Inc. (UL®)
- B. All systems and components shall be FM approved and listed and labeled by UL.
- C. Where there is a conflict between the code and contract documents, the code shall have precedence only when it is more stringent than the contract documents. Items that are allowed by code, but are less stringent than those specified, shall not be substituted.

1.4 QUALITY ASSURANCE

- A. Workmanship: The work shall be performed by competent craftsman, skilled in the trade involved, and shall be done in a manner consistent with the NECA National Electrical Installation Standards.
- B. Permits: The contractor shall familiarize themselves with all requirements regarding all permits, fees, etc. and shall comply with them. The contractor at his expense shall obtain all permits, licenses, inspections, and arrangements required for the execution of the work. All utilities shall be installed in accordance with the local rules and regulations, and the contractor shall pay all charges.
1. All permits and certificates of inspection shall be turned over to Owner prior to request for final payment.

1.5 SUBMITTALS

- A. General: Follow the procedures specified in Division 01 Section 01 3300, "Submittals," and as indicated in this section.
- B. Where required by other sections of this specification/project manual, the contractor shall submit shop drawings, product data, or samples to the Architect/Engineer for review through the general contractor. If no general contractor is assigned, the contractor may submit directly to the Architect/Engineer.
- C. Unrequired submittals will not be reviewed. Incomplete submittals will not be reviewed.
- D. Submittal Information: Include the following information in each submittal:
1. Project name.
 2. Date.
 3. Name of Architect.
 4. Name of Construction Manager.
 5. Name of Contractor.
 6. Name of firm or entity that prepared submittal.
 7. Names of subcontractor, manufacturer, and supplier.
 8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
 9. Category and type of submittal.

10. Submittal purpose and description.
 11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 12. Drawing number and detail references, as appropriate.
 13. Indication of full or partial submittal.
 14. Location(s) where product is to be installed, as appropriate.
 15. Other necessary identification.
 16. Remarks.
 17. Signature of transmitter.
- E. Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
- F. Shop drawings are drawings, diagrams, schedules, and other data specifically prepared for this project by the Contractor, or any manufacturer, supplier, or distributor to illustrate some portion of the work
- G. Shop drawing shall be drawn to accurate scale and adequate size to illustrate required details. Include a graphic scale on each shop drawing and submit in electronic format as a PDF file.
- H. Product data are illustrations, standard schedules, performance charts, instruction brochures, diagrams, and other information furnished by the contractor to illustrate a material, product, or system for some portion of the work.
- I. Samples are physical examples furnished by the contractor to illustrate materials, equipment, or workmanship, and to establish the standards by which the work will be performed.
- J. All submittals shall clearly indicate proposed items, capacities, characteristics, and details in conformance with the contract documents. All equipment items shall be marked with the same item number as used on the drawings or schedules. The manufacturer shall certify capacities, dimensions, and special features required.
- K. Submittals shall indicate manufacturer's delivery time for the item after review by the Architect/Engineer.
- L. The Architect/Engineer shall review or take other appropriate action upon receipt of the contractor's submittals such as shop drawings, product data and samples, but only to determine conformance with the design concept of the work and the information given in the contract documents.
- M. The contractor shall not be relieved of responsibility for any deviation from the requirements of the contract documents by the Architect/Engineer's review of shop drawings, product data, or samples. The Contractor shall not be relieved from responsibility for errors or omissions in the shop drawings, product data, or samples by the Architect/Engineer's review of those drawings.
- N. No portion of the work requiring submission of a shop drawing, product data, or sample shall commence until the Architect/Engineer has reviewed the submittal. All such portions of the work shall be in accordance with reviewed submittals.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

- B. Where recommended by the equipment supplier, deliver equipment in fully enclosed vans after specified environmental conditions have been permanently established in spaces where equipment is to be placed. The products accepted on the site shall be wrapped in factory packing and shall be inspected for damage prior to acceptance.
- C. Store equipment in clean, dry with non-condensing environments that are controlled within manufacturer's ambient tolerances for non-operating equipment. Protect from weather, dirt, fumes, water, construction debris, and physical damage.
- D. Handle equipment carefully to prevent damage, breaking, and scoring. The contractor shall not install damaged units or components; replace with new.
- E. Equipment furnished by others. The contractor shall be responsible for receiving, uncrating, inspecting, storing, and installing of Division 26, 27, and 28 equipment listed as furnished by others.

1.7 SPARE PARTS

Not Applicable

1.8 WARRANTIES

- A. The contractor shall warrant all materials, workmanship, and equipment against defects for a period of one year after the date of substantial completion. Certain equipment shall be warranted at the time of final acceptance, or for longer periods of time as specified in those sections of the project manual.
- B. The contractor shall repair or replace, at no additional cost to Owner, any item that may become defective within the warranty period.
- C. Any manufacturer's warranties concerning any item installed shall be to the benefit of Owner.
- D. The contractor agrees not to void or impair or to allow any sub-contractor to void or impair any warranties regarding products or items installed as part of this project.
- E. The repair of faulty workmanship shall be considered included in the contract.

1.9 MAINTENANCE MANUALS

- A. Prepare maintenance manuals in accordance with Division 01. In addition to the requirements specified in Division 01, include the following information for equipment items:
 - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
 - 2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
 - 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 - 4. Servicing instructions and lubrication charts and schedules.
- B. Contractor shall provide maintenance manuals in either Paper format, Electronic format, or both per the Owner's requirements.
- C. Manuals, Paper Copy: The Contractor shall prepare three Operating and Maintenance Manuals for the equipment furnished. Manuals shall be submitted to the Architect/Engineer for review

and distribution to Owner within thirty (30) days prior to substantial completion of the project. The Architect/Engineer may reject manuals not meeting the following requirements:

1. Each manual shall be assembled in a three-ring binder with a hard cover and plastic finish. Binders shall not exceed 3" thick. Where more than one binder is required, the manuals shall be separated into logical groupings. Where loose-leaf inserts are used, the sheets shall be reinforced to prevent tearing from continuous usage. Each binder shall have the following information clearly printed on its cover:
 - a. Project name and address.
 - b. Portion of the work covered by each volume (if more than one volume is in the set). Where more than one volume is required, label each volume as "Volume ____ of ____."
 - c. Name, address, and telephone number of the Contractor and all Sub-Contractors including night and emergency numbers.
2. The manual shall include, but shall not be limited to, the following:
 - a. A complete index.
 - b. Names, Addresses, and Telephone Numbers: The list shall include the manufacturer and local representative who stocks and furnishes repair parts for all items of equipment and shall be typed on a single page in the front of the binder.
 - c. Start-Up, Operation, and Shutdown Procedures: Provide a written description of procedures for start-up, operation, and shutdown procedures for each electrical item or system. This description shall include switches to operate, buttons to push, etc., in proper sequence, and locations of buttons and switches. The description shall include item references or labels used in the contract documents unless otherwise instructed in advance by Owner.
 - d. Equipment Accessory Schedule: Upon completion of the work, the Contractor shall furnish Owner with a complete equipment accessory schedule listing each piece of equipment and the related size, type, number required, and the manufacturer of all renewable items.
 - e. Manufacturer's Operation and Maintenance Manuals and Parts List.
 - f. Emergency Procedures: Provide a written description of emergency operating procedures or a list of service organizations (including complete business address and telephone numbers) capable of rendering emergency services to the various parts of the system.
 - g. One copy of all shop drawings and product data, clearly marked for each item furnished using the designation label specified or indicated on the contract documents.
 - h. All manufacturers' warranty information.
 - i. Normal Maintenance Schedule: Include a listing of work to be performed at various time intervals (e.g., 30, 90, 180 days, yearly).
- D. Manuals, Electronic Files: Electronic manuals shall include the same information described in section C above. Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual

directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.10 COORDINATION DRAWINGS

- A. Prepare coordination drawings to a scale of $\frac{1}{4}" = 1'-0"$ or larger, detailing major elements, components, and systems of electrical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
 - 1. Indicate the proposed locations of major raceway systems, equipment, and materials. Include the following:
 - a. Clearances for servicing equipment, including space for equipment disassembly required for periodic maintenance
 - b. Exterior wall and foundation penetrations
 - c. Fire-rated wall and floor penetrations
 - d. Equipment connections and support details
 - e. Sizes and location of required concrete pads and bases
 - 2. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
 - 3. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
 - 4. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communications systems components, sprinklers, and other ceiling-mounted devices.

1.11 RECORD DOCUMENTS

- A. Contractor shall keep an up-to-date set of "as-installed," "red-lined" drawings kept current on a daily basis. Such drawings shall be available to Owner, Engineer, or Owner's representative at the job site at all times.
- B. Upon completion of the contract, send to the Architect/Engineer, through the general contractor, one complete set of red-lined drawings showing all deviations.
- C. In addition to the requirements specified in Division 01, indicate on the marked up drawings additional information for:
 - 1. Major raceway systems, size and location, for both exterior and interior.
 - 2. Locations of control devices
 - 3. Distribution and branch electrical circuits
 - 4. Switch, fuse, and circuit breaker size and arrangements
 - 5. Equipment locations (exposed and concealed), dimensioned from prominent building lines
 - 6. Approved substitutions, Contract Modifications, and actual equipment and materials installed

1.12 SITE EXAMINATION

- A. Visit the site prior to submitting bids, examine the premises, and make a thorough survey of the conditions under which the installation is to be made.
- B. The submission of a proposal will be construed as evidence that such an examination has been made, and later claims for labor, equipment, or materials required for difficulties encountered which could have been foreseen had such an examination been made, will not be recognized.

1.13 INTERPRETATION OF THE DOCUMENTS

- A. Carefully compare the drawings and specifications, checking measurements and conditions under which this installation is to be made.
- B. The interpretations of the intent of the plans shall rest solely with the Architect and the Architect's decision shall be considered final.
- C. If questions arise during the bidding process regarding the meaning of any portion of the contract documents, the prospective bidder shall submit the questions to the Architect/Engineer for clarification. Any definitive interpretation or clarification of the contract documents will be published by addenda, properly issued to each person holding documents, prior to the bid date. Verbal interpretation or explanation, not issued in the form of an addendum, shall not be considered part of the bidding documents. When submitting questions for clarification, adequate time for issuance and delivery of addenda must be allowed.

1.14 ELECTRICAL SERVICE DISRUPTIONS

- A. No electrical service disruptions may occur without permission of Owner.
- B. Submit a written request for any work electrical outages before taking any operating electrical equipment out of service. Any work involving a task, which requires an electrical service disruption to any part of this facility, shall be closely coordinated with Owner prior to the disruption. All disruptions shall occur at times and of durations acceptable to Owner.

1.15 OVERTIME WORK

- A. Construction work shall be done during regular working hours on regular working days unless specifically noted otherwise on the drawings, and as required by Owner. If overtime work, other than specified, is required on the project, it shall be performed as indicated under the special conditions of these contracts.
- B. Pricing for required overtime work specified shall be included in the Base Bid.
- C. Items requiring overtime work are:
 - 1. Exposing any energized bus
 - 2. Any work above, below, or adjacent to active, operating equipment that must remain in operation during normal hours
 - 3. Replacement or modification to electrical service and distribution to the facility

1.16 SAFETY

- A. The contractor shall take all steps necessary to ensure the safety of the occupants, students, Owner's employees, visitors, project related personnel, or any other authorized personnel, as well as their own forces, by adequately protecting any exposed energized cable, equipment, or devices throughout the course of this work.

- B. Comply with NFPA 241 for safeguarding during construction and alteration operations. In addition, any openings in fire-rated separations between occupied and unoccupied (or operational and non-operational) areas shall be sealed at the end of each workday with an appropriate fire-rated enclosure or sealant. Do not compromise existing security or fire alarm systems serving the occupied or operational areas.

1.17 INTERFERENCE WITH OCCUPANCY

- A. If the existing building is occupied, then the work covered by these documents shall be executed with a minimum of inconvenience to the building occupants.

1.18 DAMAGE TO OTHER WORK

- A. This contractor shall be responsible for damage to other work caused by this installation. Patching and repairing of damaged work done by this Division shall be part of the cost of this Division.

1.19 LAYOUT OF WORK

- A. Layout work to be installed in coordination with other trades engaged on this project whenever their work is likely to affect the electrical installation. Be fully responsible for all dimensions and conflicts between this work and that of other trades, and make the necessary changes in the work without additional cost to Owner if the work does not comply properly with these requirements.
- B. Compare contract documents with those of other trades before proceeding with the installation. Electrical wiring, conduits, or electrical equipment which has been installed without checking for interference and without thorough coordination with other trades shall be moved or relocated without additional expense to Owner.
- C. Equipment shall be installed with ample space allowed for removal, repair, or change to the equipment. Ready accessibility to removable parts or equipment and to the wiring shall be provided without moving other equipment which is installed, or which is already in place.

1.20 OPERATING TRAINING

- A. Complete operating training for each system and item of equipment shall be provided to the Owner's designated personnel. The Operation and Maintenance Manuals must be reviewed and accepted by the Architect/Engineer and provided to the Owner prior to operating training. Training sessions shall consist of two 8 hour periods and shall be scheduled at the convenience of Owner. Training shall include instructions on the following:
 - 1. Start-Up and Shutdown Procedures
 - 2. Emergency Operation
 - 3. Periodic Maintenance
 - 4. Safety
- B. In addition to the instructions required above, wherever possible the Contractor shall perform the operation being described in order to fully illustrate system operation.
- C. At the completion of training, the Contractor shall turn over to Owner all required keys and special tools for the installed equipment. Each key or tool shall be labeled with its use.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Unless otherwise specified, all materials and equipment shall be new, unused, and undamaged. Materials and equipment shall be the current and standard designs of manufacturers regularly engaged in their production.

2.2 MATERIALS AND EQUIPMENT FURNISHED BY OTHERS

- A. Where materials and equipment are indicated as furnished by others and installed or connected under this contract, it shall be the Contractor's responsibility to verify installation details prior to proceeding with work.

PART 3 - EXECUTION

3.1 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- B. Refer to equipment specifications in Divisions 20, 21, 22, 23, 26, 27, and 28 for rough-in requirements.

3.2 ELECTRICAL INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:
 - 1. Coordinate electrical systems, equipment, and materials installation with other building components.
 - 2. Verify all dimensions by field measurements.
 - 3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
 - 4. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the space.
 - 5. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
 - 6. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
 - 7. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
 - 8. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.

9. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.3 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 01. In addition to the requirements specified in Division 01, the following requirements apply:
 1. Perform cutting, fitting, and patching of electrical equipment and materials required to:
 - a. Uncover Work to provide for installation of ill-timed Work.
 - b. Remove and replace defective Work.
 - c. Remove and replace Work not conforming to requirements of the Contract Documents.
 - d. Remove samples of installed Work as specified for testing.
 - e. Install equipment and materials in existing structures.
 - f. Upon written instructions from the Architect, uncover and restore Work to provide for Architect observation of concealed Work.
 2. Cut, remove, and legally dispose of selected electrical equipment, components, and materials as indicated, including but not limited to removal of electrical items indicated to be removed and items made obsolete by the new Work.
 3. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
 4. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
 5. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
 6. Patch existing finished surfaces and building components using new materials matching existing materials and experienced installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
 7. Patch finished surfaces and building components using new materials specified for the original installation and experienced installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

3.4 TEMPORARY LIGHTING POWER, AND FIRE ALARM

- A. Work Included
 1. Electrical Contractor shall furnish and install temporary lighting, power, and fire alarm devices for this project as required and remove same at the end of the project.
 2. Contractor shall install the above-mentioned temporary services in a safe and workmanlike manner.
 3. Provide temporary lighting and power as required in areas undergoing work during construction. Furnish and install one OSHA-approved pigtail socket with 150W lamp for every 500 ft² of floor space and a minimum one per room. The temporary lighting shall be left in place until permanent lighting is completely operational.
 4. Furnish and install power outlets to a total one for every 2,000 ft² or part thereof of floor area. These shall be 120 volt, 15 amp, single phase receptacles as directed by the General

Contractor. Coordinate for additional temporary power requirements with other trades and provide an adequate installation.

- B. Contractor to coordinate temporary services with the following:
1. General Contractor
 2. Mechanical Contractor
 3. Owner/Owner Representative

END OF SECTION

SECTION 26 0505
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Scope: The work specified in this section includes, but shall not be limited to, providing labor, material, equipment and services necessary for electrical work as shown on the drawings and as herein specified.
- B. Section Includes: The work specified in this section includes, but shall not be limited to, providing the following:
 - 1. Motor and Equipment Connections
 - 2. Sleeves and Openings
 - 3. Coring, Cutting, and Patching
 - 4. Fire stopping
 - 5. Hangers and Supports
 - 6. Demolition

1.2 DEFINITIONS

Not Applicable

1.3 CODES AND STANDARDS

- A. The electrical system shall comply with the following codes, and all other state, local, municipal, and national bureaus and departments which have authority over this project: anything in these contract documents notwithstanding. This shall not be construed as waiving compliance with any requirements of the plans and specifications that may be in excess of any requirements of any applicable code.
 - 1. National Fire Protection Association (NFPA)
 - 2. American National Standards Institute (ANSI)
 - 3. Occupational Safety and Health Administration (OSHA)
 - 4. Factory Mutual Research Corporation (FM)
 - 5. Underwriters Laboratories Inc. (UL®)
- B. All systems and components shall be FM approved and listed and labeled by UL.
- C. Where there is a conflict between the code and contract documents, the code shall have precedence only when it is more stringent than the contract documents. Items that are allowed by code, but are less stringent than those specified, shall not be substituted.

1.4 QUALITY ASSURANCE

- A. Contractor's Quality Assurance Responsibilities: The Contractor shall be solely responsible for quality control of the work.

- B. Manufacturer's Qualifications: Firms shall be engaged in the manufacture of products and materials of types and sizes required, and whose products have been in satisfactory use in similar service for not less than five years.
- C. Contractor's Qualifications: Firms shall have at least five years of successful installation experience with projects utilizing products and materials similar to that required for this Project.
- D. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and Municipal authorities having jurisdiction. Obtain approvals from such authorities.
- E. Installation: Comply with NECA National Electrical Installation standards for electrical construction methods.

1.5 SUBMITTALS

- A. General
 - 1. Submittals shall include, but shall not be limited to, equipment specifications sheets, schematic diagrams, wiring diagrams, sizes, mounting details (with required elevations), technical descriptions of components, and proper calculations to ensure specified performance of the systems.
 - 2. Submittals shall be required for the following products listed in this specification:
 - a. Utility Service Equipment
 - 3. See Division 26 Section 26 0500, "Basic Electrical Requirements" for additional submittal requirements.
- B. Product Data: Submit manufacturer's product information showing material proposed. Submit sufficient information to determine compliance with the drawings and specifications.
- C. Shop Drawings: Submit complete shop drawings as required to determine acceptability.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products and materials properly packaged in factory fabricated containers and mounted on shipping skids.
- B. Store products and materials in clean, dry, heated space. Protect from dirt, fumes, water, construction debris, and traffic. Where necessary to store outdoors, store above grade and enclose with watertight wrapping.
- C. Handle products and materials carefully to prevent internal damage, breakage, denting, and scoring enclosure finish. Do not install damaged products or materials. Replace and return damaged products or materials to manufacturer.

1.7 SPARE PARTS

Not Applicable

1.8 WARRANTY

- A. The contractor shall warrant all materials, workmanship, and equipment against defects for a period of one year after the date of substantial completion. Certain equipment shall be warranted at the time of final acceptance, or for longer periods of time as specified in those sections of the project manual.

- B. The contractor shall repair or replace, at no additional cost, to Owner, any item that may become defective within the warranty period.

1.9 MAINTENANCE

Not Applicable

1.10 PROJECT CONDITIONS

- A. Field Measurements: Verify that field measurements are as indicated on the shop drawings and as shown on the drawings.
- B. Project Location Environment. Furnish and install materials suitable for the altitude, weather, and seismic requirements of the project location.

1.11 COORDINATION

- A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
 - 1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
- C. Coordinate electrical service connections to components furnished by utility companies.
 - 1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
 - 2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.
- D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces.

PART 2 - PRODUCTS

2.1 QUALITY

- A. Electrical equipment, devices and associated materials used on this project shall be UL listed and/or labeled.
- B. Equipment and devices installed under this division and not constructed with enclosure suited for mounting and protecting all live parts shall be installed in approved metal cabinets.

2.2 MOTORS

- A. All motors will be furnished and installed under other sections of the specification.
- B. All motors shall be connected under this section.
 - 1. Final connection shall be made with suitable length of Liquidtight flexible metallic conduit.
 - 2. All motors shall be grounded with green grounding conductor as required.
- C. Electrical characteristics of motors shall be as follows:

1. Motors $\frac{1}{2}$ horsepower and smaller shall be rated for operation at 120 volt, single phase, 60 Hertz.
2. Motors $\frac{3}{4}$ horsepower and larger shall be rated for operation at 480 volts, 3 phase, 60 Hertz.

2.3 HANGERS AND SUPPORTS

- A. Surface Mounted Cabinets: Secure cabinets directly to wall using suitable wall anchors, or provide a suitable frame for mounting and supporting the cabinets using “Unistrut” type supports as required.
- B. Free Standing Motor Starters and Safety Switches: Provide suitable “Unistrut” racks with sheet steel mounting plates for this equipment.
- C. Hanger Rods:
 1. Provide hanger rods of proper length for electrical items requiring same
 2. Minimum rod diameter shall be $\frac{5}{8}$ ” for cable trays, and racks supporting more than 8” of total conduit diameter
 3. Hanger rods shall be zinc plated or galvanized steel
- D. Cable Supports: Riser cables shall be supported by means of O.Z./Gedney Co, Thomas and Betts, or Joslyn cable supports at each panel and pull box in accordance with Code requirements.
- E. Conduit Supports and Hangers:
 1. Individually suspended conduits shall be supported with galvanized pipe clamps, from threaded steel rods, spaced 5’ 0” on centers.
 2. The steel rods shall be affixed to the building structure by means of inserts in concrete slab or beam clamps affixed to the steel structure.
 3. Where multiple conduits are installed adjacent to each other, a trapeze hanger consisting of galvanized P 1000 unistrut suspended from at least two threaded steel rods, shall be used. The conduits shall be affixed to the unistrut with galvanized split pipe clamps, Nos. P 1109 through P 1126, for rigid conduit and Nos. P 1425 through P 1431, for EMT.
 4. Hangers and clamps shall be as manufactured by Unistrut, B-Line or as approved by Engineer.

2.4 EQUIPMENT TOUCH-UP PAINT

- A. The Contractor shall provide the types and brands furnished by manufacturers for all components. Furnish a minimum of one (1) gallon of the manufacturer’s paint for future touch up painting to the Owner.
- B. Repair damage to factory applied paint finishes with the appropriate touch-up paint.

PART 3 - EXECUTION

3.1 DEMOLITION

- A. Examination
 1. The contractor shall visit the site and examine areas under which the work is to be performed and notify the Owner in writing of any conditions detrimental to the proper and

timely completion of the work. Contractor shall not proceed with work until satisfactory conditions have been corrected.

2. Verify field measurements and circuiting arrangements for devices shown on drawings.
3. Demolition drawings are based on casual field observation and existing record drawings. Report discrepancies to Owner before disturbing existing installation.
4. Commencement of demolition means acceptance of existing conditions.

B. Preparation

1. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.
2. Notify the Owner at least 48 hours before disabling any electrical system. Contractor shall plan accordingly to minimize outage durations.
3. Provide temporary wiring and connections to maintain existing systems in service during construction. Experienced personnel shall be used when working on energized equipment or circuits.

C. Demolition and Extension of Existing Electrical Work

1. Remove, relocate, and extend existing electrical work as indicated on the drawings and as noted herein.
 - a. Remove abandoned wiring back to source of supply.
 - b. Where source of supply is a panelboard, re-label protective device as "Spare." After demolition is complete, submit revised panelboard schedules indicating "Spares" to Owner and Engineer.
 - c. Remove exposed abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors and patch surfaces.
 - d. Remove and disconnect abandoned outlets and associated devices.
 - e. Disconnect and remove abandoned panelboards and distribution equipment.
 - f. Disconnect and remove electrical devices and equipment that is no longer in use.
 - g. Disconnect and remove abandoned lighting fixtures. Remove brackets, stems, hangers, and other accessories.
 - h. Repair adjacent construction and finishes damaged during demolition and extension of work

D. Cleaning, Repair, and Replacement

1. General: Clean and repair existing materials and equipment that will remain or are to be reused.
2. Panelboards: Clean exposed surfaces and tighten all electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed schedule showing revised circuiting information.
3. Lighting fixtures: Remove existing lighting fixtures for cleaning. Use mild detergent to clean exterior and interior surfaces, rinse clean with clean water, and wipe dry. Replace existing lamps and ballasts with new.

E. Disposal

1. Owner shall have right to retain any equipment or materials that have been demolished prior to disposal or removal from site.

2. Any equipment or materials not wanted by the Owner shall become the property of the contractor and removed from site.
3. Contractor shall comply with environmental laws and regulations for disposal of demolished materials and equipment.

3.2 PHASE SEQUENCE, ROTATION AND IDENTIFICATION

- A. Transformers, switchgear, feeders, panelboards, motor branch circuits, etc., shall be completely phased out for sequence and motor rotation. Phase identification shall be permanently identified in all equipment including conductors by use of all temperature adhesive markers or colored tape similar to 3M #35 vinyl tape or as approved.
- B. Phase sequence shall be A B C (viewed from front):
 1. Left to right
 2. Top to bottom
 3. Front to rear

3.3 SLEEVES AND OPENINGS

- A. Provide openings and sleeves in walls and floor as required for this work.
- B. Sleeves shall be galvanized steel conduit or schedule 40 black steel pipe, unless otherwise noted. Aluminum conduit shall not be used.
- C. Unless specific sizes are indicated on the drawings, sleeves shall be sized to provide ½" clearance around outside surface of the item for which they are installed.
- D. Annular space between sleeve and surface of item protruding shall be suitably provided with fire stop as hereinafter specified.
- E. Sleeves shall be cut flush with wall surfaces and shall extend 1½" above finished floors unless otherwise indicated.

3.4 CORING, CUTTING, AND PATCHING

- A. Necessary coring or cutting in walls, floors, and ceilings shall be neatly and carefully done and repaired in an approved and workmanlike manner.
- B. No cutting into the structural work of the building shall be done without the approval of the Engineer/Architect.

3.5 FIRE STOPPING

- A. Provide fire and cold smoke stopping construction, as specified, for all through penetrations in rated fire construction (and smoke barriers) in accordance with UL fire resistance directory under categories XHCR and XHEZ. These guides have specific requirements for core and opening sizes based on the size of the penetrating item.
- B. Fire and smoke stopping compounds shall be by 3M or approved equal.
- C. Conduit penetrations through fire rated gypsum and concrete construction shall be filled with 3M Fire Barrier CP 25WB+ Caulk or equivalent, according to UL and 3M guides.

END OF SECTION

**SECTION 26 0519
CONDUCTORS AND CABLES**

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Scope: The work specified in this section includes, but shall not be limited to, providing labor, materials, equipment, and services necessary for the electrical work as shown on the drawings and as herein specified.
- B. Section includes: building wires, cables, and associated connectors, splices, and terminations for wiring systems rated 600 V and less

1.2 DEFINITION

- A. THHN: Heat-resistant thermoplastic insulation
- B. THWN: Moisture and heat-resistant thermoplastic insulation
- C. XHHW: Moisture-resistant thermoset

1.3 CODES AND STANDARDS

- A. NEMA WC3: Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
- B. NEMA WC5: Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.
 - 1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

1.5 SUBMITTALS

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

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products and materials properly packaged in factory fabricated containers and mounted on shipping skids.
- B. Store products and materials in clean, dry, heated space. Protect from dirt, fumes, water, construction debris, and traffic. Where necessary to store outdoors, store above grade and enclose with watertight wrapping.

- C. Handle products and materials carefully to prevent internal damage, breakage, denting, and scoring enclosure finish. Do not install damaged products or materials. Replace and return damaged products or materials to manufacturer.

1.7 SPARE PARTS

Not Applicable

1.8 WARRANTY

- A. The contractor shall warrant all materials, workmanship, and equipment against defects for a period of one year after the date of substantial completion.
- B. The contractor shall repair or replace, at no additional cost to Owner, any item that may become defective within the warranty period.
- C. The contractor agrees not to void or impair or to allow any sub-contractor to void or impair any warranties regarding products or items installed as part of this project.
- D. The repair of faulty workmanship shall be considered to be included in the contract.

1.9 MAINTENANCE

Not Applicable

1.10 PROJECT CONDITIONS

- A. Field Measurements: Verify that field measurements are as indicated on the shop drawings and as shown on the drawings
- B. Project Location Environment: Furnish and install materials suitable for the altitude, weather, and seismic requirements of the project location.

PART 2 - PRODUCTS

2.1 QUALITY

- A. Electrical equipment, devices and associated materials used on this project shall be UL listed and/or labeled.
- B. Equipment and devices installed under this division and not constructed with enclosure suited for mounting and protecting all live parts shall be installed in approved metal cabinets.

2.2 WIRE AND CABLE (600 V OR LESS)

- A. Acceptable Manufacturers
 - 1. Southwire
 - 2. Okonite
 - 3. Rome
- B. Wire and cable used in this installation shall be copper and shall have 600 V insulation unless otherwise noted.
- C. The wires used in this installation shall be run in conduits or approved raceways, unless specifically indicated otherwise.

- D. Conductors shall conform to the latest requirements of the Code and meet ICEA Specifications. Submit the name of manufacturer for the Engineer/Architect and Owner's approval, before work is started.
- E. Wire and cable shall be delivered to the project in complete coils with the manufacturer's name and approval tag attached thereto, indicating wire size and type of insulation, and be labeled and listed.
- F. Unless otherwise noted, conductors for lighting and power circuits shall be #12 AWG minimum size.
- G. Wire for control circuits may be #14 AWG.
- H. Wire of #10 AWG size and larger shall be stranded. Wire of #12 and smaller shall be solid.
- I. All conductors shall be rated 90°C for dry/wet locations.
- J. AC branch circuit wiring shall be installed with color coded conductors throughout the installation as specified in the identification sections of this specification.

2.3 WIRE CONNECTIONS

- A. Acceptable Manufacturers
 - 1. Thomas and Betts
 - 2. Hy-Press Corporation
 - 3. FCI Burndy Products
- B. All wire connections shall be made by means of solderless connectors.
- C. Clean conductor surfaces before installing lugs and connectors. Apply "no-ox" compound.
- D. Branch circuit joints or splices for wires #10 and smaller shall be made with 3M brand Scotchlok electrical spring connectors. No splices shall be made in a conductor except at outlet boxes, junction boxes, or in splice boxes.
- E. Control wires shall be made by 3M Scotchlok crimp connectors.
- F. Use high press long barrel, cast copper, compression connectors for splices and joints for wires #8 and higher.
- G. Wires and cables that terminate onto a bus bar shall be made by cast copper, two hole, long barrel lug, two crimps of fifteen ton compression, hex lugs. Lug bolts shall have lock washers.
- H. The phases of all feeders shall be marked at all taps, joints, splices, and near the lugs at each end with permanently colored tapes. Tapes shall be 3M #35 vinyl tape or as approved. Tape un-insulated conductors to 150% of insulation rating of conductor.

2.4 FISH WIRE

- A. Conduits which are left empty shall contain fish wire of such a gauge required to pull in wire or cable to fill the conduit as determined by Code.
- B. Each length of conduit which is to be used for the telephone system shall contain a #14 gauge nylon fish wire.
- C. Terminations of empty conduits shall be properly tagged.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

- A. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN, single conductors in raceway.
- B. Feeders Concealed in Concrete, Below Slabs-on-Grade, and in Crawlspace: Type THHN-THWN, single conductors in raceway.
- C. Exposed Branch Circuits, Including Crawlspace: Type THHN-THWN, single conductors in raceway.
- D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN, single conductors in raceway.
- E. Branch Circuits Concealed in Concrete and Below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.
- F. Fire Alarm Circuits: Type THHN-THWN, in raceway or power-limited, fire-protective, signaling circuit cable per manufacturer's direction.
- G. Class 1 Control Circuits: Type THHN, in raceway.
- H. Class 2 Control Circuits: Type THHN, in raceway or power-limited cable, concealed in building finishes, or power-limited tray cable, in cable tray per manufacturer's direction.

3.2 INSTALLATION

- A. All wires and cables shall be installed in conduits unless noted otherwise.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.
- E. Identify and color-code conductors and cables according to Division 26 Section 26 0553, "Identification for Electrical Systems".

3.3 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

3.4 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified testing agency to perform the following field quality-control testing.
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test for proper installation and polarization.

2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

END OF SECTION

SECTION 26 0526
GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Scope: The work specified in this section includes providing labor, material, equipment, and services necessary for a complete grounding system as shown on the drawings and as herein specified.
- B. Grounding Section Includes: The work specified in this section includes, but shall not be limited to, providing grounding of the following:
 - 1. Electrical power systems
 - 2. Electrical metallic raceways
 - 3. Metal enclosures
 - 4. Lighting fixtures
 - 5. Equipment requiring power
 - 6. Telecommunications systems
- C. Bonding Section Includes: The work specified in this section includes, but shall not be limited to, providing bonding of the following:
 - 1. Interior metal piping systems

1.2 DEFINITIONS

Not Applicable

1.3 CODES AND STANDARDS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. If the referenced publications have been revised prior to Contract award, the latest edition/revision shall be submitted for the referenced document.
- C. ASTM International (ASTM)
 - 1. ASTM B 8: Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
 - 2. ASTM B 33: (Revised 1985), Standard Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes
- D. Institute of Electrical and Electronics Engineers (IEEE)
 - 1. ANSI/IEEE 80: Guide for Safety in AC Substation Grounding (copyrighted by IEEE, ANSI approved)
 - 2. ANSI/IEEE 81: Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (copyrighted by IEEE, ANSI approved)
 - 3. ANSI/IEEE 142: Recommended Practice for Grounded of Industrial and Commercial Power Systems (copyrighted by IEEE, ANSI approved)

- E. Insulated Cable Engineers Association (ICEA)
 - 1. ICEA 5-68-516: Ethylene Propylene Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
- F. National Fire Protection Association (NFPA)
 - 1. NFPA 70: National Electrical Code (hereinafter referred to as NEC).
 - 2. NFPA 780: Installation of Lightning Systems
- G. Underwriters Laboratories, Inc. (UL)
 - 1. UL ECMD: Electrical Construction Materials Directory
 - 2. UL 467: Grounding and Bonding Equipment
 - 3. UL 486A: Wire Connectors and Soldering Lugs for Use with Copper Conductors, Seventh Edition
- H. American National Standards Institute, Electronic Industries Alliance/Telecommunications Industry Alliance (ANSI/EIA/TIA), ANSI/EIA/TIA-607 Grounding and Bonding.

1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms shall be engaged in manufacture of grounding and bonding products, of types, sizes required, and ancillary grounding materials, including stranded cable, copper braid and bus, grounding electrodes, and bonding jumpers, and whose products have been in satisfactory use in similar service for not less than five years.
- B. Installer's Qualifications: Firms shall have at least five years of successful installation experience with projects utilizing grounding systems similar to that required for this Project.
- C. Compliance: Comply with applicable local electrical code requirements, NEC, ANSI/IEEE 142, and applicable UL requirements.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's product data showing material proposed. Product data shall include, but shall not be limited to, the following:
 - 1. Conductors
 - 2. Cables
 - 3. Connectors
- B. Shop Drawings: Submit complete shop drawings as required to determine acceptability. Shop drawings shall consist of a complete list of materials, including manufacturer's descriptive and technical literature, catalog cuts, drawings, and installation instruction. Shop drawings shall include, but shall not be limited to, the following:
 - 1. Special fabricated components, which are not a manufactured standard product.
- C. Proof of Compliance: Where materials or equipment are specified to comply with requirements of UL, proof of such compliance shall be submitted.

1.6 DELIVERY, STORAGE, AND HANDLING:

- A. Materials and components shall be properly packaged, stored, and handled to prevent damage or breakage.

1.7 SPARE PARTS

Not Applicable

1.8 WARRANTY

- A. The contractor shall warrant all materials, workmanship, and equipment against defects for a period of one year after the date of substantial completion. Certain equipment shall be warranted at the time of final acceptance, or for longer periods of time as specified in those sections of the project manual.
- B. The contractor shall repair or replace, at no additional cost to Owner, any item that may become defective within the warranty period.
- C. The repair of faulty workmanship shall be considered to be included in the contract.

1.9 MAINTENANCE

Not Applicable

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work, include, but shall not be limited to, the following:
 - 1. Adalet-PLM Division; Scott Fetzer Co.
 - 2. Burndy Corporation
 - 3. Cadweld Division; Erico Products, Inc.
 - 4. Crouse-Hinds Division; Cooper Industries
 - 5. Joslyn Corporation
 - 6. OZ Gedney Division; General Signal Corp.
 - 7. Thomas and Betts Corp.
 - 8. Eritech; Erico Products, Inc.

2.2 CONDUCTORS

- A. General: Grounding and bonding conductors shall be bare and insulated copper as shown on the drawings or required by other sections of this specification.
- B. Conductivity: Copper conductors shall have a conductivity of not less than 98% at 75°C. Conductor resistance values shall be in accordance with the value in ICEA S-68-516.
- C. Cable Sizes: Cable sizes shall be as shown on the drawings or as required by this specification.
- D. Insulation: Insulated grounding and bonding conductors shall have an insulation equal to the current carrying conductors.

2.3 CONNECTORS

- A. Metal Pipe Connectors: Connectors shall be copper alloy, U-bolt type.
- B. Ground Bushings: Bushings shall be malleable iron, zinc plated, insulated throat with screw type wire connector.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions under which the work is to be installed, and notify the Architect/Engineer in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 COORDINATION

- A. Coordinate with other work to ensure that installation is not vulnerable to physical damage.

3.3 APPLICATION

- A. General: The entire electrical system and building structure shall be grounded. The following items of equipment, appurtenances, and as required by Article 250 of NEC, shall be grounded:
 - 1. Electrical service, equipment, and enclosures
 - 2. Conduits and raceways
 - 3. Neutral and ground conductors
 - 4. Switches and panels
 - 5. Motor frames, control cabinets, and lighting fixtures
- B. All metallic conduits, supports, cabinets, and all the other electrical equipment shall be permanently and effectively grounded. All grounded shall be in accordance with the applicable code, and shall meet the approval of the local Authority Having Jurisdiction (AHJ).
- C. All metallic raceways shall be mechanically and electrically continuous. Where non-conductive raceways are installed, provided separated equipment grounding conductors bonded to pull and/or junction boxes at each end of each conduit run.
- D. Furnish and install a separate equipment grounding wire with each branch circuit conduit, routed with the phase and neutral wires, NEVER in a separate conduit.
- E. Equipment grounding wire to be routed in conduit along the phase and neutral wires (NEVER in separate conduit).
- F. Connectors: Provide mechanical connections for the following:
 - 1. Cable-to-pipe
 - 2. Cable-to-ground bus or as otherwise noted on the drawings
- G. Bonding Jumpers: Bonding jumpers shall be installed where continuity of piping or metal must be maintained or as required by NEC.

3.4 INSTALLATION

- A. Install grounding systems as indicated, in accordance with equipment manufacturer's written instructions and with recognized practices. Comply with applicable requirements of UL 467, UL 486A, NFPA 78 ANSI/IEEE 80, and applicable NEMA standards, to ensure that products fulfill requirements.
- B. Connectors
 - 1. Provide mechanical connections as specified.

2. Remove non-conductive coatings such as paint, lacquer, and enamel on surfaces of equipment to be grounded.
 3. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with tightening torque values specified in UL 468A to assure permanent and effective grounding.
 4. Apply corrosion-resistant finish to field connections, places where factory-applied protective coatings have been destroyed, and areas subject to corrosive action.
- C. Bonding Jumpers: Install on water meters and where expansion joints or dielectric unions are used.
- D. Ground Bushings: Where a conduit enters a metal enclosure without a ground bus, a ground bushing shall be provided to terminate ground conductor.

END OF SECTION

**SECTION 26 0533
RACEWAYS AND BOXES**

PART 1 - GENERAL

1.1 SCOPE OF WORK

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

1.2 DEFINITIONS

- A. EMT: Electrical metallic tubing
- B. RMC: Rigid metal conduit (heavy wall steel)
- C. FMC: Flexible metal conduit
- D. IMC: Intermediate metal conduit
- E. LFMC: Liquidtight flexible metal conduit
- F. RNC-40: Rigid non-metallic conduit, schedule 40 PVC
- G. RNC-80: Rigid non-metallic conduit schedule 80 PVC
- H. Fittings: Conduit connection or coupling
- I. Body: Enlarged fittings with opening allowing access to the conductors for pulling purposes only
- J. Mechanical Spaces: Enclosed areas, usually kept separated from the general public, where the primary use is to house service equipment and to route services. These spaces generally have exposed structures, bare concrete and non-architecturally emphasized finishes.
- K. Finished Spaces: Enclosed areas where the primary use is to house personnel and the general public. These spaces generally have architecturally emphasized finishes, ceilings and floors.
- L. Concealed: Not visible by the general public. Often indicates a location either above the ceiling, in the walls, in or beneath the floor slab, in column coverings, or in the ceiling construction.
- M. Above Grade: Not directly in contact with the earth. For example, an interior wall located at an elevation below the finished grade shall be considered above grade but a wall retaining earth shall be considered below grade.
- N. Slab: Horizontal pour of concrete used for the purposes of a floor or sub-floor

1.3 CODES AND STANDARDS

- A. American National Standards Institute (ANSI)
 - 1. ANSI C80.1: Rigid Steel Conduit, Zinc-Coated
 - 2. ANSI C80.3: Electrical Metallic Tubing, Zinc-Coated and Fittings
 - 3. ANSI C80.4: Fittings for Rigid Metal Conduit
 - 4. ANSI C80.6: Intermediate Metal Conduit, Zinc-Coated
 - 5. ANSI/NEMA OS-1: Sheet Steel Outlet Boxes, Device Box Covers and Bottom Supports
 - 6. ANSI/NEMA OS-2: Non-Metallic Outlet Boxes, Device Boxes, and Box Support
- B. Federal Specifications (FS)

1. WC-586: Conduit Outlet Boxes, Bodies, and Entrance Caps, Electrical Cast Metal
 2. WC-408: Fittings for Conduit, Metal, Rigid, (Thick-Wall and Thin-Wall EMT Type)
 3. WC-1904A: PVC Rigid Non-Metallic Conduit
 4. WC-563A: Electrical Metallic Tubing
 5. WC-566: Specification for Flexible Metal Conduit
 6. WC-581E: Specification for Galvanized Rigid Conduit
- C. NECA “Standard of Installation”
- D. National Electrical Manufacturers Association (NEMA)
1. ANSI/NEMA FB 1: Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies
 2. RN 2: Packaging of master bundles for Steel Rigid Conduit, Intermediate Metal Conduit, and Electrical Metallic Tubing
 3. TC 2: Rigid Non-Metallic Conduit, PVC Schedule 40 (EPC-40) and Schedule 80 (EPC-80) PVC
 4. TC 3: Rigid Non Metallic Conduit and electrical Non-Metallic Tubing Fittings
 5. TC 6: PVC and ABS Plastics Utilities Duct for Underground Installation
 6. TC-8: Extra-Strength PVC Plastic Utilities Duct for Underground Installation
 7. TC-9: PVC and ABS Plastic Utilities Duct and Fittings for Underground Installation
 8. TC 10: PVC and ABS Plastic Communications Duct and Fittings for Underground Installation
 9. TC 13: Electrical Non-Metallic Tubing
 10. TC 14: Filament-Wound Reinforced Thermosetting Resin Conduit and Fittings
 11. TC 18: Packaging of Master Bundles for EPC 40 (Polyvinyl Chloride) Conduit
 12. NEMA 250: Enclosures for Electrical Equipment (1,000 volts maximum)
- E. National Fire Protection Association (NFPA)
1. ANSI/NFPA 70: National Electrical Code
- F. Underwriters Laboratories (UL®): Applicable Listings
1. UL 1: Flexible Metal Conduit
 2. UL 6: Rigid Metal Conduit
 3. UL 360: Liquid Tight Flexible Steel Conduit
 4. UL 514-B: Fittings for Conduit and Outlet Boxes
 5. UL 651-A: Type EB and a PVC Conduit and HDPE Conduit
 6. UL 797: Electrical Metal Tubing
 7. UL 1242: Intermediate Metal Conduit

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.
- C. Contractor's Quality Assurance Responsibilities: The Contractor shall be solely responsible for quality control of the work.
- D. Manufacturer's Qualifications: Firms shall be engaged in the manufacture of products and materials of types and sizes required, and whose products have been in satisfactory use in similar service for not less than five years.
- E. Contractor's Qualifications: Firms shall have at least five years of successful installation experience with projects utilizing products and materials similar to that required for this Project.
- F. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and Municipal authorities having jurisdiction. Obtain approvals from such authorities.
- G. Installation: Comply with NECA National Electrical Installation standards for electrical construction methods.

1.5 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: Show fabrication and installation details of components for raceways, fittings, enclosures, cabinets, pull boxes, and outlet boxes.
- C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
 - 1. Ceiling suspension assembly members
 - 2. Method of attaching hangers to building structure
 - 3. Size and location of initial access modules for acoustical tile
 - 4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings
- D. Manufacturer Seismic Qualification Certification: Submit certification that enclosures, cabinets, accessories, and components will withstand seismic forces as listed for the zone of work that construction occurs. Include the following:
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
 - b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products and materials properly packaged in factory fabricated containers and mounted on shipping skids.
- B. Store products and materials in clean, dry, heated space. Protect from dirt, fumes, water, construction debris, and traffic. Where necessary to store outdoors, store above grade and enclose with watertight wrapping.
- C. Handle products and materials carefully to prevent internal damage, breakage, denting, and scoring enclosure finish. Do not install damaged products or materials. Replace and return damaged products or materials to manufacturer.

1.7 SPARE PARTS

Not Applicable

1.8 WARRANTY

- A. The contractor shall warrant all materials, workmanship, and equipment against defects for a period of one year after the date of substantial completion.
- B. The contractor shall repair or replace, at no additional cost to Owner, any item that may become defective within the warranty period.
- C. The contractor agrees not to void or impair or to allow any sub-contractor to void or impair any warranties regarding products or items installed as part of this project.
- D. The repair of faulty workmanship shall be considered to be included in the contract.

1.9 MAINTENANCE

Not Applicable

1.10 PROJECT CONDITIONS

- A. Field Measurements: Verify that field measurements are as indicated on the shop drawings and as shown on the drawings.
- B. Project Location Environment: Furnish and install materials suitable for the altitude, weather, and seismic requirements of the project location.

1.11 COORDINATION

- A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
 1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: (Heavy Wall), hot-dipped galvanized with threaded fittings
- B. IMC: zinc-coated steel, with threaded fittings
- C. EMT: zinc-coated steel, with insulated throat compression fittings (no set screw)
- D. FMC: Zinc-coated steel, with insulated throat squeeze-type connectors
- E. LFMC: Zinc-coated steel with sunlight-resistant and mineral oil-resistant PVC jacket
- F. Fittings: compatible with conduit and tubing materials

2.2 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating standard enamel finish unless noted on the electrical drawings.
 - 1. Available manufacturers:
 - a. Thomas & Betts Corporation
 - b. Legrand (Wiremold)
- B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.3 BOXES, ENCLOSURES, AND CABINETS

- A. Available manufacturers:
 - 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 - 2. Appleton Electric Company
 - 3. Erickson Electrical Equipment Co.
 - 4. Hoffman
 - 5. Hubbell, Inc.; Killark Electric Manufacturing Co.
 - 6. O-Z/Gedney; Unit of General Signal
 - 7. RACO; Division of Hubbell, Inc.
 - 8. Spring City Electrical Manufacturing Co.
 - 9. Thomas & Betts Corporation
 - 10. Walker Systems, Inc.; Wiremold Company (The)
 - 11. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary
- B. Construction:
 - 1. Sheet Metal Outlet and Device Boxes: Galvanized Steel
 - 2. Cast-Metal Outlet and Device Boxes: Type FD, with gasketed cover
 - 3. Small Sheet Metal Pull and Junction Boxes: Screw cover or hinged as shown on the electrical drawing
 - 4. Cast-Metal Pull and Junction Boxes: Cast aluminum with gasketed cover

5. Cabinets: Galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.4 PULL BOXES

- A. Provide pull boxes as shown on the plans and where necessary to meet code and specification requirements for proper installation of associated wiring systems.
- B. Pull boxes shall be sized in accordance with the National Electric Code, NFPA 70.
- C. Boxes indicated on the plans are not intended to be drawn to scale.
- D. Conduit runs of more than 100 feet or with more than the equivalent of three 90° bends shall have suitable pull boxes installed in convenient intermediate locations. Such pull boxes shall be shown on the shop drawings and construction record drawings.
- E. Pull boxes over 100 cubic inches shall be supported independently of the conduits.
- F. Pull boxes shall be accessible after completion of installation.

2.5 OUTLET BOXES

- A. Boxes for Suspended or Bracket Mounted Lighting Fixtures: Ceiling outlets and bracket outlets which are to support lighting fixtures shall be equipped with a $\frac{3}{8}$ " malleable iron fixture stud securely fastened into the outlet box.
- B. Flush Mounted Boxes (in plaster, drywall, poured concrete, smooth tile):
 1. Outlet boxes for duplex receptacles, single and two gang toggle switches, shall be a minimum of 4" square by 1½" deep.
 2. Outlet boxes for other devices installed under similar conditions shall be a minimum of 4" square 1½" deep.
 3. Where more than two conduits enter an outlet box, a 2½" deep box shall be used, except in columns.
 4. Where three or more gangs of devices are required, solid gang boxes a minimum of 4½" high by 1⅝" deep shall be used.
 5. Provide suitable plaster rings as required.
 6. Provide minimum of ½" deep tile covers as required.
- C. Flush Mounted Data/Telephone or Clock Outlet Boxes: Outlet boxes which are to be used as data/telephone outlets or clock outlets shall conform to the requirements of switch and receptacle outlets, employing a single gang opening in the plaster cover, unless noted otherwise on the electrical drawings.
- D. Capped Outlet Boxes: Outlet boxes which are indicated as capped outlet boxes shall employ flat metal cover plates, fastened to the outlet box with screws.
- E. Surface Mounted Outlet Boxes: Where outlet boxes are to be installed exposed on ceiling or wall surfaces, the boxes shall be specifically designed for such a type of installation and shall be square or rectangular as required. Device plates shall match the contour of the boxes and shall be of the type manufactured for these particular type boxes. In finished areas, all boxes shall be flush mounted unless specifically noted otherwise.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Indoors:
 - 1. Exposed Dry Locations: EMT
 - 2. Concealed in Interior Partition: EMT
 - 3. Connection to Vibrating Equipment (including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC or LFMC for damp / wet locations.
 - 4. Damp or Wet Locations: RMC or IMC
 - 5. Concealed in Concrete or Block Walls: RMC or IMC
 - 6. Mechanical Rooms and Penthouses: RMC or IMC
 - 7. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
 - a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel
- B. Minimum Raceway Size: ¾" trade size (DN 21).
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid Steel and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

- A. Keep raceways at least 6" (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in Division 26 Section 26 0505, "Basic Electrical Materials and Methods."
- D. Identify and color-code raceways and boxes according to Division 26 Section 26 0553, "Identification for Electrical Systems".
- E. Install temporary caps to prevent foreign matter from entering raceways.
- F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
 - 1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- H. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
 - 1. Run parallel or banked raceways together on common supports.
 - 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- I. Join raceways with fittings designed and approved for that purpose and make joints tight.
- J. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength.
- L. Telephone and Signal System Raceways, 2" Trade Size (DN 53) and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet (45 m) and with a maximum of two 90° bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
- M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces
 2. Where otherwise required by NFPA 70
- N. Flexible Connections: Use maximum of 72" (1830 mm) of flexible conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
- O. Install hinged-cover enclosures and cabinets plumb. Support at each corner.
- P. Bushings
1. Provide bushings wherever IMC, RMC, or EMT conduit is terminated, including stub-outs, and locations not provided with connection fittings or boxes.
 2. Insulated Bushings
 - a. Provide insulated bushings or connections for IMC, RMC, or EMT conduit terminations.
 - b. Insulated bushings shall be OZ/Gedney Co., Type PBP for rigid conduit or Type "SBT" for EMT, or approved equal.
 3. Insulating Bushings
 - a. Provide insulating bushings where cables pass through walls of metal enclosures. Bushings shall be OZ/Gedney Co. Type "BBL" or "ABB" or approved equal.
 - b. Insulated bushings shall be used at ends of threaded rigid conduits and threaded fittings. Provide double locknuts when terminated in enclosure.
 - c. Bushings shall be OZ/Gedney Co. Type "A" or approved equal.
- Q. Rigid Conduit Fittings and Couplings
1. Running threads shall not be used on conduit for connection at couplings.
 2. IMC and RMC conduits shall be joined by approved threaded couplings.
 - a. Threadless couplings and connectors are not acceptable.

- b. Set screw couplings are not acceptable.
 - c. Split couplings are not acceptable.
- 3. Joints in conduit which are installed under the floor slab shall be made watertight by using T&B Kopr-shield thread compound on each joint.
- R. Electric Metallic Tubing (EMT) Conduit Fittings and Couplings
 - 1. Only insulated throat type compression fittings shall be used.
 - 2. Only compression-type fittings shall be used, set screw fittings and couplings are not acceptable.
- S. Couplings and unions shall be mechanically strong and shall be so installed to make a continuous bond between the conduits connected.

3.3 PULLING COMPOUND

- A. If it is desired to use a pulling compound on wire and cable, first obtain the approval of the Engineer/Architect before employing such compounds. Compound shall be UL listed and compatible with conductor insulation covering.
- B. Conduits shall be swabbed until moisture and dirt are removed and before wires are pulled or cables are installed.

3.4 PROTECTION

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

3.5 CLEANING

- A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION

SECTION 26 0553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Scope: The work specified in this section includes, but shall not be limited to, providing labor, material, equipment and services necessary for electrical work as shown on the drawings and as herein specified.
- B. Section includes:
 - 1. Identification for raceways.
 - 2. Identification for conductors.
 - 3. Warning labels.
 - 4. Equipment identification labels.
 - 5. Miscellaneous identification products.

1.2 DEFINITIONS

Not Applicable

1.3 CODES AND STANDARDS

- A. Comply with ASME A13.1 and IEEE C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.4 QUALITY ASSURANCE

- A. Contractor's quality assurance responsibilities: The Contractor shall be solely responsible for quality control of the work.
- B. Manufacturer's qualifications: Firms shall be engaged in the manufacture of products and materials of types and sizes required, and whose products have been in satisfactory use in similar service for not less than five years.
- C. Regulatory requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of federal, state, and municipal authorities having jurisdiction. Obtain approvals from such authorities.
- D. Installation: Comply with NECA National Electrical Installation standards for electrical construction methods.

1.5 SUBMITTALS

- A. Product data: For each electrical identification product indicated.

- B. Identification schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same *designations indicated on drawings*.
- C. Delegated-design submittal: For arc-flash hazard study.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Thermal movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature change: 120°F (67°C), ambient; 180°F (100°C), material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

- A. Warning labels and signs shall include, but are not limited to, the following legends:
 - 1. Workspace clearance warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."
 - 2. Arc flash labels: Per ANSI Z535.4, the signal word WARNING appearing in black letters on an orange background, with second line below (Arc Flash and Shock Hazard) in black letters on white background and third line below (Appropriate PPE Required) in black letters on white background. Include the following information on the label:
 - a. Equipment name
 - b. Available bolted current
 - c. Flash protection boundary distance
 - d. Incident energy level at 18" expressed in cal/cm².
 - e. Personnel protective equipment (PPE) class
 - f. Voltage shock hazard
 - g. Limited shock approach boundary
 - h. Restricted shock approach boundary
 - i. Prohibited shock approach boundary

2.3 LABELS

- A. Self-adhesive vinyl labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- B. Snap-around labels for raceways carrying circuits at 600V or Less and conduits larger than 2": Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter of raceway or cable it identifies and to stay in place by gripping action.

2.4 BANDS AND TUBES:

- A. Snap-around, color-coding bands for raceways and cables: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2" (50 mm) long, with diameters sized to suit diameters of raceways or cables they identify, and that stay in place by gripping action.

- B. Heat-shrink preprinted tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameters of and shrunk to fit firmly around cables they identify. Full shrink recovery occurs at a maximum of 200°F (93°C). Comply with UL 224.

2.5 TAPES AND STENCILS:

- A. Marker tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- B. Self-adhesive vinyl tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils (0.08 mm) thick by 1 to 2" (25 to 50 mm) wide; compounded for outdoor use.
- C. Tape and stencil for raceways carrying circuits 600 V or less: 4"- (100-mm-) wide black stripes on 10" (250-mm) centers placed diagonally over orange background that extends full length of raceway or duct and is 12" (300 mm) wide. Stop stripes at legends.

2.6 TAGS

- A. Nonmetallic preprinted tags: Polyethylene tags, 0.015" (0.38 mm) thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.
- B. Write-On Tags:
 - 1. Polyester tags: 0.010" (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment to raceway, conductor, or cable.
 - 2. Marker for tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - 3. Marker for tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.7 SIGNS

- A. Laminated acrylic or melamine, self-adhesive plastic signs:
 - 1. Engraved legend.
 - 2. Thickness:
 - a. For signs up to 20 sq. in. (129 cm²), minimum 1/16" (1.6 mm).
 - b. For signs larger than 20 sq. inches (129 cm²), 1/8" (3.2 mm) thick.
 - c. Engraved legend with black letters on white face.

2.8 CABLE TIES:

- A. General-purpose cable ties: Fungus inert, self-extinguishing, one piece, Type 6/6 nylon, self-locking type. Colors to suit coding scheme.
- B. UV-stabilized cable ties: Fungus inert, self-extinguishing, one piece, Type 6/6 nylon, self-locking type. Colors to suit coding scheme.
- C. Plenum-rated cable ties: Self-extinguishing, UV stabilized, one piece, self-locking.
 - 1. Minimum width: 3/16" (5 mm).
 - 2. Tensile strength at 73°F (23°C) according to ASTM D 638: 7000 psi (48.2 MPa).
 - 3. UL 94 flame rating: 94V-0.

4. Temperature range: -50°F to +284°F (-46° to +140°C).
5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for labels and signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers. Self-adhesive backing alone is not allowed.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Self-adhesive identification products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

- A. Self-adhesive identification products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.
- B. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.
- D. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- E. Install identifying devices before installing acoustical ceilings and similar concealment.
- F. Verify identity of each item before installing identification products.
- G. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- H. Apply identification devices to surfaces that require finish after completing finish work.
- I. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- J. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
- K. Cable ties: For attaching tags. Use general-purpose type, except as listed below:
 1. Outdoors: UV-stabilized nylon.
 2. In spaces handling environmental air: Plenum rated.

- L. Painted identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.3 IDENTIFICATION SCHEDULE

- A. Concealed raceways, duct banks, more than 600 V, within buildings: Tape and stencil 4"- (100-mm-) wide black stripes on 10" (250-mm) centers over orange background that extends full length of raceway or duct and is 12" (300 mm) wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3"- (75-mm-) high black letters on 20" (500-mm) centers. Stop stripes at legends. Apply stripes to the following finished surfaces:
 - 1. Floor surface directly above conduits running beneath and within 12" (300 mm) of a floor that is in contact with earth or is framed above unexcavated space.
 - 2. Wall surfaces directly external to raceways concealed within wall.
- B. Accessible raceways, armored and metal-clad cables, more than 600 V: Self-adhesive vinyl labels. Install labels at 10-foot (3-m) maximum intervals.
- C. Accessible raceways and metal-clad cables, 600 V or less, for service, feeder, and branch circuits, more than 30A and 120V to ground: Identify with self-adhesive vinyl label. Install labels at 10-foot (3-m) maximum intervals.
- D. Power-circuit conductor identification, 600 V or less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-coding for phase-and voltage-level identification, 600 V or less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:
 - (1) Match existing facility standard.
 - c. Colors for 480/277-V Circuits:
 - (1) Match existing facility standard.
 - d. Field-applied, color-coding conductor tape: Apply in half-lapped turns for a minimum distance of 6" (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- E. Power-circuit conductor identification, more than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use write-on tags.
- F. Control-circuit conductor identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive, self-laminating polyester labels self-adhesive vinyl labels with the conductor or cable designation, origin, and destination.
- G. Control-circuit conductor termination identification: For identification at terminations, provide heat-shrink preprinted tubes self-adhesive, self-laminating polyester labels self-adhesive vinyl labels with the conductor designation.
- H. Conductors to be extended in the future: Attach marker tape to conductors and list source.
- I. Auxiliary electrical systems conductor identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 2. Use system of marker-tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- J. Arc flash warning labeling: Self-adhesive thermal transfer vinyl labels.
1. Comply with NFPA 70E and ANSI Z535.4.
 2. Comply with Section 260574 "Overcurrent Protective Device Arc-Flash Study" requirements for arc-flash warning labels.
- K. Equipment identification labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm unless equipment is provided with its own identification.
1. Labeling instructions:
 - a. Indoor equipment: Self-adhesive, self-laminating label, or Engraved, laminated acrylic or melamine plastic label, punched or drilled for mechanical fasteners. Unless otherwise indicated, provide a single line of text with $\frac{1}{2}$ "- (13-mm-) high letters on $1\frac{1}{2}$ "- (38-mm-) high label; where two lines of text are required, use labels 2" (50 mm) high.
 - b. Outdoor equipment: Engraved, laminated acrylic or melamine label.
 - c. Elevated components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - d. Unless labels are provided with self-adhesive means of attachment, fasten them with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
 2. Equipment to be labeled:
 - a. Engraved, laminated acrylic or melamine plastic label, punched or drilled for mechanical fasteners. White with black letters.
 - (1) Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of an engraved, laminated acrylic or melamine label.
 - (2) Enclosures and electrical cabinets.
 - (3) Access doors and panels for concealed electrical items.
 - b. Self-adhesive, self-laminating label.
 - (1) Light fixtures
 - (2) Light switches
 - (3) Receptacles
 - (4) Where otherwise specifically indicated
 3. Junction boxes and pull boxes: Paint only the outside of boxes and covers, with the identifying color.

- L. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.
- M. For special ground systems (such as telecommunication facility grounding), provide engraved brass nameplates for all ground conductors at both terminations.

END OF SECTION

SECTION 26 0923
LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Section includes the following lighting control devices:
 - 1. Indoor occupancy sensors
- B. Items specified elsewhere and installed under this section:
 - 1. Conductors and Cables
 - a. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section 26 0519, "Conductors and Cables."
 - b. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 26 Section 26 0519, "Conductors and Cables."
 - c. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 26 Section 26 0519, "Conductors and Cables."

1.2 DEFINITIONS

- A. LED: Light emitting diode
- B. PIR: Passive infrared

1.3 CODES AND STANDARDS (UTILIZE LATEST EDITION)

- A. National Fire Protection Association (NFPA)
 - 1. NFPA 70: National Electrical Code
- B. Institute of Electrical and Electronics Engineers (IEEE)
 - 1. IEEE C62.41.1: Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits
 - 2. IEEE C62.41.2: Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits
 - 3. IEEE C62.45: Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits
 - 4. IEEE C136.10: Standard for Roadway Lighting Equipment Locking-Type Photocontrol Devices and Mating Receptacle Physical and Electrical Interchangeability and Testing (ANSI)
- C. National Electrical Contractors Association (NECA)
 - 1. NECA 1: Good Workmanship in Electrical Contracting
- D. National Electrical Manufacturers Association (NEMA)
 - 1. NEMA 250: Enclosures for Electrical Equipment (1000 Volts Maximum)

2. NEMA ICS 2: Industrial Control and Systems Controllers, Contactors, and Overload Relays, Rated 600 Volts
- E. Underwriters Laboratories, Inc. (UL®)
 1. UL 486A-486B: Wire Connectors
 2. UL 508: Industrial Control Equipment
 3. UL 773: Plug-in, Locking Photocontrols for Use w/ Area Lighting
 4. UL 773A: Nonindustrial Photoelectric Switches for Lighting Control
 5. UL 917: Clock-Operated Switches
 6. UL 924: Emergency Lighting and Power Equipment

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- B. Comply with NFPA 70.

1.5 SUBMITTALS

- A. Product Data: For each product specified
- B. Shop Drawings: Show installation details for occupancy and light-level sensors.
 1. Interconnection diagrams showing field-installed wiring
- C. Maintenance Data: For materials and products to include in maintenance manuals specified in Division 01

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products and materials properly packaged in factory fabricated containers and mounted on shipping skids.
- B. Store products and materials in clean, dry, heated space. Protect from dirt, fumes, water, construction debris, and traffic. Where necessary to store outdoors, store above grade and enclose with watertight wrapping.
- C. Handle products and materials carefully to prevent internal damage, breakage, denting, and scoring enclosure finish. Do not install damaged products or materials. Replace and return damaged products or materials to manufacturer.

1.7 SPARE PARTS

Not Applicable

1.8 WARRANTY

- A. The contractor shall warrant all materials, workmanship, and equipment against defects for a period of one year after the date of substantial completion. Certain equipment shall be warranted at the time of final acceptance, or for longer periods of time as specified in those sections of the project manual.

- B. The contractor shall repair or replace, at no additional cost to Owner, any item that may become defective within the warranty period.
- C. Any manufacturer's warranties concerning any item installed shall be to the benefit of Owner.
- D. The contractor agrees not to void or impair or to allow any sub-contractor to void or impair any warranties regarding products or items installed as part of this project.
- E. The repair of faulty workmanship shall be considered to be included in the contract.

1.9 MAINTENANCE

Not Applicable

1.10 PROJECT CONDITIONS

- A. Field Measurements: Verify that field measurements are as indicated on the shop drawings and as shown on the drawings.
- B. Project Location Environment: Furnish and install materials suitable for the altitude, weather, and seismic requirements of the project location.

1.11 COORDINATION

- A. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
- B. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

PART 2 - PRODUCTS

2.1 INDOOR OCCUPANCY SENSORS

- A. Product: Subject to compliance with requirements, provide products by one of the following:
 - 1. Lithonia Lighting; Acuity Lighting Group, Inc.
 - 2. Hubbell Lighting
 - 3. Leviton Mfg. Company Inc.
 - 4. Sensor Switch, Inc.
 - 5. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 20 minutes. Install sensor with time delay setting as described on the drawings.
 - 6. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
 - 7. Relay Unit: Dry contacts rated for 20 amp ballast load at 120 and 277 VAC, for 13 amp tungsten at 120 VAC, and for 1 hp at 120 VAC. Power supply to sensor shall be 24 VDC, 150 mA, Class 2 power source as defined by NFPA 70.
 - 8. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.

- b. Relay: Externally mounted through a ½" knockout in a standard electrical enclosure.
- c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
- 9. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
- 10. Bypass Switch: Override the on function in case of sensor failure.
- 11. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; keep lighting off when selected lighting level is present.
- 12. Detector Sensitivity: Detect occurrences of 6" minimum movement of any portion of a human body that presents a target of not less than 36 in².
- 13. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 ft² when mounted on a 96" high ceiling.
- 14. Detection Coverage (Corridor): Detect occupancy within 90' when mounted on a 10' high ceiling.
- 15. Detector Sensitivity: Detect a person of average size and weight moving not less than 12" in either a horizontal or a vertical manner at an approximate speed of 12 in./sec.
- 16. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 ft² when mounted on a 96" high ceiling.
- 17. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 ft² when mounted on a 96" high ceiling.
- 18. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 ft² when mounted on a 96" high ceiling.
- 19. Detection Coverage (Corridor): Detect occupancy anywhere within 90' when mounted on a 10' high ceiling in a corridor not wider than 14'.
- 20. Sensitivity Adjustment: Separate for each sensing technology.
- 21. Detector Sensitivity: Detect occurrences of 6" minimum movement of any portion of a human body that presents a target of not less than 36 in², and detect a person of average size and weight moving not less than 12" in either a horizontal or a vertical manner at an approximate speed of 12 in./sec.
- 22. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 ft² when mounted on a 96" high ceiling.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install devices and assemblies plumb and secure.
- B. Install wall plates when painting is complete.
- C. Do not share neutral conductor on load side of dimmers.
- D. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

- E. Protect devices and assemblies during painting.
- F. Adjust locations at which floor service outlets and telephone/power service poles are installed to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

- A. Comply with Division 26 Section 26 0553, "Identification for Electrical Systems."
 - 1. Switches and Sensors: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate.
 - 2. Switches and Sensors: Identify panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

3.3 CONNECTIONS

- A. Connect wiring device grounding terminal to outlet box with bonding jumper.
- B. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
 - 2. Operational Test: Verify operation of each lighting control device, and adjust time delays.
- B. Replace damaged or defective components.

3.5 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.6 DEMONSTRATION

- A. Coordinate demonstration of products specified in this Section with demonstration requirements for low-voltage, programmable lighting control system.
- B. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION

**SECTION 26 2726
WIRING DEVICES**

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Scope: The work specified in this section includes, but shall not be limited to, providing labor, materials, equipment, and services necessary for the electrical work shown on the drawings and as herein specified.
- B. Section includes: receptacles, dimmer switches, toggle switches, and finish plates.

1.2 DEFINITIONS

- A. GFI: Ground-fault circuit interrupter.

1.3 CODES AND STANDARDS

- A. FS W-C-596: Electrical Power Connector, Plug, Receptacle, and Cable Outlet
- B. FS W-S-896: Switch, Toggle
- C. NEMA WD 1: General Color Requirements for Wiring Devices
- D. NEMA WD 6: Wiring Devices – Dimensional Requirements
- E. UL 1472: Solid State Dimming Controls
- F. UL 943: Standard for Ground Fault Circuit Interrupters
- G. UL 498: Standard for Attachment Plugs and Receptacles
- H. UL 20: Standard for General Use Snap Switches
- I. DSCC W-C-896F: General Specification for Electrical Power Connector

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- B. Comply with NFPA 70.

1.5 SUBMITTALS

- A. Product Data: For each product specified
- B. Shop Drawings: Legends for receptacles and switch plates
- C. Samples: For devices and device plates for color selection and evaluation of technical features
- D. Maintenance Data: For materials and products to include in maintenance manuals specified in Division 01

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products and materials properly packaged in factory fabricated containers and mounted on shipping skids.

- B. Store products and materials in clean, dry, heated space. Protect from dirt, fumes, water, construction debris, and traffic. Where necessary to store outdoors, store above grade and enclose with watertight wrapping.
- C. Handle products and materials carefully to prevent internal damage, breakage, denting, and scoring enclosure finish. Do not install damaged products or materials. Replace and return damaged products or materials to manufacturer.

1.7 SPARE PARTS

Not Applicable

1.8 WARRANTY

- A. The contractor shall warrant all materials, workmanship, and equipment against defects for a period of one year after the date of substantial completion. Certain equipment shall be warranted at the time of final acceptance, or for longer periods of time as specified in those sections of the project manual.
- B. The contractor shall repair or replace, at no additional cost to Owner, any item that may become defective within the warranty period.
- C. Any manufacturer's warranties concerning any item installed shall be to the benefit of Owner.
- D. The contractor agrees not to void or impair or to allow any sub-contractor to void or impair any warranties regarding products or items installed as part of this project.
- E. The repair of faulty workmanship shall be considered to be included in the contract.

1.9 MAINTENANCE

Not Applicable

1.10 PROJECT CONDITIONS

- A. Field Measurements: Verify that field measurements are as indicated on the shop drawings and as shown on the drawings.
- B. Project Location Environment. Furnish and install materials suitable for the altitude, weather, and seismic requirements of the project location.

1.11 COORDINATION

- A. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
- B. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
- C. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 - 1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 SWITCHES AND RECEPTACLES

- A. Provide the various switches and receptacles shown on the plans.

- B. In general, the color of all devices shall be white, unless otherwise noted on the drawings.
- C. All devices shall be Underwriters' Laboratories listed, Federal specification listed, heavy duty type. Receptacles shall be grounding type.
- D. Devices shall be manufactured by the following:
 - 1. Duplex receptacles, 20 Ampere, 125 Volt
 - a. Standard duplex (White)
 - (1) P&S/Legrand #5362
 - (2) Hubbell #HBL5352
 - (3) Leviton #5362
 - (4) Cooper #5362
 - b. Ground Fault Circuit Interrupter (GFI) (White)
 - (1) P&S/Legrand #1591
 - (2) Hubbell #GF5362
 - (3) Leviton #6899-HG
 - (4) Cooper #GF20
 - 2. Toggle switches 20A, 120-277V (White)
 - a. Single Pole
 - (1) Hubbell
 - (2) P&S/Legrand
 - (3) Leviton
 - (4) Cooper

2.2 DEVICE PLATES

- A. Device plates in finished areas shall be nylon, white or stainless steel. Final selection shall be by architect.
- B. Device plates in non-finished areas shall be stainless steel Type 302.
- C. All multi-gang plates shall be one piece.
- D. Plates for outlet boxes shall contain a label for identifying circuit number and panel source. See specification Division 26 Section 26 0505, "Electrical Identification," for additional information.

2.3 POWER OUTLETS

- A. Power outlets for equipment requiring outlets other than standard duplex receptacle configurations shall match the "NEMA" rating of the equipment to be served or as specified on the electrical drawings.
- B. Manufacturers of power outlets shall match those specified under duplex receptacles.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install devices and assemblies plumb and secure.
- B. Install wall plates when painting is complete.

- C. Install wall dimmers to achieve indicated rating after derating for ganging as instructed by manufacturer.
- D. Do not share neutral conductor on load side of dimmers.
- E. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.
- F. Protect devices and assemblies during painting.
- G. Adjust locations at which floor service outlets and telephone/power service poles are installed to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

- A. Comply with Division 26 Section 26 0553, "Identification for Electrical Systems."
 - 1. Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate.
 - 2. Receptacles: Identify panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

3.3 CONNECTIONS

- A. Connect wiring device grounding terminal to outlet box with bonding jumper.
- B. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

- A. Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.
- B. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- C. Replace damaged or defective components.

3.5 CLEANING

- A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION

**SECTION 26 2816
SAFETY AND DISCONNECT SWITCHES**

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This Section includes the following:
 - 1. Equipment disconnects

1.2 DEFINITIONS

Not Applicable

1.3 CODES AND STANDARDS

- A. NEMA KS-1: Enclosed Switches
- B. NFPA 70: National Electrical Code

1.4 QUALITY ASSURANCE

- A. Comply with codes for components and installation.
- B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
 - 1. The Terms “Listed” and “Labeled”: As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A Nationally Recognized Testing Laboratory (NRTL) as defined in OSHA Regulation 1910.7.
- C. Single-Source Responsibility: All enclosed switches shall be the product of a single manufacturer.

1.5 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Product data for switches and accessories specified in this Section.
- C. Descriptive data and time-current curves for protective devices and let-through current curves for those devices with current-limiting characteristics. Include coordination charts and tables, and related data.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.
- B. Where recommended by the equipment supplier, deliver equipment in fully enclosed vans after specified environmental conditions have been permanently established in spaces where equipment is to be placed. The products accepted on the site shall be wrapped in factory packing and shall be inspected for damage prior to acceptance.
- C. Store equipment in clean, dry with non-condensing environments that are controlled within manufacturer's ambient tolerances for non-operating equipment. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

- D. Handle equipment carefully to prevent damage, breaking, and scoring. The contractor shall not install damaged units or components; replace with new.
- E. Equipment furnished by others. The contractor shall be responsible for receiving, uncrating, inspecting, storing, and installing of Division 26 equipment listed as furnished by others.

1.7 SPARE PARTS

Not Applicable

1.8 WARRANTY

- A. Disconnect switches shall be warranted for a minimum period of one year after project completion, or longer if manufacturer's warranty allows.

1.9 MAINTENANCE

Not Applicable

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide enclosed switches by one of the following:
 - 1. Safety Switches:
 - a. Square D
 - b. Cutler-Hammer
 - c. General Electric

2.2 GENERAL

- A. Disconnect and Safety Disconnect Switches:
 - 1. General: Provide heavy duty surface-mounted safety switches for motors and equipment unless otherwise indicated, of types, sizes, and electrical characteristics as indicated on the electrical drawings and equipment schedules.
 - 2. Switch Interiors: Switches shall have switch blades which shall be fully visible in the off position when the enclosure door is open. Current carrying parts shall be plated copper and switch contacts shall be silver-tungsten. Lugs shall be removable and shall be UL-listed for 75°C, copper wire.
 - 3. Switch Operator: Switches shall be quick-made, quick-break type. The operating handle shall be an integral part of the enclosure base and shall be padlockable in the off position. The handle position shall indicate whether the switch is in the on or off position.

2.3 ENCLOSURES

- A. NEMA 1: Provide NEMA 1 general purpose enclosures for indoor installation unless otherwise indicated on the drawings. Enclosure covers shall be attached with pin type hinges. Enclosures shall have a gray baked enamel finish, electrodeposited on clean, phosphatized steel.
- B. NEMA 3R: Provide NEMA 3R general purpose enclosures for outdoor installation unless otherwise indicated on the drawings. Enclosure cover shall be attached with pin type hinges and shall be securable in the open position. NEMA 3R enclosures shall be manufactured from

galvanized steel. Enclosures shall have a gray baked enamel finish, electrodeposited on cleaned, phosphatized steel. Provide rainproof bolt-on hubs.

2.4 RATINGS

- A. General: Provide heavy duty safety switches with ampere rating as shown on the drawings.
- B. Horsepower-Rated: Safety switches shall be horsepower-rated for 250, 480, and 600VAC and shall be rated for the motor driven loads supplied by the switch.
- C. Short Circuit Rating: Safety switches shall have a UL short circuit rating of 65,000 amperes RMS symmetrical minimum.

2.5 IDENTIFICATION DEVICES

- A. Each disconnect switch shall have an engraved, laminated Bakelite nameplate attached to the outside of the enclosure. The nameplate shall include the switch designation and the equipment it serves. Attach the nameplate by screws or rivets. See Division 26 Section 26 0553, "Identification of Electrical Systems."

2.6 ELECTRICAL INTERLOCKS

- A. Provide electrical interlock switches on disconnects as specified herein. The interlock switches shall open prior to the opening of the power switch and close only after the power switch has been enclosed. Provide two sets normally open (NO) and normally closed (NC) switches for each disconnect.
- B. Provide the necessary control wiring to the interlock switch to disconnect the control circuit from the motor controller.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install enclosed switches in locations as indicated, according to manufacturer's written instructions. Comply with all applicable requirements of electrical installations and for the seismic zone of this project.
- B. Install enclosures level and plumb.
- C. Install wiring between enclosed switches and control/indication devices as required.
- D. Connect switches, panels, enclosures, and components to wiring system and to equipment ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.
- E. Mounting: Mount enclosures on building structures adjacent to equipment unless otherwise noted. Enclosures shall not be mounted on equipment served, unless it is a part of a preassembled control panel. If building structure is not adjacent to the equipment, provide a separate unistrut rack with supports, clear of equipment, for mounting of switch enclosure. Conduits shall not be used for the support means.

F. Location:

1. Disconnects shall be readily accessible and shall not interfere with removal of equipment parts or with standard maintenance. Disconnects shall be installed with their top at 5½ feet above the floor unless otherwise noted on the drawings.

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will employ and pay an independent testing agency to perform specified field quality-control testing.

3.3 CLEANING

- A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.

END OF SECTION

**SECTION 26 5100
INTERIOR LIGHTING LUMINAIRES**

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This Section includes:
 - 1. Interior solid state luminaires that use LED technology
 - 2. Exit signs.
 - 3. Emergency power supply units.
 - 4. Luminaire supports.

1.2 DEFINITIONS

- A. Fixture: See "Luminaire".
- B. Emergency Power Unit: Self-contained, modular, battery-inverter unit.
- C. Luminaire: A complete lighting unit consisting of lamp(s), driver(s), reflector, and housing when applicable, together with parts designed to distribute light, to position and protect lamps, and to connect lamps to power supply.
- D. CCT: Correlated color temperature.
- E. CRI: Color Rendering Index.
- F. IP: International Protection or Ingress Protection Rating.
- G. LED: Light-emitting diode.
- H. Lumen: Measured output of lamp and luminaire, or both.

1.3 CODES AND STANDARDS

- A. Luminaires shall meet the applicable section of the following:
 - 1. ANSI.
 - 2. NEMA.
 - 3. NFPA 70.
 - 4. UL.

1.4 QUALITY ASSURANCE

- A. Electrical Component Standard: Provide components that comply with National Electrical Code NFPA 70 and that are listed and labeled by Underwriters Laboratory where available.
- B. Listing and Labeling: Provide luminaires, emergency lighting units, and accessory components specified in this Section that are listed and labeled for their indicated use and installation conditions on Project.
- C. Special Listing and Labeling: Provide luminaires for use in damp or wet locations, underwater, and recessed incombustible construction that are specifically listed and labeled for such use. Provide luminaires for use in hazardous (classified) locations that are listed and labeled for the specific hazard.

1. The Terms “Listed” and “Labeled”: As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A “Nationally Recognized Testing Laboratory” (NRTL) as defined in OSHA Regulation 1910.7.
- D. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the National Voluntary Laboratory Accreditation Program (NVLAP) for Energy Efficient Lighting Products.
- E. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.
- F. Provide luminaires from a single manufacturer for each luminaire type.
- G. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.5 SUBMITTALS

- A. Product Data: For each type of lighting luminaire indicated, submit each item in this Article according to the conditions of the contract and Division 01 specification section. For each type of product:
 1. Arrange in order of luminaire designation.
 2. Include data on features, accessories, and finishes.
 3. Include physical description and dimensions of luminaires.
 4. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
 5. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting luminaire as applied in this Project IES LM-79 and IES LM-80.
 - a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
 6. Emergency lighting unit including battery and charger.
 7. Low voltage transformers.
 8. LED power supplies.
 9. Types of LEDs including manufacturer, wattage, and Color Rendering Index (CRI) and color temperature in degrees Kelvin (K).
- B. Shop Drawings: Show details of nonstandard or custom luminaires. Indicate dimensions, weights, method of field assembly, components, features, and accessories.
 1. Wiring Diagrams: Detail wiring for luminaires and differentiate between manufacturer installed and field installed wiring.
 2. For custom luminaires, modified luminaires or linear luminaires mounted in continuous rows, submit scaled drawings prepared by the manufacturer showing all details of construction, lengths in runs, pendant or power feed locations, accessories, finishes and lists of materials.

- C. Coordination Drawings: Reflected ceiling plans and sections drawn to scale and coordinating luminaire installation with ceiling grid, ceiling mounted items, and other components in the vicinity. Include work of all trades that is to be installed near lighting equipment.
- D. Product Certificates: Signed by manufacturers of lighting luminaires certifying that products comply with requirements.
- E. Dimming Driver Compatibility Certificates shall be signed by manufacturer of driver certifying that drivers are compatible with dimming systems and equipment with which they are used. Project Certificates signed by product manufacturer shall be provided for each type of driver for dimmer controlled luminaires.
- F. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle lighting luminaires to avoid damage to housing, components, and finishes.

1.7 SPARE PARTS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. LED drivers: 5% for each type but not less than one driver.
 - 2. LED light bars: 5% for each type but not less than one light bar.
 - 3. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
 - 4. Plastic Diffusers and Lenses: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
 - 5. Luminaire-mounted, emergency battery pack: 1 for every 20 of each type and rating installed. Furnish at least one of each type.
 - 6. Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty for LEDs and Drivers: Manufacturer's standard form in which manufacturer of LEDs and drivers agrees to replace components that fails in materials or workmanship within specified warranty period.
 - 1. LED arrays: 10 years from date of Beneficial Occupancy.
 - 2. Drivers: 10 years from dated of Beneficial Occupancy.
- C. Special Warranty for Batteries: Written warranty, executed by manufacturer agreeing to replace rechargeable batteries that fail in materials or workmanship within specified warranty period.

Manufacturer's standard, but not less than 5 years from date of Beneficial Completion. Full warranty shall apply for first year, and prorated warranty for last four years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide products indicated for each designation on the Luminaire Schedule.

2.2 GENERAL REQUIREMENTS FOR LUMINAIRES AND LUMINAIRE COMPONENTS

- A. Fixture to be accessible and maintained from below.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
- D. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- E. Recessed Luminaires: Comply with NEMA LE 4.
- F. CRI of minimum 80 unless noted otherwise on drawings and/or Luminaire Schedule.
- G. CCT as noted on the Luminaire Schedule.
- H. LEDs shall be Restriction of Hazardous Substances Directive (RoHS) compliant.
- I. Internal driver unless noted otherwise.
- J. Nominal Operating Voltage: As noted on the Luminaire Schedule.
- K. Metal Parts: Free from burrs, sharp corners, and edges.
- L. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- M. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position.
- N. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:
 - 1. White Surfaces: 85%.
 - 2. Specular Surfaces: 90%.
 - 3. Diffusing Specular Surfaces: 75%.
- O. Reflector cones shall adhere to the following:
 - 1. Cones shall provide a minimum of 50° cutoff to source and source image unless otherwise noted elsewhere.
 - 2. Plastic material shall not be used for reflector cones.
 - 3. Cones shall not be permanently fastened to the housing and shall be removable without tools. Retention devices shall not deform the cone or be visible from normal viewing angles.

4. Trim shall be flush to ceiling without gaps or light leaks. Where the flange trim is separate from the cone, it shall have the same finish as the reflector cone.
 5. Reflector cones shall be uniform gauge, not less than 0.032" thick, high purity aluminum Alcoa 3002 alloy. Cones shall be free from spin marks or other defects.
 6. Manufacture cones using the Alzak® process. Refer to Luminaire Schedule for cone color and finish.
- P. Lenses, Diffusers, Covers, and Globes:
1. Acrylic Lighting Diffusers: 100% virgin acrylic plastic. UV stabilized high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation or annealed crystal glass, unless otherwise indicated.
 - a. Lens Thickness: 0.125" (3 mm) minimum, unless otherwise indicated.
 - b. Lenses shall have uniform brightness throughout the entire visible area without LED pixilation.
 2. Glass Globes: Annealed crystal glass unless otherwise indicated.
- Q. Housings:
1. Extruded-aluminum or minimum code gauge steel construction housing.
 2. Extruded-aluminum heat sink.
 3. Painted finish.
- R. Luminaires provided shall have means for disconnection from power source during service, as required by NEC Article 410.
- S. Adjustable luminaires shall have positive locking devices to fix aiming angle. Luminaires shall be capable of being relamped without adjusting aiming angle.
- T. Each luminaire that has an array with a beam pattern or spread lens that defines beam orientation shall contain locking devices to insure the orientation is not disturbed during array replacement or cleaning.
- U. Trim and mounting hardware to match ceiling type.
- V. Luminaires recessed in suspended ceilings where the space above the ceiling is either an air supply or return plenum shall conform to NEC Article 300-22.
- W. Provide plaster frame for recessed luminaires mounted in other than T-bar ceilings. Verify mounting with architectural reflected ceiling plan before ordering luminaires.
- X. Luminaires installed in "hard" ceilings shall have all connections accessible through the luminaire.
- Y. Luminaire for use in areas designated as damp locations shall be suitable gasketed to prevent the entrance of moisture. Provide approved wire mesh screens for ventilation openings. Dissimilar metals shall be separated by non-conductive material to prevent galvanic action. Luminaire shall be UL listed for application.
- Z. Factory Applied Labels: Comply with UL 1568. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when light bars are in place.
- AA. Luminaires shall be free of light leaks while providing sufficient ventilation of LEDs and drivers to provide the required photometric performance.

BB. Luminaire shall hold LED arrays securely against normal vibration and maintenance handling.

CC. Electromagnetic Interference Filters: Integral to luminaire assembly. Provide one filter for each driver. Suppress conducted electromagnetic interference filters as required by MIL STD 461.

2.3 LED DRIVERS

A. General Requirements:

1. Operate for at least 50,000 hours at maximum case temperature and 90% non-condensing relative humidity.
2. Provide thermal fold-back protection by automatically reducing power output (dimming) to protect LED driver and LED light engine/luminaire from damage due to over-temperature conditions that approach or exceed the LED driver's maximum operating temperature at calibration point.
3. Designed and tested to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2.
4. Manufactured in a facility that employs ESD reduction practices in compliance with ANSI/ESD S20.20.
5. UL8750 recognized or listed as applicable.
6. UL Type TL rated where possible to allow for easier luminaire evaluation and listing of different driver series.
7. UL 1598C listed for field replacement as applicable.
8. Designed and tested to withstand Category A surges of 4,000 V according to IEEE C62.41.2 without impairment of performance.
9. Class A sound rating; Inaudible in a 27 dBA ambient.
10. Demonstrate no visible change in light output with a variation of $\pm 10\%$ change in line-voltage input.
11. LED drivers of the same family/series to track evenly across multiple luminaires at all light levels.
12. Offer programmable output currents in 10 mA increments within designed driver operating ranges for custom luminaire length and lumen output configurations, while meeting a low-end dimming range of 100 to 1% or 100 to 5% as applicable.
13. Meet NEMA 410 inrush requirements for mitigating inrush currents with solid state lighting sources.
14. Employ integral fault protection up to 277 V to prevent LED driver damage or failure in the event of incorrect application of line-voltage to communication link inputs.
15. LED driver may be remote located up to 100 feet (30m) from LED light engine depending on power outputs required and wire gauge utilized by installer.

2.4 LED ARRAYS

- A. All LEDs of the same type shall be provided by the same manufacturer.
- B. Equip each luminaire with the proper LED array of the type shown or specified in the Luminaire Schedule.

2.5 EXIT SIGNS

- A. General Requirements for Exit Signs:
 - 1. Comply with UL 924.
 - 2. Sign Colors and Lettering Size: Comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 - 1. Signs Colors and Lettering Size: Comply with authorities having jurisdiction.
 - 2. Lamps for AC Operation: Light emitting diodes, 70,000 hours minimum rated lamp life.
 - 3. LED Indicator Light: Indicate normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.6 EMERGENCY POWER SUPPLY UNIT

- A. External Type: Self-contained, modular, battery inverter unit. Comply with UL 924.
 - 1. Test Switch and Light Emitting Diode Indicator Light: Visible and accessible without entering ceiling space.
 - 2. Battery: Sealed, maintenance free, nickel cadmium type with minimum 10 year nominal life.
 - 3. Charger: Fully automatic, solid state, constant current type.
 - 4. Operation: Relay automatically energizes lamp from unit when normal supply circuit voltage drops to 80% of nominal voltage or below. When normal voltage is restored, relay disconnects lamp, and battery is automatically recharged and floated on charger.
 - 5. Housing: NEMA 250, Class 1 enclosure.

2.7 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with Division 26 Section “Basic Electrical Materials and Methods,” for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single Stem Hangers: ½” (12 mm) steel tubing with swivel ball fitting and ceiling canopy. Finish same as luminaire.
- C. Twin Stem Hangers: Two, ½” (12 mm) steel tubes with single canopy arranged to mount a single luminaire. Finish same as luminaire.
- D. Rod Hangers: ⅜” (5 mm) minimum diameter, cadmium plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire and line voltage and equipped with threaded attachment, cord, and locking type plug.
- F. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by luminaire manufacturer.

2.8 FINISHES

- A. Luminaires: Manufacturer’s standard, unless otherwise indicated.
 - 1. Paint Finish: Applied over corrosion resistant treatment or primer, free of defects.
 - 2. Metallic Finish: Corrosion resistant.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install Luminaires level, plumb, and square with ceiling and walls, and secure according to manufacturer's written instructions and approved submittal materials.
- C. Install lamps in each luminaire.
- D. Support luminaires according to requirements of Division 26 Basic Electrical Materials and Methods.
- E. Support for Luminaires in or on Grid Type Suspended Ceilings:
 - 1. Install a minimum of two ceiling support system rods or wires for each luminaire. Locate not more than 6" (150 mm) from luminaire corners.
 - 2. Support Clips: Fasten to luminaires and to ceiling grid members at or near each luminaire corner.
 - 3. Luminaires of Sizes Less Than Ceiling Grid: Arrange as indicated on reflected ceiling plans or center in acoustical panel, and support luminaires independently with at least two $\frac{3}{4}$ " (20 mm) metal channels spanning and secured to ceiling tees.
- F. Suspended Luminaire Support: As follows:
 - 1. Pendants and Rods: Where longer than 48" (1200 mm), brace to limit swinging.
 - 2. Stem Mounted, Single Unit Luminaires: Suspend with twin stem hangers.
 - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
 - 4. Continuous Rows: Suspend from cable installed according to luminaire manufacturer's written instructions and details on Drawings.
- G. Luminaire Attachment: Fasten to indicated structural supports.
- H. Luminaire Attachment with Adjustable Features or Aiming: Attach luminaires and supports to allow aiming for indicated light distribution.

3.2 CONNECTIONS

- A. Wire per requirements of branch circuit installation. Properly ground each luminaire.
- B. Tighten electrical connectors and terminals according to manufacturer's published torque tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 IDENTIFICATION

- A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Division 26 Section 26 0553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Inspect each installed unit for damage. Replace damaged units.
- B. Advance Notice: Give dates and times for field tests.

- C. Provide instruments to make and record test results.
- D. Tests and Observations: Verify normal operation of lighting units after installing lighting luminaires by energizing circuits with normal power source, and performing the following:
 - 1. Measure light intensities at night if specific illumination performance is indicated. Use photometers with calibration referenced to NIST standards.
 - 2. Check intensity and uniformity of illumination.
 - 3. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation. Verify transfer to emergency/battery source and retransfer to normal.
- E. Prepare a written report of tests, inspections, observations and verifications indicating and interpreting results.
- F. Replace all inoperable LED arrays at the end of construction prior to beneficial occupancy.
- G. Malfunctioning Luminaires and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

3.5 CLEANING AND ADJUSTING

- A. Clean luminaires internally and externally after installation. Use methods and materials recommended by manufacturer.
- B. Adjust aimable luminaires to provide required light intensities.

END OF SECTION