



Project Manual

for

Fannin County Recreation Center – Phase I Blue Ridge, Georgia

owner:

Fannin County Parks & Recreation

architect:

Praxis3 LLC

100 Peachtree St. NW

Suite 1450

Atlanta, GA 30303

(404) 875-4500

Project No. 24184

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SECTION 01 1000

SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Project information.
- 2. Work covered by Contract Documents.
- 3. Owner-furnished, Contractor-installed (OFCl) products.
- 4. Owner-furnished, Owner-installed (OFOl) products.
- 5. Contractor's use of site and premises.
- 6. Coordination with occupants.
- 7. Work restrictions.
- 8. Specification and Drawing conventions.
- 9. Miscellaneous provisions.

- B. Related Requirements:

- 1. Section 01 5000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

- A. Project Identification: 24184 - Fannin County Recreation Center – Phase I.

- 1. Project Location: 580 Winding Drive Blue Ridge, Georgia 30513.

- B. Owner: Fannin County Recreation Department; 580 Winding Drive Blue Ridge, Georgia 30513

- 1. Owner's Representative: Eddie O'Neal, 580 Winding Drive Blue Ridge, Georgia 30513

- C. Architect: Jared Bier, 404-474-9938.
- D. Web-Based Project Software: Project software will be used for purposes of managing communication and documents during the construction stage.
 - 1. See Section 01 3100 "Project Management and Coordination." for requirements for using web-based Project software.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
 - 1. The project is a new, stand alone, single-story 2,475 sf classroom building to service an existing recreation center. The building is a pre-engineered metal building including 4 classrooms, an office, and storage space.
- B. Type of Contract:
 - 1. Project will be constructed under a single prime contract.

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

- A. The Owner will furnish and install products indicated.
- B. Owner-Furnished/Owner-Installed (OFOI) Products: As indicated in drawings on FFE plan (4/A201-I).

1.6 OWNER-FURNISHED, CONTRACTOR-INSTALLED (OFCI) PRODUCTS

- A. Owner shall furnish products indicated. The Work includes unloading, handling, storing, installing and protecting Owner-furnished products and making building services connections.
- B. Owner-Furnished, Contractor-Installed Products: As indicated in drawings on FFE plan (4/A201-I).

1.7 CONTRACTOR'S USE OF SITE AND PREMISES

- A. General: Contractor shall have use of Project site for construction operations as indicated on Drawings and by the Contract limits and as indicated by requirements of this Section.
- B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Driveways, Walkways and Entrances: Keep driveways, parking garage, 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 for storage of materials unless indicated otherwise.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.8 COORDINATION WITH OCCUPANTS

- A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
 - 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
 - 1. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
 - 2. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
 - 3. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.9 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 - 2. Obtain Owner's written permission before proceeding with utility interruptions.
- C. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Owner not less than two days in advance of proposed disruptive operations.
2. Obtain Owner's written permission before proceeding with disruptive operations.

1.10 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations are scheduled on Drawings.
 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 1000

SECTION 01 2500
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Section 01 6000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

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

1.3 ACTION SUBMITTALS

- A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication, or installation method cannot be provided, if applicable.
 - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where requested.
 - f. Certificates and qualification data, where applicable or requested.

- g. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
 - h. Cost information, including a proposal of change, if any, in the Contract Sum.
 - i. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
 - j. 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.
- 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 14 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.

1.4 QUALITY ASSURANCE

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

1.5 PROCEDURES

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

1.6 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution is compatible with other portions of the Work.
 - e. Requested substitution provides specified warranty.
- B. Substitutions for Convenience: Architect will consider requests for substitution if received within 15 days after the Notice of Award. Requests received after that time will not be considered.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d. Substitution request is fully documented and properly submitted.
 - e. Requested substitution will not adversely affect Contractor's construction schedule.
 - f. Requested substitution is compatible with other portions of the Work.
 - g. Requested substitution provides specified warranty.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2500

SECTION 01 2501
SUBSTITUTION REQUEST FORM

IDENTIFICATION:

Owner: _____

Contractor: _____

Design Professional: _____

Project Name: _____

Project Number: _____

Substitution Reason: ☐ For Cause ☐ For Convenience Date: _____

REFERENCE:

Substitution Request Title: _____

Substitution Request No.: _____

Specification Title: _____

Specification No.: _____

DESCRIPTION:

Manufacturer's Name: _____

Model No.: _____

Trade Name: _____

Installer: _____

Proposed Substitution General Description: _____

EXPLANATION:

Reason for not providing specified item: _____

Differences between proposed substitution and specified item: _____

Proposed substitution affects other parts of work as follows: _____

Saving to Owner for accepting substitution: _____

Change to Contract Time due to accepting substitution:: _____

CERTIFICATION:

The Undersigned certifies:

- Proposed substitution has been investigated and determined that it meets or exceeds the quality level of the specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

FANNIN COUNTY REC CENTER – PHASE I
BLUE RIDGE, GA
PRAXIS3-24184

01 2501-3
SUBSTITUTION REQUEST FORM
MAY 22, 2026

Submitted and Signed by: _____
Name: Title:

Firm: _____

Address: _____

Telephone: _____

ATTACHED SUPPORTING DATA:

☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

A/E's REVIEW AND ACTION:

- ☐ Substitution approved – Make submittals in accordance with Specification Section 01 2500.
- ☐ Substitution approved as noted – Make submittals in accordance with Specification Section 01 2500.
- ☐ Substitution rejected – Use specified materials.
- ☐ Substitution Request received too late – Use specified materials.

Signed by: _____

ADDITIONAL COMMENTS:

END OF SECTION 01 2501

SECTION 01 2900
PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 01 3200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.2 DEFINITIONS

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

1.3 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule
 - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Owner's name.
 - c. Owner's Project number.
 - d. Name of Architect.
 - e. Architect's Project number.
 - f. Contractor's name and address.
 - g. Date of submittal.
 - 2. Arrange schedule of values consistent with format of AIA Document G703.
 - 3. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

- a. Differentiate between items stored on-site and items stored off-site.
4. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
5. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
6. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.4 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Architect and paid for by Owner.
- B. Payment Application Times: The date for each progress payment is indicated in the Owner/Contractor Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
 1. Submit draft copy of Application for Payment five days prior to due date for review by Architect.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.

- b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- F. Transmittal: Submit one signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
 - 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 - 2. When an application shows completion of an item, submit conditional final or full waivers.
 - 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 - 4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 - 5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 - 1. List of subcontractors.
 - 2. Schedule of values.
 - 3. Contractor's construction schedule (preliminary if not final).
 - 4. Products list (preliminary if not final).
 - 5. Sustainable design action plans, including preliminary project materials cost data.
 - 6. Schedule of unit prices.
 - 7. Submittal schedule (preliminary if not final).
 - 8. List of Contractor's staff assignments.
 - 9. List of Contractor's principal consultants.
 - 10. Copies of building permits.
 - 11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 - 12. Initial progress report.
 - 13. Report of preconstruction conference.
- I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
 - 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 - a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 017700 "Closeout Procedures."

2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Certification of completion of final punch list items.
 3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 4. Updated final statement, accounting for final changes to the Contract Sum.
 5. AIA Document G706.
 6. AIA Document G706A.
 7. AIA Document G707.
 8. Evidence that claims have been settled.
 9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 10. Final liquidated damages settlement statement.
 11. Proof that taxes, fees, and similar obligations are paid.
 12. Waivers and releases.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2900

SECTION 01 3100

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. RFIs.
 - 3. Digital project management procedures.
 - 4. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
 - 1. Section 01 7300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 2. Section 01 7700 "Closeout Procedures" for coordinating closeout of the Contract.

1.2 DEFINITIONS

- A. BIM: Building Information Modeling.
- B. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site.

Identify individuals and their duties and responsibilities, list addresses and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office, in web-based Project software directory, and in prominent location in each built facility. Keep list current at all times.

1.4 GENERAL COORDINATION PROCEDURES

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

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

1.5 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Architect.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above.
 1. Attachments shall be electronic files in PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use software log that is part of web-based Project software. 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 returned without action or withdrawn.
 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.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1.6 DIGITAL PROJECT MANAGEMENT PROCEDURES

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

- a. Subcontractors, and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement form provided by the Architect and acceptable to Owner and Architect.
- B. Web-Based Project Software: Use Architect's web-based Project software site, ROUNDHOUSEPM for purposes of hosting and managing Project communication and documentation until Final Completion.
 1. Web-based Project software site includes, at a minimum, the following features:
 - a. Compilation of Project data, including Contractor, subcontractors, Architect, architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
 - b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
 - c. Document workflow planning, allowing customization of workflow between project entities.
 - d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
 - e. Track status of each Project communication in real time, and log time and date when responses are provided.
 - f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
 - g. Processing and tracking of payment applications.
 - h. Processing and tracking of contract modifications.
 - i. Creating and distributing meeting minutes.
 - j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
 - k. Management of construction progress photographs.
 - l. Mobile device compatibility, including smartphones and tablets.
 2. At completion of Project, provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prevent further changes.
- C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.7 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 a minimum of 10 working days prior to meeting.
 - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
 - 1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority (if any), Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Phasing.
 - d. Critical work sequencing and long lead items.
 - e. Designation of key personnel and their duties.
 - f. Lines of communications.
 - g. Use of web-based Project software.
 - h. Procedures for processing field decisions and Change Orders.
 - i. Procedures for RFIs.
 - j. Procedures for testing and inspecting.
 - k. Procedures for processing Applications for Payment.
 - l. Distribution of the Contract Documents.
 - m. Submittal procedures.
 - n. Sustainable design requirements.
 - o. Preparation of Record Documents.
 - p. Use of the premises and existing buildings (if any).
 - q. Work restrictions.
 - r. Working hours.
 - s. Owner's occupancy requirements.
 - t. Responsibility for temporary facilities and controls.
 - u. Procedures for moisture and mold control.
 - v. Procedures for disruptions and shutdowns.
 - w. Construction waste management and recycling.
 - x. Parking availability.

- y. Office, work, and storage areas.
 - z. Equipment deliveries and priorities.
 - aa. First aid.
 - bb. Security.
 - cc. Progress cleaning.
 - 3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, and Owner's Commissioning Authority (if any) of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility requirements.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written instructions.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 30 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority (if any), Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of Record Documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Procedures for completing and archiving web-based Project software site data files.
 - d. Submittal of written warranties.
 - e. Requirements for preparing operations and maintenance data.
 - f. Requirements for delivery of material samples, attic stock, and spare parts.
 - g. Requirements for demonstration and training.
 - h. Preparation of Contractor's punch list.
 - i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - j. Submittal procedures.
 - k. Coordination of separate contracts.
 - l. Owner's partial occupancy requirements.
 - m. Installation of Owner's furniture, fixtures, and equipment.
 - n. Responsibility for removing temporary facilities and controls.
 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings biweekly or as otherwise agreed upon intervals.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority (if any) and Architect, each contractor, subcontractor, supplier, and other entity concerned with

current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Resolution of BIM component conflicts.
 - 4) Status of submittals.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site use.
 - 9) Temporary facilities and controls.
 - 10) Progress cleaning.
 - 11) Quality and work standards.
 - 12) Status of correction of deficient items.
 - 13) Field observations.
 - 14) Status of RFIs.
 - 15) Status of Proposal Requests.
 - 16) Pending changes.
 - 17) Status of Change Orders.
 - 18) Pending claims and disputes.
 - 19) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Within 3 days, the Architect will be provided or given access to any meetings recorded by others.
 - b. Meeting transcripts produced by software are not an acceptable substitute for meeting minutes and will not be reviewed.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 3100

SECTION 01 3200

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Startup construction schedule.
 - 2. Contractor's Construction Schedule.
 - 3. Construction schedule updating reports.
 - 4. Daily construction reports.
 - 5. Material location reports.
 - 6. Site condition reports.
 - 7. Unusual event reports.
- B. Related Requirements:
 - 1. Section 01 2900 "Payment Procedures" for schedule of values and requirements for use of cost-loaded schedule for Applications for Payment.
 - 2. Section 01 4000 "Quality Requirements" for schedule of tests and inspections.

1.2 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.
- 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 the critical path of Project and when activities can be performed.
- 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 belongs to Owner.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Resource Loading: The allocation of labor and equipment necessary for completing an activity as scheduled.

1.3 INFORMATIONAL SUBMITTALS

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

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

B. Startup construction schedule.

1. Submittal of cost-loaded startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

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

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

D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports to 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 activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
3. Total Float Report: List of activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

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

F. Daily Construction Reports: Submit at **[weekly]** **[monthly]** intervals.

G. Material Location Reports: Submit at **[weekly]** **[monthly]** intervals.

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

I. Unusual Event Reports: Submit at time of unusual event.

J. Qualification Data: For scheduling consultant.

1.4 QUALITY ASSURANCE

- A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:
1. Review software limitations and content and format for reports.
 2. Verify availability of qualified personnel needed to develop and update schedule.
 3. Discuss constraints, including work stages, area separations, interim milestones, and partial Owner occupancy.
 4. Review delivery dates for Owner-furnished products.
 5. Review schedule for work of Owner's separate contracts.
 6. Review submittal requirements and procedures.
 7. Review time required for review of submittals and resubmittals.
 8. Review requirements for tests and inspections by independent testing and inspecting agencies.
 9. Review time required for Project closeout and Owner startup procedures.
 10. Review and finalize list of construction activities to be included in schedule.
 11. Review procedures for updating schedule.

1.5 COORDINATION

- A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
1. Secure time commitments for performing critical elements of the Work from entities involved.
 2. Coordinate each construction activity in the network with other activities, and schedule them in proper sequence.

1.6 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Computer Scheduling Software: Prepare schedules using current version of a program that is capable of managing construction schedules.
- B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.
1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 2. Temporary Facilities: Indicate start and completion dates for the following as applicable:
 - a. Securing of approvals and permits required for performance of the Work.
 - b. Temporary facilities.
 - c. Construction of mock-ups, prototypes and samples.

- d. Owner interfaces and furnishing of items.
 - e. Interfaces with Separate Contracts.
 - f. Regulatory agency approvals.
 - g. Punch list.
 - 3. Procurement Activities: Include procurement process activities for the following long lead-time items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - a. Pre-Engineered Metal Building
 - 4. Submittal Review Time: Include review and resubmittal times indicated in Section 01 3300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
 - 5. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
 - 6. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
 - 7. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and Final Completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.
- 1. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 - 2. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 01 1000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 - 3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 1000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 - 4. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use-of-premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
- E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
- 1. Unresolved issues.
 - 2. Unanswered Requests for Information.
 - 3. Rejected or unreturned submittals.
 - 4. Notations on returned submittals.
 - 5. Pending modifications affecting the Work and the Contract Time.

- F. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate Final Completion percentage for each activity.
- G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.
- H. 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.

1.7 GANTT-CHART SCHEDULE REQUIREMENTS

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice of Award.
 - 1. Base schedule on the startup construction schedule and additional information received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 - 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

1.8 REPORTS

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

8. Accidents.
 9. Meetings and significant decisions.
 10. Unusual events.
 11. Stoppages, delays, shortages, and losses.
 12. Meter readings and similar recordings.
 13. Emergency procedures.
 14. Orders and requests of authorities having jurisdiction.
 15. Change Orders received and implemented.
 16. Construction Change Directives received and implemented.
 17. Services connected and disconnected.
 18. Equipment or system tests and startups.
 19. Partial completions and occupancies.
 20. Substantial Completions authorized.
- B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List to be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
 2. Material stored prior to previous report and since removed from storage and installed.
 3. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- D. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.
1. Submit unusual event reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 3200

SECTION 01 3233

PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Periodic construction photographs.
 - 2. Final completion construction photographs.
- B. Related Requirements:
 - 1. Section 01 3100 "Project Management and Coordination" for Project meetings and Project schedule.
 - 2. Section 01 7700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.

1.2 INFORMATIONAL SUBMITTALS

- A. Digital Photographs: Submit image files within three days of taking photographs.
 - 1. Submit photos by uploading to web-based project software site.
 - 2. Identification: Provide the following information with each image description in web-based project software site.
 - a. Name of Project.
 - b. Name and contact information for photographer.
 - c. Name of Architect
 - d. Name of Contractor.
 - e. Date photograph was taken.
 - f. Description of location, vantage point, and direction.

1.3 FORMATS AND MEDIA

- A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels. Use flash in low light levels or backlit conditions.
- B. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
- C. Metadata: Record accurate date and time from camera.
- D. File Names: Name media files with date and sequential numbering suffix.

1.4 CONSTRUCTION PHOTOGRAPHS

- A. General: Take photographs with maximum depth of field and in focus.
- B. Periodic Construction Photographs: Take 20 photographs coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
- C. In addition to periodic, recurring views, take photographs of each of the following events:
 - 1. Completion of site clearing.
 - 2. Excavation in progress.
 - 3. Foundations in progress and upon completion.
 - 4. Structural framing in progress and upon completion.
 - 5. Enclosure of building, upon completion.
- D. Final Completion Construction Photographs: Take 20 photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 3233

SECTION 01 3300

SUBMITTAL PROCEDURES

1.1 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.
3. Electronic Document Submittal Service.

B. Related Requirements:

1. Section 01 3301 "Submittal Cover Sheet" for Submittal Cover Sheet form to be used with all submittals.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.3 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format and transmitted via ROUNDHOUSEPM, an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
1. Besides submittals for review, information, and closeout, this procedure applies to requests for information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
 2. Contractor and Architect are required to use this service.
 3. It is the Contractor's responsibility to submit documents in PDF format.
 4. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge. If the Contractor desires to use other software (e.g. ProCore, etc.), the Contractor shall negotiate a fee to be paid to the Architect for time performed to duplicate administrative activities.
 5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
 6. Paper document transmittals will not be reviewed; emailed PDF documents will not be reviewed.

7. All other specified submittal and document transmission procedures apply, except that electronic document requirements to not apply to samples or color selection charts, oversized submittals (too large to be scanned and transmitted via ROUNDHOUSEPM) and samples.
- B. The Contractor shall furnish to the Architect a list of names and email addresses for any party that should have access to the project website. This includes people within their company plus any Subcontractors working on the project requiring access to project information. The cost for ROUNDHOUSEPM is not a cost to the Contractor so the Contractor is encouraged to provide all names and email addresses.

1.4 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Within 5 days of Contract commencement, submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1.5 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal and include on submittal cover sheet in format indicated on the attached submittal cover sheet sample.:
 1. Project name.
 2. Date.
 3. Name of Architect.
 4. Name of Contractor.
 5. Name of firm or entity that prepared submittal.
 6. Names of subcontractor, manufacturer, and supplier.
 7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
 8. Category and type of submittal.
 9. Submittal purpose and description.
 10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 11. Drawing number and detail references, as appropriate.
 12. Indication of full or partial submittal.
 13. Location(s) where product is to be installed, as appropriate.
 14. Other necessary identification.
 15. Remarks.
 16. Signature of transmitter.
- B. Options: Clearly identify options requiring selection by Architect.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

1.6 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. ROUNDHOUSEPM: Prepare submittals in PDF form, and upload to ROUNDHOUSEPM software website. Enter required data in web-based software site to fully identify submittal.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 - 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow 14 calendar days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Resubmittal Review: Allow 14 calendar days for review of each resubmittal.
- D. Resubmittals: Make resubmittals in same form as initial submittal.
- E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- F. Use for Construction: Retain complete copies of submittals on Project construction site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.7 SUBMITTAL REQUIREMENTS

- A. Submittal Cover Sheet: Each submittal shall utilize the Submittal Cover Sheet form provided in Section 01 3301 "Submittal Cover Sheet". Submittals without a cover sheet will be returned without review.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.

- b. Manufacturer's product specifications.
 - c. Standard color charts (physical color charts and color samples are required, copies of color charts are not acceptable).
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams that show factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 - 5. Submit Product Data before Shop Drawings, and 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 unless submittal based on Architect's digital data drawing files is otherwise permitted.
- 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
- D. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
- 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Product name and name of manufacturer.
 - c. Number and title of applicable 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 one full set 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 two sets of Samples, unless other quantity is specified in individual sections. Architect will retain one Sample set; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
- F. Qualification Data: As required in individual specification sections, prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- G. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- H. Certificates: Submit as required by individual sections
 1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.

2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
 3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
 4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
 5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- I. Test and Research Reports: as required by individual sections:
1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
 2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
 3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
 4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
 5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

1.8 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
- C. Delegated Design certification shall be made by a licensed professional in good standing in the State or jurisdiction having authority where the specific project is located.

1.9 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Contractor's Approval: Indicate Contractor's approval for each submittal with indication in web-based Project software. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
 - 1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval stamp. Such submittals will be returned without review.
 - 2. Submittals without cover sheet (see section 01 3301 "Submittal Cover Sheet") will be returned without review.

1.10 ARCHITECT'S REVIEW

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 3300

SECTION 013330
STRUCTURAL SUBMITTALS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Structural submittals include shop drawings, design calculations, diagrams, illustrations, schedules, performance charts, nomenclature charts, samples, brochures and other data prepared by the Contractor or any subcontractor, manufacturer, supplier, fabricator, or distributor and which illustrate some portion of the Project.
- B. Submittals by the Contractor are not a part of the Contract Documents.

1.2 RELATED SECTIONS

- A. Section 01 33 00 - Submittals

1.3 SUBMITTAL PROCEDURES

- A. Prior to the initial submittal, Contractor shall submit to the Design Professional a completed Submittal Information and Schedules form given in Appendix I.
- B. Submittals shall be accompanied by a transmittal letter with the following information:
 - 1. Project name.
 - 2. Contractor's name.
 - 3. Date submitted.
 - 4. Description of items submitted; identify work and product by Specification Section.
 - 5. Number of drawings and other pertinent data.
- C. Provide blank space on each submittal for the Design Professional's review stamp.
- D. The type and number of submittals for each item shall be in accordance with Section 013000.
- E. Contractor shall direct specific attention on the submittal to any deviation from the Contract Documents.

1.4 CONTRACTOR RESPONSIBILITY

- A. Contractor shall make all submittals in advance of installation or construction to allow the Design Professional sufficient time for review.
- B. Contractor shall stamp and sign each sheet of shop drawings and product data, and sign or initial each sample to certify compliance with requirements of Contract Documents. SUBMITTALS RECEIVED WITHOUT THE CONTRACTOR'S STAMP OF REVIEW WILL BE RETURNED TO THE CONTRACTOR FOR REVIEW AND RESUBMITTAL.
- C. Contractor shall understand that the submittal of the required documents does not constitute compliance with the requirements of the Contract Documents; only submittals reviewed by the Design Professional constitute compliance.
- D. It is the Contractor's responsibility to furnish equipment, materials, and labor for the Project which meets the requirements of the codes and authorities quoted as well as the Contract Documents. Proprietary items specified herein only establish a minimum functional and aesthetic standard and it is incumbent upon the Contractor to ascertain conformance of these proprietary items or any proposed substitution with the codes and authorities.
- E. By reviewing, approving and submitting shop drawings, product data, or samples, Contractor thereby represents that he has determined and verified all field measurements, field construction criteria, materials, member sizes catalog numbers, and similar data and that he has checked and coordinated shop drawings with the requirements of the Project and of the Contract Documents.
- F. Work requiring shop drawings, whether called for by the Contract Documents or requested by the Contractor, shall not commence until the submission has been reviewed by the Design Professional. Work may commence if the Contractor verifies the accuracy of the Design Professional's corrections and notations and complies with them without exception and without requesting change in Contract Sum or Contract Time.

1.5 DESIGN PROFESSIONAL REVIEW

- A. Design Professional will review submittals with reasonable promptness.

- B. Design Professional's review or corrections refer only to the general arrangement and conformance of the subject of the submittals with the design concept of the project and with the information given in the Contract Documents. Under no conditions should the Contractor consider the review to include the dimensions, quantities, and details of the items nor the approval of an assembly in which the item functions.
 - C. Design Professional's review shall not relieve the Contractor from responsibility for errors or omissions in the submittals.
 - D. Design Professional's review of submittals shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents unless the Contractor has directed specific attention to the deviation at the time of submission and the Design Professional has given written approval to the specific deviation.
 - E. Design Professional's review of submittals shall not be construed as authorizing any change in the Contract Sum or Contract Time.
- 1.6 SHOP DRAWINGS
- A. Present in a clear and thorough manner. Title each drawing with Project name and number; identify each element of drawings by reference to sheet number and detail of Contract Documents.
 - B. Reproduction of Structural Drawings for shop drawings is not permitted. Electronic drawing files will not be provided to the Contractor.
 - C. Identify field dimensions; show relationship to adjacent or critical features of Work or products.
 - D. A copy of the marked structural shop drawings with the Design Professional's review stamp is to be maintained at the job site.
- 1.7 PRODUCT DATA
- A. Submit only pages which are pertinent; mark each copy of standard printed data to identify pertinent products, referenced to Specification Section and Article number. Show reference standards, performance characteristics, and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions; and required clearances.
 - B. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information which is not applicable.
 - C. Provide manufacturer's preparation, assembly, and installation instructions.
- 1.8 SAMPLES
- A. Submit full range of manufacturer's standard finishes except where more restrictive requirements are specified, indicating colors, textures, and patterns.
 - B. Submit samples to illustrate functional characteristics of products, including parts and attachments as required by Design Professional.
 - C. Approved samples which are of proper size may be incorporated in Work.
 - D. Label each sample with identification.
 - E. Field Finishes: Provide full samples at Project, at location acceptable to Design Professional, as required by individual Specification Section. Install each sample complete and finished. Acceptable finishes in place may be retained in completed work.
- 1.9 RESUBMITTALS
- A. When submittals are returned to the Contractor with the Design Professional's corrections the Contractor shall make the required corrections. Upon request, resubmit one corrected set.
 - B. Contractor shall direct specific attention on the resubmittal to all revisions including those requested by the Design Professional on previous submission.
- 1.10 DISTRIBUTION
- A. Distribute reproductions of shop drawings, copies of product data, and samples which bear the Design Professional's review stamp to job site file, Record Documents file, subcontractors, suppliers, other affected contractors, and other entities requiring information.
 - B. Work shall be in accordance with and performed from the reviewed drawings.

FANNIN COUNTY REC CENTER – PHASE 1
BLUE RIDGE, GA
PRAXIS3-24184

01 3330-3
STRUCTURAL SUBMITTALS
MAY 22, 2026

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

APPENDIX I
SUBMITTAL INFORMATION AND SCHEDULES

PROJECT _____
CONTRACTOR _____
CONTRACTOR'S ADDRESS _____
PROJ. MANAGER _____
PHONE _____
FAX _____
SUPERINTENDENT _____
PHONE _____
FAX _____
MOBILIZATION DATE _____

PROJECTED SUBMITTAL DATES

FOUNDATION, CONCRETE & REINFORCING		STRUCTURAL STEEL		MASONRY	
SUBMITTAL	DATE	SUBMITTAL	DATE	SUBMITTAL	DATE
Site Preparation & Equipment Information		Pre-Engineered Metal Building			
Concrete Mix Design					
Foundation Reinforcing					
				WOOD	DATE
				Trusses	

REMARKS: _____

COMPLETED BY _____ DATE _____

FANNIN COUNTY REC CENTER – PHASE 1
BLUE RIDGE, GA
PRAXIS3-24184

01 3330-5
STRUCTURAL SUBMITTALS
MAY 22, 2026

END OF APPENDIX I

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 2. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner or authorities having jurisdiction are not limited by provisions of this Section.

1.2 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- D. Mockups: Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
 - 1. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as freestanding temporary built elements or as part of permanent construction, consisting of multiple products, assemblies, and subassemblies.

2. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes; doors; windows; millwork; casework; specialties; furnishings and equipment; and lighting.
- E. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Tests: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.
- G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- H. 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.
- I. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.3 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents including the Specifications, provide products and systems complying with specific performance and design criteria indicated. Delegated Design certification shall be made by a licensed professional in good standing in the State or jurisdiction having authority where the specific project is located.

1.4 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements are specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for direction 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.

1.5 ACTION SUBMITTALS

- A. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.6 INFORMATIONAL SUBMITTALS

- A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
 - 2. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

1.7 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, telephone number, and email address of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspection.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
 - 1. Statement on condition of substrates and their acceptability for installation of product.
 - 2. Statement that products at Project site comply with requirements.
 - 3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.

4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 5. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Statement that equipment complies with requirements.
 2. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 3. Other required items indicated in individual Specification Sections.

1.8 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

- I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 1. Build mockups of size indicated.
 2. Build mockups in location indicated or, if not indicated, as directed by Architect.
 3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 4. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed to perform same tasks during the construction at Project.
 5. Demonstrate the proposed range of aesthetic effects and workmanship.
 6. Obtain Architect's approval of mockups before starting corresponding work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup for projects within 2 hours driving distance of Atlanta, Georgia, 14 days if more than 2 hours driving distance.
 7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 8. Demolish and remove mockups when directed unless otherwise indicated.

1.9 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
 1. Engage a qualified testing agency to perform 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 inspection 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 inspection 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.

- 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. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 3300 "Submittal Procedures."
- E. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.10 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in the Statement of Special Inspections, and as follows:
 - 1. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 - 2. 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.
 - 3. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 - 4. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 - 5. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to Architect.
 - 4. Identification of testing agency or special inspector conducting test or inspection.

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

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

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 7300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 4000

SECTION 014525
STRUCTURAL TESTING/INSPECTION AGENCY SERVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Section summarizes the responsibility of the Contractor and the Structural Testing/Inspection Agency in the performance of the testing/inspection specified in the Contract Documents.
- B. Neither the observation of the Design Professional in the administration of the contract, nor tests/inspections by the Testing/Inspection Agency, nor approvals by persons other than the Design Professional shall relieve the Contractor from his obligation to perform the work in accordance with the Contract Documents.

1.2 RELATED SECTIONS

- A. Section 013330 - Structural Submittals.
- B. Section 014000 - Quality Control Services.

1.3 REFERENCES

- A. ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- B. ASTM E329 - Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.
- C. American Council of Independent Laboratories - Recommended Requirements for Independent Laboratories Qualifications.

1.4 SELECTION AND PAYMENT

- A. Owner will employ and pay for the structural testing/inspection services that are required by the Contract Documents.
- B. Contractor shall pay for any additional structural testing/inspection required for work or materials not complying with Contract Documents due to negligence or nonconformance.
- C. Contractor shall pay for any additional structural testing/inspection required for his convenience.
- D. Qualifications: Minimum Special Inspector qualifications shall be per Table 1704.2 of 2022 Georgia State Amendments to the International Building Code (2018 Edition).

1.5 STRUCTURAL TESTING/INSPECTION REQUIREMENT SUMMARY

- A. Specific structural testing/inspection requirements are given in the following specification sections:

Specification 03 1000	-	Concrete Formwork Inspection
Specification 03 2000	-	Concrete Reinforcement Inspection
Specification 03 3000	-	Concrete Testing/Inspection
Specification 05 1000	-	Structural Steel Inspection
Specification 31 2301	-	Excavating, Backfilling, and Compacting For Structures

1.6 STATEMENT OF SPECIAL INSPECTIONS

- A. Provide testing/inspection required to meet the provisions of the Schedule of Special Inspection Services below.

PART 2 - MATERIALS

Not Used.

PART 3 - EXECUTION

3.1 STRUCTURAL PRECONSTRUCTION MEETING

- A. A structural preconstruction meeting may be conducted at the construction site by the Design Professional to discuss quality issues. The parties involved may be the Design Professional, Contractor, Structural Testing/Inspection Agency, appropriate subcontractors, suppliers, and detailers.

3.2 STRUCTURAL TESTING/INSPECTION AGENCY'S RESPONSIBILITIES

- A. Cooperate with the Contractor and provide timely service.
- B. Upon arriving at the construction site, sign in and notify the Contractor of presence.
- C. Select the representative samples that are to be tested/ inspected.
- D. Perform tests/ inspections as outlined in Contract Documents, the applicable codes, and as directed by the Design Professional.
- E. Report work and materials not complying with Contract Documents immediately to the Contractor and Design Professional.
- F. Leave copies of field notes with the Contractor prior to leaving the construction site. Field notes shall include the message given to the Contractor, date, time of message, name of Contractor's representative informed, type and location of work or materials tested/inspected, whether the work or materials complies with Contract Documents and name of the Structural Testing/Inspection Agency's representative.
- G. Report and distribute results of tests/inspections promptly in the form of written reports as directed by the Design Professional.
- H. Structural Testing/Inspection Agency shall not alter requirements of Contract Documents, approve or reject any portion of the work, or perform duties of the Contractor.

3.3 CONTRACTOR'S RESPONSIBILITIES

- A. Provide copy of Contract Documents to the Structural Testing/Inspection Agency.
- B. Arrange the preconstruction meeting to discuss quality issues.
- C. Notify the Structural Testing/Inspection Agency sufficiently in advance of operations to allow assignment of personnel and scheduling of tests.
- D. Cooperate with Structural Testing/Inspection Agency and provide access to work.
- E. Provide samples of materials to be tested in required quantities.
- F. Furnish copies of mill test reports when requested.
- G. Provide storage space for Structural Testing/Inspection Agency's exclusive use, such as for storing and curing concrete testing samples.
- H. Provide labor to assist the Structural Testing/Inspection Agency in performing tests/inspections.

3.4 OPTIONS

- A. If the Structural Testing/Inspection Agency is located at such a distance from the project that travel expenses will be a consideration, or if the amount of sampling performed is minor, and by mutual agreement of the Design Professional and Contractor, the Contractor may be requested to take samples and forward them to the Structural Testing/Inspection Agency for testing/inspection.

END OF SECTION

SECTION 01 5000

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 USE CHARGES

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

1.3 INFORMATIONAL SUBMITTALS

- A. Prior to commence of the work submit the following for approval:
 - 1. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
 - 2. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
 - 3. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
 - 4. Moisture-and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold.
 - 5. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation.
 - 6. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the Owner.

1.4 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.

PART 2 - PRODUCTS

2.1 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 Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. 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 no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack and marker boards.
 - 3. Drinking water and private toilet.
 - 4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
 - 5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
 - 6. Internet Access: Wireless.
 - 7. Printer.

2.2 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 qualified testing agency acceptable to authorities having jurisdiction and marked for intended location and application.
 - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 01 7700 "Closeout Procedures."
- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
- C. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
 - 1. Prior to commencing work, isolate the HVAC system in area where work is to be performed.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area, using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 - 2. Maintain dust partitions during the Work. Isolate limited work within occupied areas using portable dust-containment devices.
 - 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. Temporary 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.
 - 1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - 1. Install electric power service underground unless otherwise indicated.
- 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.
- H. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install WiFi cell phone access equipment and one land-based telephone line(s) for each field office.

3.4 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 - 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
 - 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.
 - 1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- D. Parking: Provide temporary parking areas for construction personnel.

- E. Project Signs: Unauthorized signs are not permitted.
 - 1. Provide project identification sign if indicated on Drawings.
 - 2. Erect on site at location established by Architect.
 - 3. No other signs are allowed without Owner permission except those required by law.
- F. Waste Disposal Facilities: Comply with requirements specified in Section 01 7419 "Construction Waste Management and Disposal."
- G. 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.
- H. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- I. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
 - 1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Provide Erosion and Sedimentation Control measures as indicated in the Contract Documents.
- C. Tree Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- D. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- E. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- F. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

- G. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed, and permanent enclosure is incomplete, insulate temporary enclosures.
 - a. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.
- H. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 - 1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
 - 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.

3.6 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
 - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
 - 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
 - 3. Indicate methods to be used to avoid trapping water in finished work.
- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 - 1. Protect porous materials from water damage.
 - 2. Protect stored and installed material from flowing or standing water.
 - 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 - 4. Remove standing water from decks.
 - 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 2. Keep interior spaces reasonably clean and protected from water damage.
 3. Periodically collect and remove waste containing cellulose or other organic matter.
 4. Discard or replace water-damaged material.
 5. Do not install material that is wet.
 6. Discard and replace stored or installed material that begins to grow mold.
 7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

3.7 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 7700 "Closeout Procedures."

END OF SECTION 01 5000

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 01 1000 "Summary" for information regarding Owner-Furnished products.
 - 2. Section 01 2500 "Substitution Procedures" for requests for substitutions.
 - 3. Section 01 7700 "Closeout Procedures" for submitting warranties.

1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved by Architect through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.
- C. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

1.3 ACTION SUBMITTALS

- A. As indicated in Section 01 3300 "Submittal Requirements".

1.4 QUALITY ASSURANCE

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

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
 - 1. 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. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 - 5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 - 6. Protect stored products from damage and liquids from freezing.

1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.

3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 6. DO NOT USE products having any of the following characteristics:
 - a. Made using or containing CFC's or HCFC's.
 - b. Made of wood from newly cut old growth timber.
 7. Where all other criteria are met, contractor shall give preference to products that:
 - a. Are extracted, harvested, and/or manufactured closer to the location of the project.
 - b. Have longer documented life span under normal use.
 - c. Results in less construction waste.
 - d. Are made of vegetable materials that are rapidly renewable.
 - e. Have a published GreenScreen Chemical Hazard Analysis.
 8. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
 1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole product may be indicated by the phrase: "Subject to compliance with requirements, provide the following: ..."
 2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

- a. Sole manufacturer/source may be indicated by the phrase: "Subject to compliance with requirements, provide products by the following: ..."
 3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
 - a. Limited list of products may be indicated by the phrase: "Subject to compliance with requirements, provide one of the following: ..."
 4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, which complies with requirements.
 - a. Non-limited list of products is indicated by the phrase: "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following: ..."
 5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
 - a. Limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, provide products by one of the following: ..."
 6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, which complies with requirements.
 - a. Non-limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following: ..."
 7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
 - a. For approval of products by unnamed manufacturers, comply with requirements in Section 01 2500 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 2500 "Substitution Procedures" for proposal of product.

- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
- E. Sustainable Product Selection: Where Specifications require product to meet sustainable product characteristics, select products complying with indicated requirements. Comply with requirements in Division 01 sustainability requirements Section and individual Specification Sections.
 - 1. Select products for which sustainable design documentation submittals are available from manufacturer.

2.2 COMPARABLE PRODUCTS

- A. Comparable Products must meet the requirements of 01 2500 "Substitution Procedures".

2.3 OWNER-FURNISHED, OWNER-INSTALLED (OFOI) PRODUCTS

A. Owner's Responsibilities:

- 1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
- 2. Arrange and pay for product delivery to site.
- 3. On delivery, inspect products jointly with Contractor.
- 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
- 5. Arrange for manufacturers' warranties, inspections, and service.
- 6. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
- 7. Handle, store, install and finish products.
- 8. Repair or replace items damaged after receipt.

B. Contractor's Responsibilities:

- 1. Make space available and coordinate appropriate time in schedule for Owner or Owner's forces to install.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 6000

SECTION 01 7300

EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
- B. Related Requirements:
 - 1. Section 01 1000 "Summary" for coordination of Owner-furnished products, Owner-performed work, and limits on use of Project site.
 - 2. Section 01 3300 "Submittal Procedures" for submitting surveys.
 - 3. Section 01 7700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.

1.2 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 INFORMATIONAL SUBMITTALS

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

1.4 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Professional Engineer Qualifications: Refer to Section 014000 "Quality Requirements."

- C. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 - 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
 - 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
 - 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services; and other utilities.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. 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 caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 01 3100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

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

- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
- B. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Where possible, select tools or equipment that minimize production of excessive noise levels.

- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Remove and replace damaged, defective, or non-conforming Work.

3.6 OWNER-FURNISHED, OWNER-INSTALLED (OFOI) PRODUCTS

- A. Per 01 6000 PRODUCT REQUIREMENTS, Make space available and coordinate appropriate time in schedule for Owner or Owner's forces to install.

3.7 CUTTING AND PATCHING

- B. Cutting and Patching, 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.
- C. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- D. Temporary Support: Provide temporary support of work to be cut.
- E. 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.
- F. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 01 1000 "Summary."

- G. 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 minimize or prevent interruption to occupied areas.
- H. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete 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 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.
 - 7. Use of explosives is not permitted.
- I. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 - 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- J. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 - B. Site: Maintain Project site free of waste materials and debris.
 - C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
 - D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
 - E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
 - F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
 - G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 7419 "Construction Waste Management and Disposal."
 - H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
 - I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
 - J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.
- 3.8 STARTING AND ADJUSTING
- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
 - B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Section 01 4000 "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- C. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 01 7300

SECTION 01 7419

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. Construction Waste Management Goal: Divert at least 75% of construction waste to uses other than landfill disposal.

1.2 DEFINITIONS

- A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.
- C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 14 days of date established for the Notice of Award.

1.4 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:
 - 1. Material category.
 - 2. Total quantity of waste in tons.
 - 3. Quantity of waste salvaged, both estimated and actual in tons.
 - 4. Quantity of waste recycled, both estimated and actual in tons.

5. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.5 QUALITY ASSURANCE

- A. Waste Management Conference: Conduct conference at Project site to comply with requirements of this Section.

1.6 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.

6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
 1. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
 2. Comply with Section 01 5000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 4. Store components off the ground and protect from the weather.

5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

3.3 RECYCLING DEMOLITION WASTE

- A. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.
- B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
 1. Pulverize concrete to maximum 4-inch size.
- C. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- D. Metals: Separate metals by type if required by recycling vendor.
 1. Structural Steel: Stack members according to size, type of member, and length.
 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

3.4 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 2. Polystyrene Packaging: Separate and bag materials.
 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.
- D. Paint: Seal containers and store by type.

3.5 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 1. 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.

FANNIN COUNTY REC CENTER – PHASE I
BLUE RIDGE, GA
PRAXIS3-24184

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B. Burning: Do not burn waste materials.

END OF SECTION 01 7419

SECTION 01 7700
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.
- B. Related Requirements:
 - 1. Section 01 2900 "Payment Procedures" for final Application for Payment.
 - 2. Section 01 7823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
 - 3. Section 01 7839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 4. Section 01 7900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.2 ACTION SUBMITTALS

- A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- B. Certified List of Incomplete Items: Final submittal at final completion.

1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.4 SUBSTANTIAL COMPLETION PROCEDURES

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

- B. Submittals Prior to Substantial Completion: Complete the following a minimum of seven days prior to requesting inspection for determining date of Substantial Completion. Submit closeout submittals a maximum of 21 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
 5. Submit testing, adjusting, and balancing records.
 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of seven days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 7900 "Demonstration and Training."
 6. Advise Owner of changeover in utility services.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements.
 10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of seven days prior to date the Work will be completed and ready for final inspection and tests. 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.

1.5 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 01 2900 requirements of the Contract.

2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1.6 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
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. Submit list of incomplete items in the following format:
 - a. Web-based project software upload. Utilize software feature for creating and updating list of incomplete items (punch list).

1.7 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
1. Submit by uploading to web-based project software site.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. 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.
 - c. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - d. Sweep concrete floors broom clean in unoccupied spaces.
 - e. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - f. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - g. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - h. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - i. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 01 5000 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in Section 01 7419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations, before requesting inspection for determination of Substantial Completion.
- B. Repair, or remove and replace, defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

END OF SECTION 01 7700

SECTION 01 7823

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory manuals.
 - 2. Emergency manuals.
 - 3. Systems and equipment operation manuals.
 - 4. Systems and equipment maintenance manuals.
 - 5. Product maintenance manuals.

1.2 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operation and maintenance manuals in the following format:
 - 1. Submit by uploading to web-based project software site. Enable reviewer comments on draft submittals.
- C. Final Manual Submittal: Submit each manual in final form a maximum of 21 days prior to requesting inspection for Substantial Completion and at least 14 days before commencing demonstration and training. Architect will return copy with comments.
 - 1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 14 days of receipt of Architect's comments and prior to commencing demonstration and training.
- D. Comply with Section 01 7700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.3 FORMAT OF OPERATION AND MAINTENANCE MANUALS

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

1.4 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
 2. Table of contents.
 3. Manual contents.
- B. Title Page: Include the following information:
1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name and contact information for Contractor.
 6. Name and contact information for Architect.
 7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 8. 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.
- 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."

1.5 EMERGENCY MANUALS

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

- B. Content: Organize manual into a separate section for each of the following:
 - 1. Type of emergency.
 - 2. Emergency instructions.
 - 3. Emergency procedures.
- C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 - 1. Fire.
 - 2. Flood.
 - 3. Gas leak.
 - 4. Water leak.
 - 5. Power failure.
 - 6. Water outage.
 - 7. System, subsystem, or equipment failure.
 - 8. Chemical release or spill.
- D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- E. Emergency Procedures: Include the following, as applicable:
 - 1. Instructions on stopping.
 - 2. Shutdown instructions for each type of emergency.
 - 3. Operating instructions for conditions outside normal operating limits.
 - 4. Required sequences for electric or electronic systems.
 - 5. Special operating instructions and procedures.
 - 6. Emergency Procedures on video when available.

1.6 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
- B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 - 2. Performance and design criteria if Contractor has delegated design responsibility.
 - 3. Operating standards.
 - 4. Operating procedures.
 - 5. Operating logs.
 - 6. Wiring diagrams.
 - 7. Control diagrams.
 - 8. Piped system diagrams.

9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

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

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

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

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

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

1.7 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
- B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds, as described below.
- C. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
 1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the

Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

- a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. 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.
- H. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1.8 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Product Information: Include the following, as applicable:

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

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

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

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 7823

SECTION 01 7839
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data and Shop Drawings
- B. Related Requirements:
 - 1. Section 01 7823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

- A. Submit all closeout submittals a maximum of 21 days prior to requesting inspection for determining date of Substantial Completion.
- B. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set of marked-up record prints.
- C. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- D. Record Product Data and Shop Drawings: Submit annotated PDF electronic files and directories of each submittal.

1.3 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
 - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

- b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding photographic documentation.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
 1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
 2. Refer instances of uncertainty to Architect for resolution.
- C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
 1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets. Scan in color for Owner PDF files.
 2. Format: Annotated PDF electronic file with comment function enabled.
 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 4. Identification: As follows:

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

1.4 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
- B. Format: Submit record Specifications as annotated PDF electronic file.

1.5 RECORD PRODUCT DATA AND SHOP DRAWINGS

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Preparation: Mark Product Data and Shop Drawings to indicate the actual product installation where installation varies substantially from that indicated in Product Data and/or Shop Drawings 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.
- C. Format: Submit record Product Data and Shop Drawings as annotated PDF electronic file.
 - 1. Include record Product Data and Shop Drawings directory organized by Specification Section number and title, electronically linked to each item of record Product Data and Shop Drawings.

1.6 MAINTENANCE OF RECORD DOCUMENTS

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

FANNIN COUNTY REC CENTER – PHASE I
BLUE RIDGE, GA
PRAXIS3-24184

01 7839-4
PROJECT RECORD DOCUMENTS
MAY 22, 2026

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 7839

SECTION 01 7900
DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Instruction in operation and maintenance of systems, subsystems, and equipment.
 - 2. Demonstration and training video recordings.

1.2 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

1.3 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
 - 1. At completion of training, submit complete training manual(s) for Owner's use prepared in same PDF file format required for operation and maintenance manuals specified in Section 01 7823 "Operation and Maintenance Data."

1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 4000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Instruction Conference: Conduct conference at Project site.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.6 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Systems and equipment operation manuals.
 - c. Systems and equipment maintenance manuals.
 - d. Product maintenance manuals.
 - e. Project Record Documents.
 - f. Identification systems.
 - g. Warranties and bonds.
 - h. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.

- e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
- a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
- a. Diagnostic instructions.
 - b. Test and inspection procedures.
7. Maintenance: Include the following:
- a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning.
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
8. Repairs: Include the following:
- a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

1.7 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 7823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

1.8 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner, through Architect, with at least seven days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- F. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.9 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
 - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode with vibration reduction technology.
 - 1. Submit video recordings on CD-ROM or thumb drive or by uploading to web-based Project software site.

- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
- D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
- E. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 01 7900

SECTION 03 0505
UNDERSLAB VAPOR RETARDERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sheet Vapor Retarders under concrete slabs on grade.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 Sheet Vapor Retarder

A. Manufacturer's Proprietary Vapor Retarders: ASTM E-1745, 15 mil thick sheet, with maximum permeance rating of 0.1 perm.

1. Products: Subject to compliance with requirements, provide one of the following products:

- a. Fortifiber Corporation; Moistop Ultra 15.
- b. Stego Industries, LLC; Stego Wrap, 15 mil.
- c. W.R. Grace Construction Products; FlorPrufe 120.
- d. W.R. Meadows, Inc., PERMINATOR Underslab Vapor Mat 15.

2. Accessory Products: Vapor Retarder Manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetration in vapor retarder installation.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to vapor retarders, including removing projections capable of puncturing vapor retarders.

3.2 INSTALLATION OF VAPOR RETARDERS

- A. Install vapor retarders over prepared grade. Lap joints a minimum of 6 inches and seal with manufacturers recommended tape.
- B. Extend vapor retarder over footings and seal to foundation wall or grade beam with manufacturer's recommended tape.
 - 1. Extend vapor retarder vertically minimum 24 inches above top of footing where possible or as indicated on the drawings.
- C. Seal around penetrations such as utilities and columns in order to create a monolithic, airtight membrane at grade surface, perimeter, and all vertical penetrations.

3.3 PROTECTION

- A. Protect vapor retarders from damage until concealed by permanent construction.

END OF SECTION 03 0505

SECTION 031000
CONCRETE FORMWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Section includes the design and erection of formwork, shoring and reshoring for cast-in-place concrete and accessories.

1.2 RELATED SECTIONS

- A. Section 013330 - Structural Submittals.
- B. Section 032000 - Concrete Reinforcement.
- C. Section 033000 - Cast-in-Place Concrete.

1.3 REFERENCES

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
- B. ACI 301 - Standard Specifications for Structural Concrete.
- C. ACI 318 - Building Code Requirements for Structural Concrete.
- D. ACI 347 - Guide to Formwork for Concrete.
- E. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- F. ASTM E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

1.4 SUBMITTALS

- A. Product Data: For each of the following:
 - 1. Exposed surface form-facing material.
 - 2. Concealed surface form-facing material.
 - 3. Pan-type forms.
 - 4. Void forms.
 - 5. Form liners.
 - 6. Form ties.
 - 7. Isolation joint filler.
 - 8. Inserts.
 - 9. Form-release agent.
- B. Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly and support of forms.
 - 1. For exposed vertical concrete walls, indicate dimensions and form tie locations.
 - 2. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301.
 - a. Location of construction joints is subject to approval of the Architect.
 - 3. Indicate location of waterstops.
 - 4. Indicate form liner layout and form line termination details.
 - 5. Indicate proposed schedule and sequence of stripping of forms, shoring removal and reshoring installation and removal.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Concrete Formwork: Design, engineer, erect, shore and brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.
 - 1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
 - 2. Design formwork to limit deflection of form-facing material to $l/360$ of center-to-center spacing of supports

2.2 FORM-FACING MATERIALS

- A. As-Cast Surface Form-Facing Material:
 - 1. Provide continuous, true, and smooth concrete surfaces.
 - 2. Furnish in largest practicable sizes to minimize number of joints.
 - 3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete, and as follows:
 - a. Plywood, metal, or other approved panel materials.
 - b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - 1) APA HDO (high-density overlay).
 - 2) APA MDO (medium-density overlay); mill-release agent treated and edge sealed.
 - 3) APA Structural 1 Plyform, B-B or better; mill oiled and edge sealed.
 - 4) APA Plyform Class I, B-B or better; mill oiled and edge sealed.
 - B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.
 - 1. Provide lumber dressed on at least two edges and one side for tight fit.
 - C. Forms for Circular Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class.
 - 1. Provide forms with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
 - D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation, with straight end forms.
 - E. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
- 2.3 FORMWORK ACCESSORIES
- A. Formwork accessories that are embedded in concrete, including ties and hangers, shall be commercially manufactured products. Do not use nonfabricated wire form ties.
- 2.4 FORM RELEASE AGENT
- A. Form release agent shall not bond with, stain, nor adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
 - 2. Form release agent for form liners shall be acceptable to form liner manufacturer.
- 2.5 FORM TIES
- A. Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.
- 2.6 VAPOR BARRIER
- A. Vapor barrier shall consist of polyethylene sheet. See Architect for thickness.
- 2.7 ISOLATION JOINT FILLER
- A. Asphalt impregnated premolded fiberboard isolation joint filler shall conform with ASTM D1751 and be 1/2-inch thick by full thickness of slab or joint, unless indicated otherwise on the Drawings.
- 2.8 CONSTRUCTION JOINTS
- A. Provide key type steel forms by Vulcan screed joints, Burke Keyed Kold joint form or Form-A-Key.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

- A. Comply with ACI 301.
- B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes
- C. Limit concrete surface irregularities as follows:
 - 1. Surface Finish-1.0: ACI 117 Class C, 1/2 inch (12 mm).
 - a. To be used on concrete surfaces not exposed to view.
 - 2. Surface Finish-2.0: ACI 117 Class B, 1/4 inch (6 mm).
 - a. To be used on concrete surfaces exposed to view.
- D. Construct forms tight enough to prevent loss of concrete mortar.
 - 1. Minimize joints.
 - 2. Exposed Concrete: Symmetrically align joints in forms.
- E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.
 - 1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
 - 2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 3. Install keyways, reglets, recesses, and other accessories, for easy removal.
- F. Do not use rust-stained, steel, form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.
 - 1. Provide and secure units to support screed strips
 - 2. Use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.
 - 1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
 - 2. Locate temporary openings in forms at inconspicuous locations.
- I. Chamfer exterior corners and edges of permanently exposed concrete. Provide 3/4-inch chamfer at all corners.
- J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.
- K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.
 - 1. Determine sizes and locations from trades providing such items.
 - 2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.
- L. Construction and Movement Joints:
 - 1. Construct joints true to line with faces perpendicular to surface plane of concrete.
 - 2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Design Professional.
 - 3. Place joints perpendicular to main reinforcement.
 - 4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.
 - a. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 6. Space vertical joints in walls per Specification 033000 Cast-In-Place Concrete.
 - a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 7. Provide construction joints in accordance with ACI 318.

8. Provide 1 1/2-inch-deep key type construction joints at end of each placement for slabs, beams, walls, and footings. Bevel forms for easy removal.
 9. Remove loose particles and latency from surface prior to placing the next lift. Chip the surface to a depth sufficient to expose sound concrete.
 - M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.
 1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
 2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.
 - N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
 - O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
 - P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement. Do not allow excess form release agent to accumulate in forms or come in contact with concrete surfaces against which fresh concrete will be placed.
- 3.2 CAMBER
- A. Camber formwork for slabs and beams to compensate for anticipated deflections in formwork prior to hardening of concrete to maintain tolerances specified by ACI 117.
 - B. Set screeds to a like camber to maintain specified concrete thickness.
- 3.3 FOUNDATION ELEMENTS
- A. Form foundation elements if soil or other conditions are such that earth trench forms are unsuitable.
 - B. Maintain minimum coverage of reinforcing steel as indicated on Structural Drawings.
- 3.4 INSTALLATION OF WATERSTOPS
- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm.
 1. Install in longest lengths practicable.
 2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
 3. Allow clearance between waterstop and reinforcing steel of not less than 2 times the largest concrete aggregate size specified in Section 033000 "Cast-In-Place Concrete."
 4. Secure waterstops in correct position at 12 inches (305 mm) on center.
 5. Field fabricate joints in accordance with manufacturer's instructions using heat welding.
 - a. Miter corners, intersections, and directional changes in waterstops.
 - b. Align center bulbs.
 6. Clean waterstops immediately prior to placement of concrete.
 7. Support and protect exposed waterstops during progress of the Work.
 - B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated on Drawings, according to manufacturer's written instructions, by adhesive bonding, mechanically fastening, and firmly pressing into place.
 1. Install in longest lengths practicable.
 2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
 3. Protect exposed waterstops during progress of the Work.
- 3.5 INSTALLATION OF EMBEDDED ITEMS
- A. Set and secure embedded plates, bearing plates, and anchor bolts in accordance with approved setting drawings and in such a manner to prevent displacement during placement of concrete.
 - B. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

- C. Install and secure in position required inserts, hangers, sleeves, anchors, and nailers.
- D. Install continuous vertical dovetail anchoring slots with filler strips at intersections of concrete and masonry walls unless indicated otherwise by the Drawings.
- E. Clean embedded items immediately prior to concrete placement.
- 3.6 VAPOR BARRIER
 - A. Where indicated on Drawings, place vapor barrier over sewer, piping, and granular subbase, but below conduits and ducts, and behind insulation and expansion joints at sidewalls.
 - B. Lap vapor barrier six inches minimum at splices.
 - C. Do not puncture vapor barrier.
- 3.7 REMOVING AND REUSING FORMS
 - A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
 - B. Clean and repair surfaces of forms to be reused in the Work.
 - 1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
 - 2. Apply new form-release agent.
 - C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.
 - 1. Align and secure joints to avoid offsets.
 - 2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.
- 3.8 SHORING AND RESHORING INSTALLATION
 - A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
 - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
 - B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
 - C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.
- 3.9 FIELD QUALITY CONTROL
 - A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
 - B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
 - C. Inspections:
 - 1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.
 - 2. Inspect insulating concrete forms for shape, location, and dimensions of the concrete member being formed.

END OF SECTION

SECTION 032000
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Section 013330 - Structural Submittals.
- B. Section 014525 - Structural Testing/Inspection Agency Services.
- C. Section 031000 – Concrete Formwork
- D. Section 033000 – Cast-In-Place Concrete.

1.2 REFERENCES

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
- B. ACI 301 - Standard Specifications for Structural Concrete.
- C. ACI 318- Building Code Requirements for Structural Concrete.
- D. ASTM A1064- Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete Reinforcement.
- E. ASTM A615- Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- F. ASTM A706- Standard Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement.
- G. AWS D1.4- Structural Weld Code - Reinforcing Steel.
- H. CRSI - Manual of Practice, and Documents 63 and 65.

1.3 SUBMITTALS

- A. Shop drawings:
 - 1. Notify Design Professional prior to detailing reinforcing steel shop drawings.
 - 2. Include placing drawings that detail fabrication, bending, and placement. Provide elevations of all wall reinforcement.
 - 3. Include locations of proposed construction joints for approval by EOR. Contractor to submit sequence of placing concrete.
 - 4. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement. Reinforcement detailing of standard hooks, splices and development lengths shall conform to ACI 318 unless noted otherwise on drawings.
 - 5. Include proposed field bending or cutting locations and cutting methods for approval by EOR.
 - 6. Written description of reinforcement without adequate sections, elevations, and details is not acceptable.
 - 7. All revisions to shop drawings shall be clouded.
 - 8. Reproduction of Structural Drawings for shop drawings is not permitted. Electronic drawing files will not be provided to the Contractor.
- B. Submit a certification from each manufacturer or supplier stating that materials meet the requirements of the ASTM and ACI standards referenced.
- C. Submit mill test reports
- D. Submit manufacturer's data for tensile and compressive splicers.
- E. Submit manufacturer's data including installation recommendations for dowel adhesive.

1.4 QUALITY ASSURANCE

- A. Coordinate and schedule in a timely manner with the Structural Testing/Inspection Agency the following quality related items:
 - 1. Verify reinforcing steel for quantity, size, location, and support.
 - 2. Verify proper reinforcing steel concrete coverage.
 - 3. Inspect mechanical splice couplers and reinforcement welding.
- B. Structural Testing/Inspection Agency shall provide special inspections as required by Chapter 17 of the building code and as required by Specification 014525.

- C. The Structural Testing/Inspection Agency shall be qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1.5 STORAGE AND PROTECTING

- A. Store reinforcing steel above ground so that it remains clean. Maintain steel surfaces free from materials and coatings which might impair bond.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Deformed reinforcing steel shall conform to ASTM A615, refer to Structural Drawings for grade (Grade 60 minimum).
- B. Welded steel wire fabric shall conform to ASTM A1064.

2.2 ACCESSORY MATERIALS

- A. Annealed steel tie wire shall be 16-1/2 gage minimum.
- B. Bar supports shall be plastic-tipped steel Class I bar supports conforming to CRSI Specifications. Concrete brick may be used to support reinforcement to obtain proper clearance from earth.

2.3 SPLICERS

- A. Tensile splicers shall be capable of developing 125% of the reinforcing steel ASTM specified minimum yield strength.
- B. Compression splicers shall be the mechanical type such that the compression stress is transmitted by end bearing held in concentric contact.

2.4 DOWEL ADHESIVE

- A. Adhesive for reinforcing dowels in existing concrete shall conform to ASTM C881-13, Type IV, Grade 3, CLASS A, B, & C except gel times and epoxy content. Adhesive shall consist of a two component adhesive system contained in side by side packaging connected to a mixing nozzle which thoroughly mixes the components as it is injected into the hole. Adhesive shall have passed ICC Evaluation Services, Inc. Acceptance Criteria 308 for long term creep and be specifically approved for use in cracked concrete.

PART 3 - EXECUTION

3.1 FABRICATION

- A. Fabricate steel in accordance with ACI 318 and CRSI standards.
- B. Bend bars cold. Do not heat or flame cut bars. No field bending of bars partially embedded in concrete is permitted, unless specifically approved Design Professional and checked by Testing and Inspection Agency for cracks.
- C. Weld only as indicated. Perform welding in accordance with AWS D1.4.
- D. Tag reinforcing steel for easy identification.

3.2 INSTALLATION

- A. Before placing concrete, clean reinforcement of foreign particles and coatings.
- B. Place, support on chairs, and secure reinforcement against displacement in accordance with ACI 318 and CRSI standards. Do not deviate from alignment or measurement. Maximum support spacing shall not exceed 48 inches.
- C. Place concrete beam reinforcement support parallel to main reinforcement.
- D. Install welded-wire reinforcement in longest practicable lengths.
 - 1. Locate welded wire fabric in the top third of slabs unless otherwise noted in drawings. WWF shall be supported on chairs.
 - 2. Overlap mesh one lap plus two inches at side and end joints. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wires.
 - 3. Support spacing of welded wire reinforcement shall not exceed 24 inches, unless noted otherwise on plans.
- E. Furnish and install dowels or mechanical splices at intersections of walls, columns and piers to permit continuous reinforcement or development lengths at such intersections.
- F. Maintain cover and tolerances in accordance with ACI and CRSI Specifications, unless indicated otherwise on Structural Drawings.

- G. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
 - H. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
 - 3.3 INSTALLATION TOLERANCES
 - A. Comply with ACI 117 for installation tolerances.
 - 3.4 SPLICES
 - A. Do not splice reinforcement except as indicated on Structural Drawings.
 - B. Stagger splices in accordance with ACI 318.
 - C. Tension couplers may be used and installed in accordance with manufacturer's specifications.
 - 3.5 DOWELS IN EXISTING CONCRETE
 - A. Install dowels and dowel adhesive in accordance with manufacturer's recommendations.
 - B. Minimum embedment length shall be 12 bar diameters, unless noted otherwise.
- END OF SECTION

SECTION 033000
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Section includes cast-in-place concrete work indicated in the Contract Documents or otherwise required for proper completion of the work.

1.2 RELATED SECTIONS

- A. Section 013300 - Structural Submittals.
- B. Section 014525 - Structural Testing/Inspection Agency Services.
- C. Section 031000 - Concrete Formwork.
- D. Section 032000 - Concrete Reinforcement.

1.3 REFERENCES

- A. ACI 301 - Specifications for Structural Concrete for Buildings.
- B. ACI 318 - Building Code Requirements for Structural Concrete.
- C. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- D. ASTM C33 - Standard Specification for Concrete Aggregates.
- E. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- F. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
- G. ASTM C138 - Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.
- H. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.
- I. ASTM C150 - Standard Specification for Portland Cement.
- J. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
- K. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
- L. ASTM C230 - Standard Specification for Flow Table or Use in Tests of Hydraulic Cement.
- M. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
- N. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
- O. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
- P. ASTM C618 - Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
- Q. ASTM E1155 - Standard Test Method for Determining Floor Flatness and Levelness Using the F-Number System.
- R. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

1.4 NOTICE

- A. Notify Design Professional and Structural Testing/Inspection Agency not less than 48 hours prior to placing concrete.

1.5 QUALITY ASSURANCE

- A. Structural Testing/Inspection Agency shall perform the following quality related items:
 - 1. Examine concrete in truck to verify that concrete appears properly mixed.
 - 2. Perform a slump test as deemed necessary for each concrete load. Record if water or admixtures are added to the concrete at the job site. Perform additional slump tests after job site adjustments.
 - 3. Concrete testing: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu yd. plus one sample for each additional 100 cu. yd.
 - a. At a minimum, obtain 5 compressive strength tests for each concrete mixture per ACI 318.
 - 4. Per composite sample taken, mold four standard cured specimens per set for compressive strength testing. For each set molded, record:
 - a. Slump

- b. Air content
 - c. Unit weight
 - d. Temperature, ambient and concrete
 - e. Location of placement
 - f. Any pertinent information, such as addition of water, addition of admixtures, etc.
 - 5. .
 - 6. Report in writing, as directed by the Design Professional, on the same day that tests are performed. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing agency, concrete design compressive strength, location of concrete placement in structure, concrete mix proportions and materials, compressive breaking strength and type of break.
 - B. The ready-mixed concrete plant shall be certified for conformance with the requirements of the National Ready Mix Concrete Association.
 - C. Installer qualifications: Installer shall be experienced in placing concrete systems similar in complexity to this project as evidenced by 10 completed projects.
 - D. The Structural Testing / Inspection Agency shall provide special inspections as required by Chapter 17 of the building code as required in Specification 01 4525.
- 1.6 CONCRETE MIX DESIGN
- A. Establish concrete mix design proportions in accordance with ACI 318, Chapter 19 and 26 for each concrete strength noted on the contract drawings.
 - B. Submit concrete mix designs. Include the following:
 - 1. Type and quantities of materials.
 - 2. Slump.
 - 3. Air content.
 - 4. Fresh unit weight.
 - 5. Aggregates sieve analysis.
 - 6. Design compressive strength.
 - 7. Location of placement in structure.
 - 8. Method of placement.
 - 9. Method of curing.
 - 10. Seven-day and 28-day compressive strengths.
 - C. Concrete supplier shall submit certifications that the materials used meet applicable ASTM Specifications. Mix designs not conforming to the above will be rejected.
 - D. Limits on cementitious material substitutes in concrete mix design:
 - 1. Fly ash (ASTM C618) 25%
 - 2. Slag Cement (ASTM C989) 30%
 - 3. Total of Fly Ash plus Slag Cement 40%
- 1.7 SLUMP
- A. Design concrete with a maximum slump of five inches.
 - B. If a slump greater than five inches is desired it shall be achieved with a high-range water reducer. Design the concrete mix with a high range water reducer slump of two and one-half inches plus or minus one and one-half inches. The maximum slump after high-range water reducers are added shall be eight inches.
- 1.8 FRESH UNIT WEIGHT
- A. Normal weight concrete shall have a fresh unit weight of 140 to 152 pcf.
- 1.9 AIR CONTENT
- A. No entrained air content is required in concrete placed in the foundation.
 - B. Provide entrained air content per the table below and exposure category specified on structural drawings. Tolerance on air content as delivered shall be +/-1.5 percent.

Nominal maximum aggregate	Air Content, percent
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size, in.*	Exposure Class F1	Exposure Classes F2 and F3
3/8	6	7.5
1/2	5.5	7
3/4	5	6
1	4.5	6
1-1/2	4.5	5.5
* See ASTM C33 for tolerance on oversize for various nominal maximum size designations.		

1.10 WATER/CEMENT RATIO

- A. Concrete elements shall have a maximum water cement ratio of 0.5, unless noted otherwise.
- B. Air entrained concrete elements shall have a maximum water cement ratio of 0.45.
- C. Concrete elements within an aggressive environment (Exposure Class F2) shall have a maximum water/cement ratio of 0.45.

1.11 SUBMITTALS

- A. Submit a concrete mix design as specified above for each type of concrete included in the work.
- B. Submit a certification from each manufacturer or supplier stating that materials meet the requirements of the ASTM and ACI standards referenced.
- C. Submit manufacturer's data including Product Data and installation instructions for the following items. Manufacturer's Data shall include the name of the manufacturer and date of the publication. All manufacturers' data shall be maintained at the project site by the contractor.
 1. Admixtures
 2. Curing materials
 3. Joint sealing materials
 4. Expansion joint filler
 5. Patching compounds
 6. Bonding agents

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials designated by specific manufacturer's trade names are approved, subject to compliance with the quality and performance indicated by the manufacturer. Instructions and specifications, published by the manufacturer of such materials are included in and are a part of these specifications. Upon request, provide certification from manufacturer or supplier that materials designated by reference to ASTM and ACI standards meet the requirements of these standards.

2.2 CONCRETE STRENGTH

- A. Provide concrete strengths indicated on the Structural Drawings.

2.3 CEMENTITIOUS MATERIALS

- A. Portland cement shall conform to ASTM C150, Type I.
- B. Blended Hydraulic Cement shall conform to ASTM C595, Type IL.
- C. Fly Ash shall conform to ASTM C618, Class C or F.
 1. Class F fly ash shall have a loss on ignition of less than five percent.
 2. Class C fly ash shall have a loss on ignition of less than one percent.
- D. Slag Cement shall conform to ASTM C989, Grade 100 or 120.

2.4 AGGREGATE

- A. Fine aggregate shall conform to ASTM C33.
- B. Coarse aggregate of gravel or crushed stone shall conform to ASTM C33, Class 3M. Size coarse aggregate in accordance with ACI 318.
- 2.5 WATER
 - A. Water shall be potable and free of deleterious substances in accordance with ACI 318.
- 2.6 AIR ENTRAINING AGENT
 - A. Air entraining agent shall conform to ASTM C260.
- 2.7 WATER REDUCER
 - A. Water reducing agent shall conform to ASTM C494.
- 2.8 HIGH-RANGE WATER REDUCER
 - A. High-range water reducers (superplasticizers) shall conform to ASTM C494.
- 2.9 CHLORIDE
 - A. Use no chlorides of any form in concrete.
- 2.10 CURING MATERIALS
 - A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 - B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
 - C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
 - 1. Color:
 - a. Ambient Temperature Below 50 deg F (10 deg C): Black.
 - b. Ambient Temperature between 50 deg F (10 deg C) and 85 deg F (29 deg C): Any color.
 - c. Ambient Temperature Above 85 deg F (29 deg C): White.
 - D. Curing Paper: Eight-feet- (2438-mm-) wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.
 - E. Water: Potable or complying with ASTM C1602/C1602M.
 - F. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.
 - G. Clear, Waterborne, Membrane-Forming, Nondissipating Curing Compound: ASTM C309, Type 1, Class B, certified by curing compound manufacturer to not interfere with bonding of floor covering].
 - H. Clear, Waterborne, Membrane-Forming, Curing Compound: ASTM C309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering].
 - I. Clear, Solvent-Borne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.
 - J. Clear, Waterborne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.
- 2.11 ACCELERATORS
 - A. Non-chloride accelerators shall conform to ASTM C494.
- 2.12 RETARDERS
 - A. Retarders shall conform to ASTM C494.
- PART 3 - EXECUTION
- 3.1 HIGH-RANGE WATER REDUCERS
 - A. High-range water reducers are to be added at dosage recommended by the manufacturer. The slump of the concrete shall be one to four inches at the time the high-range water reducers are added. Do not permit fresh concrete containing superplasticizers to come in contact with fresh concrete not containing superplasticizers.
- 3.2 ADDITION OF WATER AT JOB SITE
 - A. Provide batch tickets indicating the amount of mix water withheld at the batch plant for each load of concrete delivered. Water may be added to the batch only if neither the maximum permissible water/cement ratio nor the maximum slump is exceeded.
 - B. Water shall not be added to the batch after the required on-site testing has been performed.

3.3 PLACEMENT OF CONCRETE

- A. Deposit concrete as near as practical to final position to prevent segregation of concrete.
- B. Do not use aluminum equipment in placing and finishing concrete.
- C. Place thickened slabs for partitions integral with floor slabs.
- D. Prepare place of deposit, mix, convey, place, and cure concrete in accordance with ACI 301 and ACI 318. Wet forms before placing concrete.
- E. Concrete Placement
 - 1. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
 - a. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
 - b. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
 - 2. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
 - 3. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
 - a. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
 - 4. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M), but not to exceed the amount indicated on the concrete delivery ticket.
 - a. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
 - 5. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
 - a. If a section cannot be placed continuously, provide construction joints as indicated.
 - b. Deposit concrete to avoid segregation.
 - c. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - d. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301 (ACI 301M).
 - 1. Do not use vibrators to transport concrete inside forms
 - 2. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer.
 - 3. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
 - 4. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
 - 6. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - a. Do not place concrete floors and slabs in a checkerboard sequence.
 - b. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - c. Maintain reinforcement in position on chairs during concrete placement.

- d. Screed slab surfaces with a straightedge and strike off to correct elevations.
- e. Level concrete, cut high areas, and fill low areas.
- f. Slope surfaces uniformly to drains where required.
- g. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
- h. Do not further disturb slab surfaces before starting finishing operations.

3.4 TIME LIMIT

- A. Deposit concrete within one and one-half hours after batching.

3.5 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

- 1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
 - a. Patch voids larger than 1-1/2 inches (38 mm) wide or 1/2 inch (13 mm) deep.
 - b. Remove projections larger than 1/2 inch (25 mm).
 - c. Tie holes do not require patching.
 - d. Surface Tolerance: ACI 117 Class C.
 - e. Apply to concrete surfaces not exposed to public view.
- 2. ACI 301 Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
 - a. Patch voids larger than 3/4 inch (19 mm) wide or 1/2 inch (13 mm) deep.
 - b. Remove projections larger than 1/4 inch (6 mm).
 - c. Patch tie holes.
 - d. Surface Tolerance: ACI 117 Class B.
 - e. Locations: Apply to concrete surfaces exposed to public view.
- 3. ACI 301 Surface Finish SF-3.0:
 - a. Patch voids larger than 3/4 inch (19 mm) wide or 1/2 inch (13 mm) deep.
 - b. Remove projections larger than 1/8 inch (3 mm).
 - c. Patch tie holes.
 - d. Surface Tolerance: ACI 117 Class A.
 - e. Locations: Apply to concrete surfaces exposed to public view.

3.6 CURING

- A. Begin curing procedures immediately following the commencement of the finishing operation.
- B. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
 - 1. Maintain moisture loss no more than 0.2 lb/sq. ft. x h (1 kg/sq. m x h), calculated in accordance with ACI 305.1, before and during finishing operations.
- C. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
 - 1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
 - 2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
 - 3. If forms remain during curing period, moist cure after loosening forms.
 - 4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
 - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
 - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
 - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.

- d. Water-Retention Sheetting Materials: Cover exposed concrete surfaces with sheetting material, taping, or lapping seams.
 - e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 1. Recoat areas subject to heavy rainfall within three hours after initial application.
 - 2. Maintain continuity of coating and repair damage during curing period.
- D. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
- 1. Begin curing immediately after finishing concrete.
 - 2. Interior Concrete Floors:
 - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
 - 1. Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - i. Lap edges and ends of absorptive cover not less than 12-inches (300-mm).
 - ii. Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive.
 - i. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - ii. Cure for not less than seven days.
 - 3. Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - i. Water.
 - ii. Continuous water-fog spray
 - b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:
 - 1. Absorptive cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - i. Lap edges and ends of absorptive cover not less than 12 inches.
 - ii. Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive.
 - i. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - ii. Cure for not less than seven days.
 - 3. Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - i. Water.
 - ii. Continuous water-fog spray.
 - c. Floors to Receive Polished Finish: Contractor has option of the following:

1. Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - i. Lap edges and ends of absorptive cover not less than 12 inches.
 - ii. Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
2. Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - i. Water.
 - ii. Continuous water-fog spray.
- d. Floors to Receive Curing Compound:
 1. Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 2. Recoat areas subjected to heavy rainfall within three hours after initial application.
 3. Maintain continuity of coating, and repair damage during curing period.
 4. Removal: After curing period has elapsed remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacture unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
- e. Floors to Receive Curing and Sealing Compound:
 1. Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 2. Recoat areas subjected to heavy rainfall within three hours after initial application.
 3. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.7 ENVIRONMENTAL PROVISIONS

- A. Hot weather concrete
 1. Procedure applies when concrete mix starts to exceed 77 degrees Fahrenheit.
 2. Forms, reinforcing steel and subgrade shall be fogged or sprinkled with cool water. prior to concrete in placement.
 3. Expedite all elements of the concrete placement.
 4. Moist curing shall commence as soon as the surfaces are finished and shall continue for at least seven days.
 5. Hot weather concreting shall comply with ACI 305.1.
- B. Cold weather concrete
 1. Procedure applies when a period of more than 3 successive days the average daily air temperature drops below 40 degrees Fahrenheit and stays below 50 degrees for more than one half of any 24-hour period.
 2. Provide wind break or heated enclosure to protect freshly placed concrete.
 3. During curing protect concrete with polyethylene sheets or insulating blankets for at least seven days.
 4. In no instance shall the concrete temperature drop below 50 degrees Fahrenheit prior to stripping forms and reshoring the structure.
 5. Cold weather concreting shall comply with ACI 306.1.
- C. Protect concrete from drying and excessive temperature for the first seven days.
- D. Protect fresh concrete from wind.

3.8 CONTRACTION JOINTS

- A. Obtain Design Professional 's approval for location of contraction joints.

- B. Do not place contraction joints in framed floors, composite slabs, or shear walls.
 - C. Place contraction joints in slabs-on-grade as indicated on the Drawings.
 - D. Alternately, in areas to receive carpeting or wood flooring contraction joints may be provided by preformed plastic strip inserts.
 - E. Provide contraction joints in concrete foundation or retaining walls at a maximum spacing of 20-foot but not more than 1.5 or less than 0.7 times the wall height. Space contraction joints equally between column interruptions in the wall surface such as pedestals, corners, or construction joints, and ensure a joint is located within 10 feet of corners. Coordinate location with Architect. Contraction joints shall be formed as a V-groove on both faces of the wall, 3/4-inch minimum depth.
- 3.9 CUTTING CONCRETE
- A. Obtain Design Professional's written approval prior to cutting concrete for installation of other work.
- 3.10 PATCHWORK AND REPAIRS
- A. Notify Design Professional of any defective areas in concrete to be patched or repaired. Repair and patch defective areas with non-shrink grout. Cut out defective areas over two inches in diameter to solid concrete, but not less than a depth of one inch. Make edges of
- 3.11 JOINT FILLING
- A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least three months.
 - 2. Do not fill joints until construction traffic has permanently ceased.
 - B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
 - C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.
 - D. Overfill joint, and trim joint filler flush with top of joint after hardening.
- 3.12 CONCRETE FINISHES
- A. Finish concrete in accordance with ACI 301.
 - B. Finish concrete slabs to flatness and levelness tolerances which correspond to FF 25/FL 20 minimum overall for composite of all measured values and FF 17/FL 12 minimum for any individual floor section.
 - C. For concrete slabs to receive thin-set flooring, finish to flatness and levelness tolerances which correspond to FF 35/FL 25 minimum overall for composite of all measured values and FF 25/FL 20 minimum for any individual floor section.
 - D. For concrete slabs to receive wood flooring, finish to flatness and levelness tolerances which correspond to FF 45/FL 30 minimum overall for composite of all measured values and FF 30/FL 20 minimum for any individual floor section.
 - E. For metal deck construction, floors shall be finished to an FF 25.
 - F. For shored construction, FL values do not apply if slab is tested after shoring is removed.
 - G. Slabs, which do not meet the flatness and levelness criteria shall be repaired or replaced.
- 3.13 FIELD QUALITY CONTROL
- A. Special Inspections: Special inspector to perform field tests and inspections and prepare testing and inspection reports.
 - B. Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
 - C. For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
 - D. Inspections:
 - 1. Headed bolts and studs.
 - 2. Verification of use of required design mixture.
 - 3. Concrete placement, including conveying and depositing.
 - 4. Curing procedures and maintenance of curing temperature.

5. Verification of concrete strength before removal of shores and forms from beams and slabs.
6. Batch Plant Inspections: On a random basis, as determined by Architect.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172 shall be performed in accordance with the following requirements:
 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture for each 100 cubic yards per Section 1.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C143:
 - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.
 3. Slump Flow: ASTM C1611:
 - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.
 4. Air Content: ASTM C231 pressure method, for normal-weight concrete;
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 5. Concrete Temperature: ASTM C1064:
 - a. One test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.
 6. Unit Weight: ASTM C138 fresh unit weight of structural concrete or ASTM C567 fresh unit weight of structural lightweight concrete.
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 7. Compression Test Specimens: ASTM C31:
 - a. Cast and laboratory cure four 6-inch (150 mm) by 12-inch (300 mm) cylinder specimens for each composite sample. If testing agency chooses to use 4 inch by 8 inch cylinders an additional cylinder will be required.
 - b. Cast, initial cure, and field cure two standard cylinder specimens for each composite sample for evaluation of concrete strength for formwork/shoring removal.
 - c. Cast, initial cure, and field cure two standard cylinder specimens for each composite sample for evaluation of concrete strength at time of post-tensioning.
 8. Compressive-Strength Tests: ASTM C39.
 - a. From each set:
 1. Test one laboratory-cured specimen at seven days and two specimens at 28 days. Fourth specimen is to be held in reserve.
 2. Test two field-cured specimens for removal of forms or shoring. Date to be determined by formwork engineer per their calculations.
 3. Test two field-cured specimens prior to stressing of post-tensioning. Date to be determined by post-tensioning engineer per their calculations.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated. If 4 inch by 8 inch cylinders are used, it shall be from a set of three specimens.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 10. Strength of each concrete mixture will be satisfactory if both of the following conditions are met:
 - a. Every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength.
 - b. No compressive-strength test value falls below the specified compressive strength by: more than 500 psi (3.4 MPa) when specified compressive strength is less than or equal to 5000 psi (34.5 MPa) or more than 10 percent of specified compressive strength when the specified compressive strength is greater than 5000 psi (34.5 MPa).
 11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 12. Additional Tests:
 - a. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 - b. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 72 hours of completion of floor finishing and promptly report test results to Architect.

END OF SECTION

SECTION 05 4000
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exterior non-load-bearing wall framing.
 - 2. Interior non-load-bearing wall framing.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Environmental Product Declaration (EPD): Provide a Type III EPD according to ISO 14025 for the following products:
 - a. Cold Formed Metal Framing Materials
 - 2. Health Product Declaration (HPD): Provide a Health Product Declaration according to the requirements of the "HPD Open Standard" for the following products:
 - a. Cold Formed Metal Framing Materials
- C. Shop Drawings:
 - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
 - 3. Delegated Design Submittal: Provide design engineer's stamp for Project jurisdiction on drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product certificates.
- C. Product test reports.

- D. Evaluation Reports: For post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

- A. Product Tests: Mill certificates or data from a qualified independent testing agency.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code - Steel."
 - 2. AWS D1.3, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer to be member of SFIA, SSMA or CSSA.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: **As indicated on Drawings.**
 - 2. Deflection Limits: Design framing systems to withstand **design loads** without deflections greater than the following: as indicated on drawings.
 - 3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).
 - 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as indicated on drawings.
- C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:
 - 1. Wall Studs: AISI S211.
 - 2. Headers: AISI S212.
 - 3. Lateral Design: AISI S213.
- D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.3 COLD-FORMED STEEL FRAMING MATERIALS

- A. Provide components required to produce a complete framing system as indicated on the drawings.
- B. Steel Sheet: ASTM A 1003, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:
 - 1. Grade: As required to meet structural performance.
 - 2. Coating: G90 or equivalent.
- C. Steel Sheet for Vertical Deflection and/or Drift Clips: ASTM A 653, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: As required to meet structural performance.
 - 2. Coating: G90.

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and matching minimum base-metal thickness of steel studs.
- C. Vertical Deflection Clips: Manufacturer's standard bypass and/or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure.
- E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.5 INTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and matching minimum base-metal thickness of steel studs.
- C. Vertical Deflection Clips: Manufacturer's standard bypass and/or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure.
- E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.6 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from ASTM A 1003, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated.

2.7 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36, zinc coated by hot-dip process according to ASTM A 123.
- B. Anchor Bolts: ASTM F 1554 and as required by the structural drawings, specifications and notes.
- C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on the structural drawings, specifications and notes and as appropriate for the substrate.
- D. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

2.8 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C 1107, and with a fluid consistency and 30-minute working time.
- D. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.2 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
- D. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- E. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- F. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- G. Install insulation, specified in Section 07 2100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- H. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.3 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: As indicated on Shop Drawings.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support as indicated on Shop Drawings.

- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Channel Bridging: Cold-rolled steel channel welded or mechanically fastened to webs of punched studs.
 - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - 3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
 - 1. Install solid blocking at centers indicated on Shop Drawings.
- G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.4 INTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated on Shop Drawings.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: As indicated on Shop Drawings.
- C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support as indicated on Shop Drawings.
 - 1. Install single deep-leg deflection tracks and anchor to building structure.
 - 2. Connect vertical deflection clips to studs and anchor to building structure.
 - 3. Connect drift clips to cold-formed steel metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
- F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
 - 1. Install solid blocking at centers indicated on Shop Drawings.
- G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 ERECTION TOLERANCES

- A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.6 FIELD QUALITY CONTROL

- A. Field and shop welds will be subject to testing and inspecting.
- B. Testing agency will report test results promptly and in writing to Contractor and Architect.
- C. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

END OF SECTION 05 4000

SECTION 05 5000

METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous steel framing and supports.
2. Miscellaneous steel trim.
3. Metal bollards.
4. Pipe Downspout guards.

B. Products furnished, but not installed, under this Section include the following:

1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Paint products.
2. Grout.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 degree F, ambient; 180 degree F, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36.

C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

- D. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- E. Steel Pipe: ASTM A 53, Standard Weight (Schedule 40) unless otherwise indicated.
- F. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
 - 1. Size of Channels: 1-5/8 by 1-5/8 inches.
 - 2. Material: Galvanized steel, ASTM A 653, commercial steel, Type B, with G90 coating; 0.108-inch nominal thickness.
- G. Cast Iron: Either gray iron, ASTM A 48, or malleable iron, ASTM A 47, unless otherwise indicated.
- H. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
- I. Aluminum-Alloy Rolled Tread Plate: ASTM B 632, Alloy 6061-T6.
- J. Aluminum Castings: ASTM B 26, Alloy 443.0-F.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
 - 2. Provide stainless-steel fasteners for fastening stainless steel.
 - 3. Provide stainless-steel fasteners for fastening nickel silver.
 - 4. Provide bronze fasteners for fastening bronze.
- B. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27 cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- C. Post-Installed Anchors: Torque-controlled expansion anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group A1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.
- D. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 09 9000 "Painting."
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- C. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
- D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- H. Concrete: Comply with requirements in Section 03 3000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
- C. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended.
- D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.
- E. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors not less than 8 inches from ends and corners of units and 24 inches o.c.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS (Including reel bank supports)

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes recommended by partition manufacturer with attached bearing plates, anchors, and braces as recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

2.7 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
- C. Prime miscellaneous steel trim with primer specified in Section 09 9000 "Painting."

2.8 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
 - 1. Cap bollards with Topguard concrete cap as detailed.
- B. Prime bollards with primer specified in Section 09 9000 "Painting."

2.9 PIPE GUARDS

- A. Fabricate pipe guards from 3/8-inch-thick by 12-inch-wide steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe with 2-inch clearance between pipe and pipe guard. Drill each end for two 3/4-inch anchor bolts.
- B. Prime pipe guards with primer specified in Section 09 9000 "Painting."

2.10 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.

2.11 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153 for steel and iron hardware and with ASTM A 123 for other steel and iron products.

- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
- C. Preparation for Shop Priming: requirements indicated below:
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.

3.2 INSTALLING METAL BOLLARDS

- A. Fill bollards solidly with concrete and allow concrete to cure seven days before installing.
- B. Anchor bollards in place with concrete footings. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
- C. Fill bollards solidly with concrete and prepare to receive prefabricated cap, where indicated on drawings.

3.3 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 5000

SECTION 06 1053

MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Wood blocking and nailers.
 - 2. Wood furring.
 - 3. Plywood backing panels.

1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches size in least dimension.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
 - 2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat all miscellaneous carpentry unless otherwise indicated.
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - 4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
 - 5. Wood floor plates that are installed over concrete slabs-on-grade.
 - 6. Separate Wood-Preservative-Treated wood materials from cold form metal framing with an ice and water shield product to prevent corrosion.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Treatment shall not promote corrosion of metal fasteners.
 - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
 - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
 - 4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664, and design value adjustment factors shall be calculated according to ASTM D 6841. For enclosed roof framing, framing in attic spaces, and where high-temperature fire-retardant treatment is indicated, provide material with adjustment factors of not less than 0.85 modulus of elasticity and 0.75 for extreme fiber in bending for Project's climatological zone.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.
- F. Application: Treat all miscellaneous carpentry unless otherwise indicated.
- G. Separate Fire-Retardant-Treated wood materials from cold form metal framing with an ice and water shield product to prevent corrosion.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Furring.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.
- C. Concealed Boards: 19 percent maximum moisture content of the following species and grades:

1. Mixed southern pine or southern pine, No. 2 grade; SPIB.

- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Screws for Fastening to Metal Framing: ASTM C 1002, length as recommended by screw manufacturer for material being fastened.
- D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.7 MISCELLANEOUS MATERIALS

- A. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- E. Do not splice structural members between supports unless otherwise indicated.
- F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- G. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- H. Comply with AWP A M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- I. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- J. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
 - 3. ICC-ES evaluation report for fastener.
- K. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 1053

SECTION 06 4116

PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad architectural cabinets.
2. Cabinet hardware and accessories.
3. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Sustainable Design Submittals:

1. Environmental Product Declaration (EPD): Provide a Type III EPD according to ISO 14025 for the following products:
 - a. Plastic Laminate
2. Health Product Declaration (HPD): Provide a Health Product Declaration according to the requirements of the "HPD Open Standard" for the following products:
 - a. Plastic Laminate

C. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Show large-scale details.
3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
4. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.
5. Apply AWI Quality Certification Program label to Shop Drawings.

- D. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.
- C. Field quality control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.6 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
 - 1. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program.
- B. Installer Qualifications: Licensed participant in AWI's Quality Certification Program.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. Provide labels and certificates from AWI certification program indicating that woodwork complies with requirements of grades specified.
- B. Architectural Woodwork Standards Grade: Custom
- C. Type of Construction: Frameless.
- D. Door and Drawer-Front Style: Flush overlay.
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Arborite
 - b. Formica Corporation
 - c. Panolam Surface Systems
- F. Laminate Cladding for Exposed Surfaces:
 - 1. Horizontal Surfaces: Grade HGS.
 - 2. Postformed Surfaces: Grade HGP.

3. Vertical Surfaces: Grade VGS.
 4. Edges: Grade HGS.
 5. Pattern Direction: As indicated on drawings.
- G. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- H. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
1. Join subfronts, backs, and sides with glued dovetail joints.
- I. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. As selected by Architect from laminate manufacturer's full range
 2. *Where wood grain or directional patterns are selected, the grain of the laminate shall be oriented in the same direction across all doors and drawers or the specified cabinetry.*

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
 2. Particleboard: ANSI A208.1, Grade M-2.
 3. Straw-Based Particleboard: ANSI A208.1, Grade M-2, except for density.
 4. Softwood Plywood: DOC PS 1, medium-density overlay.
 5. Thermoset Decorative Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials that are acceptable to authorities having jurisdiction as determined by testing performed on identical products by a qualified testing agency.
1. Use treated materials that comply with requirements of referenced quality standard. Do not use materials that are warped, discolored, or otherwise defective.
 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

2.4 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 08 7100 "Door Hardware."
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 100 degrees of opening, self-closing.
- C. Back-Mounted Pulls: BHMA A156.9, B02011.
- D. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.
- E. Catches: Magnetic catches, BHMA A156.9, B03141.
- F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- G. Shelf Rests: BHMA A156.9, B04013; two-pin plastic with shelf hold-down clip.
- H. Drawer Slides: BHMA A156.9.
 - 1. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
 - 2. For drawers more than 3 inches high, but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.
 - 3. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-200.
- I. Door Locks: BHMA A156.11, E07121.
- J. Drawer Locks: BHMA A156.11, E07041.
- K. Door and Drawer Silencers: BHMA A156.16, L03011.
- L. Grommets for Cable Passage: 2-inchOD, molded-plastic grommets and matching plastic caps with slot for wire passage.
 - 1. Color: Black, unless noted otherwise on drawings.
- M. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Stainless Steel: BHMA 630.
- N. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.5 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

- C. Adhesive for Bonding Plastic Laminate: Type informed by fabricator to suit application.

2.6 FABRICATION

- A. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- B. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.
- B. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.
- C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.
- D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.
 - 1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
 - 2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.

END OF SECTION 06 4116

SECTION 07 2100
THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Glass-fiber blanket insulation.
- B. Product Data: For each type of product.
- C. Sustainable Design Submittals:
 - 1. Batt type insulations shall be formaldehyde free.
 - 2. Environmental Product Declaration (EPD): Provide a Type III EPD according to ISO 14025 for the following products:
 - a. Glass Fiber Blanket
 - 3. Health Product Declaration (HPD): Provide a Health Product Declaration according to the requirements of the “HPD Open Standard” for the following products:
 - a. Glass Fiber Blanket

1.2 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET

- A. Batt type insulations shall be formaldehyde free.
- B. Glass-Fiber Blanket, Unfaced: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Owens Corning.
- C. Glass-Fiber Blanket, Kraft Faced: ASTM C 665, Type II (nonreflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Owens Corning.

2.2 ACCESSORIES

- A. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Install insulation with manufacturer's R-value label exposed after insulation is installed.
- D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.2 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends. Insulation shall be mechanically supported where required (R-value) blanket dimension exceeds wall cavity.
 2. Place insulation in cavities formed by framing members to produce a tight friction fit between edges of insulation and adjoining framing members. Completely fill the voids inside hollow steel stud flanges.
 3. Where a direct friction fit is not achievable, insulation must be fit without gaps and held in place with supplemental mechanical support with wires or straps, starting 4'-0" above the floor and then every 2'-0" on center. Where insulation thickness is less than the depth of the stud cavity, the mechanical support should be positioned to hold the batt against the exterior sheathing without compressing it. Continuous mesh support is also acceptable.
 4. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

5. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.

3.3 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.
- B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 2100

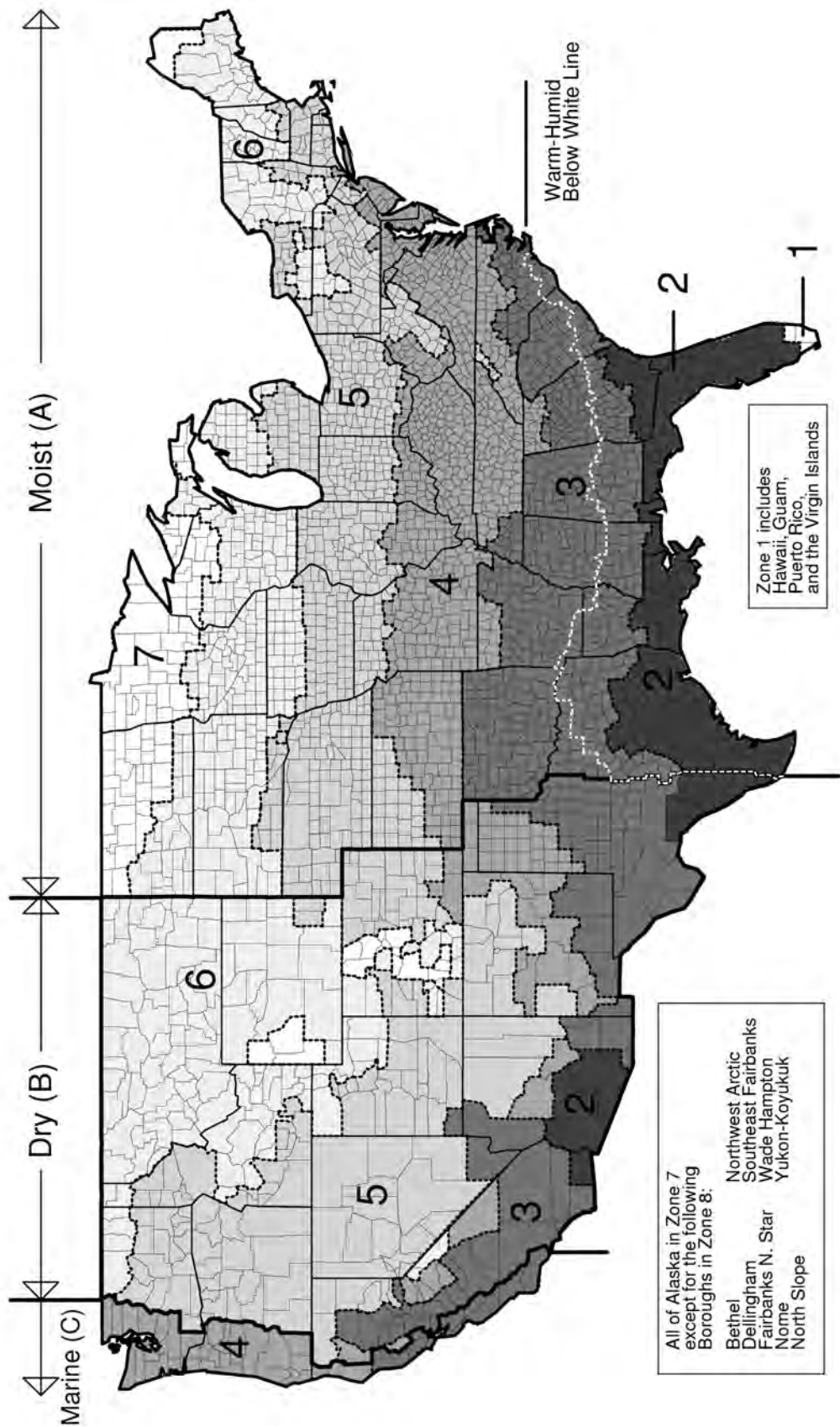


FIGURE C301.1
CLIMATE ZONES

TABLE C301.1
CLIMATE ZONES, MOISTURE REGIMES, AND WARM-HUMID
DESIGNATIONS BY STATE, COUNTY AND TERRITORY

Key: A – Moist, B – Dry, C – Marine. Absence of moisture designation indicates moisture regime is irrelevant. Asterisk (*) indicates a warm-humid location.

US STATES

ALABAMA	3A Lee	7 Lake and Peninsula	4A Carroll	3A Montgomery
3A Autauga*	3A Limestone	7 Matanuska-Susitna	3A Chicot	3A Nevada
2A Baldwin*	3A Lowndes*	8 Nome	3A Clark	4A Newton
3A Barbour*	3A Macon*	8 North Slope	3A Clay	3A Ouachita
3A Bibb	3A Madison	8 Northwest Arctic	3A Cleburne	3A Perry
3A Blount	3A Marengo*	7 Prince of Wales	3A Cleveland	3A Phillips
3A Bullock*	3A Marion	Outer Ketchikan	3A Columbia*	3A Pike
3A Butler*	3A Marshall	7 Sitka	3A Conway	3A Poinsett
3A Calhoun	2A Mobile*	7 Skagway-Hoonah-	3A Craighead	3A Polk
3A Chambers	3A Monroe*	Angoon	3A Crawford	3A Pope
3A Cherokee	3A Montgomery*	8 Southeast Fairbanks	3A Crittenden	3A Prairie
3A Chilton	3A Morgan	7 Valdez-Cordova	3A Cross	3A Pulaski
3A Choctaw*	3A Perry*	8 Wade Hampton	3A Dallas	3A Randolph
3A Clarke*	3A Pickens	7 Wrangell-Petersburg	3A Desha	3A Saline
3A Clay	3A Pike*	7 Yakutat	3A Drew	3A Scott
3A Cleburne	3A Randolph	8 Yukon-Koyukuk	3A Faulkner	4A Searcy
3A Coffee*	3A Russell*	ARIZONA	3A Franklin	3A Sebastian
3A Colbert	3A Shelby	5B Apache	4A Fulton	3A Sevier*
3A Conecuh*	3A St. Clair	3B Cochise	3A Garland	3A Sharp
3A Coosa	3A Sumter	5B Coconino	3A Grant	3A St. Francis
3A Covington*	3A Talladega	4B Gila	3A Greene	4A Stone
3A Crenshaw*	3A Tallapoosa	3B Graham	3A Hempstead*	3A Union*
3A Cullman	3A Tuscaloosa	3B Greenlee	3A Hot Spring	3A Van Buren
3A Dale*	3A Walker	2B La Paz	3A Howard	4A Washington
3A Dallas*	3A Washington*	2B Maricopa	3A Independence	3A White
3A DeKalb	3A Wilcox*	3B Mohave	4A Izard	3A Woodruff
3A Elmore*	3A Winston	5B Navajo	3A Jackson	3A Yell
3A Escambia*	ALASKA	2B Pima	3A Jefferson	CALIFORNIA
3A Etowah	7 Aleutians East	2B Pinal	3A Johnson	3C Alameda
3A Fayette	7 Aleutians West	3B Santa Cruz	3A Lafayette*	6B Alpine
3A Franklin	7 Anchorage	4B Yavapai	3A Lawrence	4B Amador
3A Geneva*	8 Bethel	2B Yuma	3A Lee	3B Butte
3A Greene	7 Bristol Bay	ARKANSAS	3A Lincoln	4B Calaveras
3A Hale	7 Denali	3A Arkansas	3A Little River*	3B Colusa
3A Henry*	8 Dillingham	3A Ashley	3A Logan	3B Contra Costa
3A Houston*	8 Fairbanks North Star	4A Baxter	3A Lonoke	4C Del Norte
3A Jackson	7 Haines	4A Benton	4A Madison	4B El Dorado
3A Jefferson	7 Juneau	4A Boone	4A Marion	3B Fresno
3A Lamar	7 Kenai Peninsula	3A Bradley	3A Miller*	3B Glenn
3A Lauderdale	7 Ketchikan Gateway	3A Calhoun	3A Mississippi	4C Humboldt
3A Lawrence	7 Kodiak Island		3A Monroe	2B Imperial

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM-HUMID
DESIGNATIONS BY STATE, COUNTY AND TERRITORY

4B Inyo	COLORADO	4B Otero	2A Flagler*	2A Taylor*
3B Kern	5B Adams	6B Ouray	2A Franklin*	2A Union*
3B Kings	6B Alamosa	7 Park	2A Gadsden*	2A Volusia*
4B Lake	5B Arapahoe	5B Phillips	2A Gilchrist*	2A Wakulla*
5B Lassen	6B Archuleta	7 Pitkin	2A Glades*	2A Walton*
3B Los Angeles	4B Baca	5B Prowers	2A Gulf*	2A Washington*
3B Madera	5B Bent	5B Pueblo	2A Hamilton*	GEORGIA
3C Marin	5B Boulder	6B Rio Blanco	2A Hardee*	2A Appling*
4B Mariposa	6B Chaffee	7 Rio Grande	2A Hendry*	2A Atkinson*
3C Mendocino	5B Cheyenne	7 Routt	2A Hernando*	2A Bacon*
3B Merced	7 Clear Creek	6B Saguache	2A Highlands*	2A Baker*
5B Modoc	6B Conejos	7 San Juan	2A Hillsborough*	3A Baldwin
6B Mono	6B Costilla	6B San Miguel	2A Holmes*	4A Banks
3C Monterey	5B Crowley	5B Sedgwick	2A Indian River*	3A Barrow
3C Napa	6B Custer	7 Summit	2A Jackson*	3A Bartow
5B Nevada	5B Delta	5B Teller	2A Jefferson*	3A Ben Hill*
3B Orange	5B Denver	5B Washington	2A Lafayette*	2A Berrien*
3B Placer	6B Dolores	5B Weld	2A Lake*	3A Bibb
5B Plumas	5B Douglas	5B Yuma	2A Lee*	3A Bleckley*
3B Riverside	6B Eagle	CONNECTICUT	2A Leon*	2A Brantley*
3B Sacramento	5B Elbert	5A (all)	2A Levy*	2A Brooks*
3C San Benito	5B El Paso	DELAWARE	2A Liberty*	2A Bryan*
3B San Bernardino	5B Fremont	4A (all)	2A Madison*	3A Bulloch*
3B San Diego	5B Garfield	DISTRICT OF	2A Manatee*	3A Burke
3C San Francisco	5B Gilpin	COLUMBIA	2A Marion*	3A Butts
3B San Joaquin	7 Grand	4A (all)	2A Martin*	3A Calhoun*
3C San Luis Obispo	7 Gunnison	FLORIDA	1A Miami-Dade*	2A Camden*
3C San Mateo	7 Hinsdale	2A Alachua*	1A Monroe*	3A Candler*
3C Santa Barbara	5B Huerfano	2A Baker*	2A Nassau*	3A Carroll
3C Santa Clara	7 Jackson	2A Bay*	2A Okaloosa*	4A Catoosa
3C Santa Cruz	5B Jefferson	2A Bradford*	2A Okeechobee*	2A Charlton*
3B Shasta	5B Kiowa	2A Brevard*	2A Orange*	2A Chatham*
5B Sierra	5B Kit Carson	1A Broward*	2A Osceola*	3A Chattahoochee*
5B Siskiyou	7 Lake	2A Calhoun*	2A Palm Beach*	4A Chattooga
3B Solano	5B La Plata	2A Charlotte*	2A Pasco*	3A Cherokee
3C Sonoma	5B Larimer	2A Citrus*	2A Pinellas*	3A Clarke
3B Stanislaus	4B Las Animas	2A Clay*	2A Polk*	3A Clay*
3B Sutter	5B Lincoln	2A Collier*	2A Putnam*	3A Clayton
3B Tehama	5B Logan	2A Columbia*	2A Santa Rosa*	2A Clinch*
4B Trinity	5B Mesa	2A DeSoto*	2A Sarasota*	3A Cobb
3B Tulare	7 Mineral	2A Dixie*	2A Seminole*	3A Coffee*
4B Tuolumne	6B Moffat	2A Duval*	2A St. Johns*	2A Colquitt*
3C Ventura	5B Montezuma	2A Escambia*	2A St. Lucie*	3A Columbia
3B Yolo	5B Montrose		2A Sumter*	2A Cook*
3B Yuba	5B Morgan		2A Suwannee*	3A Coweta

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM-HUMID
DESIGNATIONS BY STATE, COUNTY AND TERRITORY

3A Crawford	2A Lanier*	3A Taylor*	5B Cassia	4A Crawford
3A Crisp*	3A Laurens*	3A Telfair*	6B Clark	5A Cumberland
4A Dade	3A Lee*	3A Terrell*	5B Clearwater	5A DeKalb
4A Dawson	2A Liberty*	2A Thomas*	6B Custer	5A De Witt
2A Decatur*	3A Lincoln	3A Tift*	5B Elmore	5A Douglas
3A DeKalb	2A Long*	2A Toombs*	6B Franklin	5A DuPage
3A Dodge*	2A Lowndes*	4A Towns	6B Fremont	5A Edgar
3A Dooly*	4A Lumpkin	3A Treutlen*	5B Gem	4A Edwards
3A Dougherty*	3A Macon*	3A Troup	5B Gooding	4A Effingham
3A Douglas	3A Madison	3A Turner*	5B Idaho	4A Fayette
3A Early*	3A Marion*	3A Twiggs*	6B Jefferson	5A Ford
2A Echols*	3A McDuffie	4A Union	5B Jerome	4A Franklin
2A Effingham*	2A McIntosh*	3A Upson	5B Kootenai	5A Fulton
3A Elbert	3A Meriwether	4A Walker	5B Latah	4A Gallatin
3A Emanuel*	2A Miller*	3A Walton	6B Lemhi	5A Greene
2A Evans*	2A Mitchell*	2A Ware*	5B Lewis	5A Grundy
4A Fannin	3A Monroe	3A Warren	5B Lincoln	4A Hamilton
3A Fayette	3A Montgomery*	3A Washington	6B Madison	5A Hancock
4A Floyd	3A Morgan	2A Wayne*	5B Minidoka	4A Hardin
3A Forsyth	4A Murray	3A Webster*	5B Nez Perce	5A Henderson
4A Franklin	3A Muscogee	3A Wheeler*	6B Oneida	5A Henry
3A Fulton	3A Newton	4A White	5B Owyhee	5A Iroquois
4A Gilmer	3A Oconee	4A Whitfield	5B Payette	4A Jackson
3A Glascock	3A Oglethorpe	3A Wilcox*	5B Power	4A Jasper
2A Glynn*	3A Paulding	3A Wilkes	5B Shoshone	4A Jefferson
4A Gordon	3A Peach*	3A Wilkinson	6B Teton	5A Jersey
2A Grady*	4A Pickens	3A Worth*	5B Twin Falls	5A Jo Daviess
3A Greene	2A Pierce*		6B Valley	4A Johnson
3A Gwinnett	3A Pike	HAWAII	5B Washington	5A Kane
4A Habersham	3A Polk	1A (all)*		5A Kankakee
4A Hall	3A Pulaski*	IDAHO	ILLINOIS	5A Kendall
3A Hancock	3A Putnam	5B Ada	5A Adams	5A Knox
3A Haralson	3A Quitman*	6B Adams	4A Alexander	5A Lake
3A Harris	4A Rabun	6B Bannock	4A Bond	5A La Salle
3A Hart	3A Randolph*	6B Bear Lake	5A Boone	4A Lawrence
3A Heard	3A Richmond	5B Benewah	5A Brown	5A Lee
3A Henry	3A Rockdale	6B Bingham	5A Bureau	5A Livingston
3A Houston*	3A Schley*	6B Blaine	5A Calhoun	5A Logan
3A Irwin*	3A Screven*	6B Boise	5A Carroll	5A Macon
3A Jackson	2A Seminole*	6B Bonner	5A Cass	4A Macoupin
3A Jasper	3A Spalding	6B Bonneville	5A Champaign	4A Madison
2A Jeff Davis*	4A Stephens	6B Boundary	4A Christian	4A Marion
3A Jefferson	3A Stewart*	6B Butte	5A Clark	5A Marshall
3A Jenkins*	3A Sumter*	6B Camas	4A Clay	5A Mason
3A Johnson*	3A Talbot	5B Canyon	4A Clinton	4A Massac
3A Jones	3A Taliaferro	6B Caribou	5A Coles	5A McDonough
3A Lamar	2A Tattnall*		5A Cook	5A McHenry

(continued)

GENERAL REQUIREMENTS

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM-HUMID
DESIGNATIONS BY STATE, COUNTY AND TERRITORY

5A McLean	5A Boone	5A Miami	5A Appanoose	5A Jasper
5A Menard	4A Brown	4A Monroe	5A Audubon	5A Jefferson
5A Mercer	5A Carroll	5A Montgomery	5A Benton	5A Johnson
4A Monroe	5A Cass	5A Morgan	6A Black Hawk	5A Jones
4A Montgomery	4A Clark	5A Newton	5A Boone	5A Keokuk
5A Morgan	5A Clay	5A Noble	6A Bremer	6A Kossuth
5A Moultrie	5A Clinton	4A Ohio	6A Buchanan	5A Lee
5A Ogle	4A Crawford	4A Orange	6A Buena Vista	5A Linn
5A Peoria	4A Daviess	5A Owen	6A Butler	5A Louisa
4A Perry	4A Dearborn	5A Parke	6A Calhoun	5A Lucas
5A Piatt	5A Decatur	4A Perry	5A Carroll	6A Lyon
5A Pike	5A De Kalb	4A Pike	5A Cass	5A Madison
4A Pope	5A Delaware	5A Porter	5A Cedar	5A Mahaska
4A Pulaski	4A Dubois	4A Posey	6A Cerro Gordo	5A Marion
5A Putnam	5A Elkhart	5A Pulaski	6A Cherokee	5A Marshall
4A Randolph	5A Fayette	5A Putnam	6A Chickasaw	5A Mills
4A Richland	4A Floyd	5A Randolph	5A Clarke	6A Mitchell
5A Rock Island	5A Fountain	4A Ripley	6A Clay	5A Monona
4A Saline	5A Franklin	5A Rush	6A Clayton	5A Monroe
5A Sangamon	5A Fulton	4A Scott	5A Clinton	5A Montgomery
5A Schuyler	4A Gibson	5A Shelby	5A Crawford	5A Muscatine
5A Scott	5A Grant	4A Spencer	5A Dallas	6A O'Brien
4A Shelby	4A Greene	5A Starke	5A Davis	6A Osceola
5A Stark	5A Hamilton	5A Steuben	5A Decatur	5A Page
4A St. Clair	5A Hancock	5A St. Joseph	6A Delaware	6A Palo Alto
5A Stephenson	4A Harrison	4A Sullivan	5A Des Moines	6A Plymouth
5A Tazewell	5A Hendricks	4A Switzerland	6A Dickinson	6A Pocahontas
4A Union	5A Henry	5A Tippecanoe	5A Dubuque	5A Polk
5A Vermilion	5A Howard	5A Tipton	6A Emmet	5A Pottawattamie
4A Wabash	5A Huntington	5A Union	6A Fayette	5A Poweshiek
5A Warren	4A Jackson	4A Vanderburgh	6A Floyd	5A Ringgold
4A Washington	5A Jasper	5A Vermillion	6A Franklin	6A Sac
4A Wayne	5A Jay	5A Vigo	5A Fremont	5A Scott
4A White	4A Jefferson	5A Wabash	5A Greene	5A Shelby
5A Whiteside	4A Jennings	5A Warren	6A Grundy	6A Sioux
5A Will	5A Johnson	4A Warrick	5A Guthrie	5A Story
4A Williamson	4A Knox	4A Washington	6A Hamilton	5A Tama
5A Winnebago	5A Kosciusko	5A Wayne	6A Hancock	5A Taylor
5A Woodford	5A Lagrange	5A Wells	6A Hardin	5A Union
INDIANA	5A Lake	5A White	5A Harrison	5A Van Buren
5A Adams	5A La Porte	5A Whitley	5A Henry	5A Wapello
5A Allen	4A Lawrence	IOWA	6A Howard	5A Warren
5A Bartholomew	5A Madison	5A Adair	6A Humboldt	5A Washington
5A Benton	5A Marion	5A Adams	6A Ida	5A Wayne
5A Blackford	5A Marshall	6A Allamakee	5A Iowa	6A Webster
	4A Martin		5A Jackson	6A Winnebago

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM-HUMID
DESIGNATIONS BY STATE, COUNTY AND TERRITORY

6A Winneshiek	4A Haskell	4A Sedgwick	2A Iberville*	6A Cumberland
5A Woodbury	4A Hodgeman	4A Seward	3A Jackson*	6A Franklin
6A Worth	4A Jackson	4A Shawnee	2A Jefferson*	6A Hancock
6A Wright	4A Jefferson	5A Sheridan	2A Jefferson Davis*	6A Kennebec
KANSAS	5A Jewell	5A Sherman	2A Lafayette*	6A Knox
4A Allen	4A Johnson	5A Smith	2A Lafourche*	6A Lincoln
4A Anderson	4A Kearny	4A Stafford	3A La Salle*	6A Oxford
4A Atchison	4A Kingman	4A Stanton	3A Lincoln*	6A Penobscot
4A Barber	4A Kiowa	4A Stevens	2A Livingston*	6A Piscataquis
4A Barton	4A Labette	4A Sumner	3A Madison*	6A Sagadahoc
4A Bourbon	5A Lane	5A Thomas	3A Morehouse	6A Somerset
4A Brown	4A Leavenworth	5A Trego	3A Natchitoches*	6A Waldo
4A Butler	4A Lincoln	4A Wabaunsee	2A Orleans*	6A Washington
4A Chase	4A Linn	5A Wallace	3A Ouachita*	6A York
4A Chautauqua	5A Logan	4A Washington	2A Plaquemines*	MARYLAND
4A Cherokee	4A Lyon	5A Wichita	2A Pointe Coupee*	4A Allegany
5A Cheyenne	4A Marion	4A Wilson	2A Rapides*	4A Anne Arundel
4A Clark	4A Marshall	4A Woodson	3A Red River*	4A Baltimore
4A Clay	4A McPherson	4A Wyandotte	3A Richland*	4A Baltimore (city)
5A Cloud	4A Meade	KENTUCKY	3A Sabine*	4A Calvert
4A Coffey	4A Miami	4A (all)	2A St. Bernard*	4A Caroline
4A Comanche	5A Mitchell	LOUISIANA	2A St. Charles*	4A Carroll
4A Cowley	4A Montgomery	2A Acadia*	2A St. Helena*	4A Cecil
4A Crawford	4A Morris	2A Allen*	2A St. James*	4A Charles
5A Decatur	4A Morton	2A Ascension*	2A St. John the Baptist*	4A Dorchester
4A Dickinson	4A Nemaha	2A Assumption*	2A St. Landry*	4A Frederick
4A Doniphan	4A Neosho	2A Avoyelles*	2A St. Martin*	5A Garrett
4A Douglas	5A Ness	2A Beauregard*	2A St. Mary*	4A Harford
4A Edwards	5A Norton	3A Bienville*	2A St. Tammany*	4A Howard
4A Elk	4A Osage	3A Bossier*	2A Tangipahoa*	4A Kent
5A Ellis	5A Osborne	3A Caddo*	3A Tensas*	4A Montgomery
4A Ellsworth	4A Ottawa	2A Calcasieu*	2A Terrebonne*	4A Prince George's
4A Finney	4A Pawnee	3A Caldwell*	3A Union*	4A Queen Anne's
4A Ford	5A Phillips	2A Cameron*	2A Vermilion*	4A Somerset
4A Franklin	4A Pottawatomie	3A Catahoula*	3A Vernon*	4A St. Mary's
4A Geary	4A Pratt	3A Claiborne*	2A Washington*	4A Talbot
5A Gove	5A Rawlins	3A Concordia*	3A Webster*	4A Washington
5A Graham	4A Reno	3A De Soto*	2A West Baton Rouge*	4A Wicomico
4A Grant	5A Republic	2A East Baton Rouge*	3A West Carroll	4A Worcester
4A Gray	4A Rice	3A East Carroll	2A West Feliciana*	MASSACHUSETTS
5A Greeley	5A Rooks	2A East Feliciana*	3A Winn*	5A (all)
4A Greenwood	4A Rush	2A Evangeline*	MAINE	MICHIGAN
5A Hamilton	4A Russell	3A Franklin*	6A Androscoggin	6A Alcona
4A Harper	4A Saline	3A Grant*	7 Aroostook	6A Alger
4A Harvey	5A Scott	2A Iberia*		

(continued)

GENERAL REQUIREMENTS

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM-HUMID
DESIGNATIONS BY STATE, COUNTY AND TERRITORY

5A Allegan	7 Mackinac	6A Carver	7 Otter Tail	3A Clay
6A Alpena	5A Macomb	7 Cass	7 Pennington	3A Coahoma
6A Antrim	6A Manistee	6A Chippewa	7 Pine	3A Copiah*
6A Arenac	6A Marquette	6A Chisago	6A Pipestone	3A Covington*
7 Baraga	6A Mason	7 Clay	7 Polk	3A DeSoto
5A Barry	6A Mecosta	7 Clearwater	6A Pope	3A Forrest*
5A Bay	6A Menominee	7 Cook	6A Ramsey	3A Franklin*
6A Benzie	5A Midland	6A Cottonwood	7 Red Lake	3A George*
5A Berrien	6A Missaukee	7 Crow Wing	6A Redwood	3A Greene*
5A Branch	5A Monroe	6A Dakota	6A Renville	3A Grenada
5A Calhoun	5A Montcalm	6A Dodge	6A Rice	2A Hancock*
5A Cass	6A Montmorency	6A Douglas	6A Rock	2A Harrison*
6A Charlevoix	5A Muskegon	6A Faribault	7 Roseau	3A Hinds*
6A Cheboygan	6A Newaygo	6A Fillmore	6A Scott	3A Holmes
7 Chippewa	5A Oakland	6A Freeborn	6A Sherburne	3A Humphreys
6A Clare	6A Oceana	6A Goodhue	6A Sibley	3A Issaquena
5A Clinton	6A Ogemaw	7 Grant	6A Stearns	3A Itawamba
6A Crawford	7 Ontonagon	6A Hennepin	6A Steele	2A Jackson*
6A Delta	6A Osceola	6A Houston	6A Stevens	3A Jasper
6A Dickinson	6A Oscoda	7 Hubbard	7 St. Louis	3A Jefferson*
5A Eaton	6A Otsego	6A Isanti	6A Swift	3A Jefferson Davis*
6A Emmet	5A Ottawa	7 Itasca	6A Todd	3A Jones*
5A Genesee	6A Presque Isle	6A Jackson	6A Traverse	3A Kemper
6A Gladwin	6A Roscommon	7 Kanabec	6A Wabasha	3A Lafayette
7 Gogebic	5A Saginaw	6A Kandiyohi	7 Wadena	3A Lamar*
6A Grand Traverse	6A Sanilac	7 Kittson	6A Waseca	3A Lauderdale
5A Gratiot	7 Schoolcraft	7 Koochiching	6A Washington	3A Lawrence*
5A Hillsdale	5A Shiawassee	6A Lac qui Parle	6A Watonwan	3A Leake
7 Houghton	5A St. Clair	7 Lake	7 Wilkin	3A Lee
6A Huron	5A St. Joseph	7 Lake of the Woods	6A Winona	3A Leflore
5A Ingham	5A Tuscola	6A Le Sueur	6A Wright	3A Lincoln*
5A Ionia	5A Van Buren	6A Lincoln	6A Yellow Medicine	3A Lowndes
6A Iosco	5A Washtenaw	6A Lyon		3A Madison
7 Iron	5A Wayne	7 Mahanomen		3A Marion*
6A Isabella	6A Wexford	7 Marshall		3A Marshall
5A Jackson		6A Martin		3A Monroe
5A Kalamazoo	MINNESOTA	6A McLeod		3A Montgomery
6A Kalkaska	7 Aitkin	6A Meeker		3A Neshoba
5A Kent	6A Anoka	7 Mille Lacs		3A Newton
7 Keweenaw	7 Becker	6A Morrison		3A Noxubee
6A Lake	7 Beltrami	6A Mower		3A Oktibbeha
5A Lapeer	6A Benton	6A Murray		3A Panola
6A Leelanau	6A Big Stone	6A Nicollet		2A Pearl River*
5A Lenawee	6A Blue Earth	6A Nobles		3A Perry*
5A Livingston	6A Brown	7 Norman		3A Pike*
7 Luce	7 Carlton	6A Olmsted		3A Pontotoc
			MISSISSIPPI	
			3A Adams*	
			3A Alcorn	
			3A Amite*	
			3A Attala	
			3A Benton	
			3A Bolivar	
			3A Calhoun	
			3A Carroll	
			3A Chickasaw	
			3A Choctaw	
			3A Claiborne*	
			3A Clarke	

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM-HUMID
DESIGNATIONS BY STATE, COUNTY AND TERRITORY

3A Prentiss	4A Christian	4A Moniteau	5A Worth	4A Essex
3A Quitman	5A Clark	4A Monroe	4A Wright	4A Gloucester
3A Rankin*	4A Clay	4A Montgomery	MONTANA	4A Hudson
3A Scott	5A Clinton	4A Morgan	6B (all)	5A Hunterdon
3A Sharkey	4A Cole	4A New Madrid	NEBRASKA	5A Mercer
3A Simpson*	4A Cooper	4A Newton	5A (all)	4A Middlesex
3A Smith*	4A Crawford	5A Nodaway	NEVADA	4A Monmouth
2A Stone*	4A Dade	4A Oregon	5B Carson City (city)	5A Morris
3A Sunflower	4A Dallas	4A Osage	5B Churchill	4A Ocean
3A Tallahatchie	5A Daviess	4A Ozark	3B Clark	5A Passaic
3A Tate	5A DeKalb	4A Pemiscot	5B Douglas	4A Salem
3A Tippah	4A Dent	4A Perry	5B Elko	5A Somerset
3A Tishomingo	4A Douglas	4A Pettis	5B Esmeralda	5A Sussex
3A Tunica	4A Dunklin	4A Phelps	5B Eureka	4A Union
3A Union	4A Franklin	5A Pike	5B Humboldt	5A Warren
3A Walthall*	4A Gasconade	4A Platte	5B Lander	NEW MEXICO
3A Warren*	5A Gentry	4A Polk	5B Lincoln	4B Bernalillo
3A Washington	4A Greene	4A Pulaski	5B Lyon	5B Catron
3A Wayne*	5A Grundy	5A Putnam	5B Mineral	3B Chaves
3A Webster	5A Harrison	5A Ralls	5B Nye	4B Cibola
3A Wilkinson*	4A Henry	4A Randolph	5B Pershing	5B Colfax
3A Winston	4A Hickory	4A Ray	5B Storey	4B Curry
3A Yalobusha	5A Holt	4A Reynolds	5B Washoe	4B DeBaca
3A Yazoo	4A Howard	4A Ripley	5B White Pine	3B Dona Ana
MISSOURI	4A Howell	4A Saline	NEW HAMPSHIRE	3B Eddy
5A Adair	4A Iron	5A Schuyler	6A Belknap	4B Grant
5A Andrew	4A Jackson	5A Scotland	6A Carroll	4B Guadalupe
5A Atchison	4A Jasper	4A Scott	5A Cheshire	5B Harding
4A Audrain	4A Jefferson	4A Shannon	6A Coos	3B Hidalgo
4A Barry	4A Johnson	5A Shelby	6A Grafton	3B Lea
4A Barton	5A Knox	4A St. Charles	5A Hillsborough	4B Lincoln
4A Bates	4A Laclede	4A St. Clair	6A Merrimack	5B Los Alamos
4A Benton	4A Lafayette	4A Ste. Genevieve	5A Rockingham	3B Luna
4A Bollinger	4A Lawrence	4A St. Francois	5A Stratford	5B McKinley
4A Boone	5A Lewis	4A St. Louis	6A Sullivan	5B Mora
5A Buchanan	4A Lincoln	4A St. Louis (city)	4A Atlantic	3B Otero
4A Butler	5A Linn	4A Stoddard	5A Bergen	4B Quay
5A Caldwell	5A Livingston	4A Stone	4A Burlington	5B Rio Arriba
4A Callaway	5A Macon	5A Sullivan	4A Camden	4B Roosevelt
4A Camden	4A Madison	4A Taney	4A Cape May	5B Sandoval
4A Cape Girardeau	4A Maries	4A Texas	4A Cumberland	5B San Juan
4A Carroll	5A Marion	4A Vernon		5B San Miguel
4A Carter	4A McDonald	4A Warren		5B Santa Fe
4A Cass	5A Mercer	4A Washington		4B Sierra
4A Cedar	4A Miller	4A Wayne		4B Socorro
5A Chariton	4A Mississippi	4A Webster		5B Taos

(continued)

GENERAL REQUIREMENTS

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM-HUMID
DESIGNATIONS BY STATE, COUNTY AND TERRITORY

5B Torrance	5A Rensselaer	4A Cleveland	3A Pamlico	6A Dunn
4B Union	4A Richmond	3A Columbus*	3A Pasquotank	7 Eddy
4B Valencia	5A Rockland	3A Craven	3A Pender*	6A Emmons
NEW YORK	5A Saratoga	3A Cumberland	3A Perquimans	7 Foster
5A Albany	5A Schenectady	3A Currituck	4A Person	6A Golden Valley
6A Allegany	6A Schoharie	3A Dare	3A Pitt	7 Grand Forks
4A Bronx	6A Schuylar	3A Davidson	4A Polk	6A Grant
6A Broome	5A Seneca	4A Davie	3A Randolph	7 Griggs
6A Cattaraugus	6A Steuben	3A Duplin	3A Richmond	6A Hettinger
5A Cayuga	6A St. Lawrence	4A Durham	3A Robeson	7 Kidder
5A Chautauqua	4A Suffolk	3A Edgecombe	4A Rockingham	6A LaMoure
5A Chemung	6A Sullivan	4A Forsyth	3A Rowan	6A Logan
6A Chenango	5A Tioga	4A Franklin	4A Rutherford	7 McHenry
6A Clinton	6A Tompkins	3A Gaston	3A Sampson	6A McIntosh
5A Columbia	6A Ulster	4A Gates	3A Scotland	6A McKenzie
5A Cortland	6A Warren	4A Graham	3A Stanly	7 McLean
6A Delaware	5A Washington	4A Granville	4A Stokes	6A Mercer
5A Dutchess	5A Wayne	3A Greene	4A Surry	6A Morton
5A Erie	4A Westchester	4A Guilford	4A Swain	7 Mountrail
6A Essex	6A Wyoming	4A Halifax	4A Transylvania	7 Nelson
6A Franklin	5A Yates	4A Harnett	3A Tyrrell	6A Oliver
6A Fulton	NORTH	4A Haywood	3A Union	7 Pembina
5A Genesee	CAROLINA	4A Henderson	4A Vance	7 Pierce
5A Greene	4A Alamance	4A Hertford	4A Wake	7 Ramsey
6A Hamilton	4A Alexander	3A Hok	4A Warren	6A Ransom
6A Herkimer	5A Alleghany	3A Hyde	3A Washington	7 Renville
6A Jefferson	3A Anson	4A Iredell	5A Watauga	6A Richland
4A Kings	5A Ashe	4A Jackson	3A Wayne	7 Rolette
6A Lewis	5A Avery	3A Johnston	4A Wilkes	6A Sargent
5A Livingston	3A Beaufort	3A Jones	3A Wilson	7 Sheridan
6A Madison	4A Bertie	4A Lee	4A Yadkin	6A Sioux
5A Monroe	3A Bladen	3A Lenoir	5A Yancey	6A Slope
6A Montgomery	3A Brunswick*	4A Lincoln	NORTH DAKOTA	6A Stark
4A Nassau	4A Buncombe	4A Macon	6A Adams	7 Steele
4A New York	4A Burke	4A Madison	7 Barnes	7 Stutsman
5A Niagara	3A Cabarrus	3A Martin	7 Benson	7 Towner
6A Oneida	4A Caldwell	4A McDowell	6A Billings	7 Traill
5A Onondaga	3A Camden	3A Mecklenburg	7 Bottineau	7 Walsh
5A Ontario	3A Carteret*	5A Mitchell	6A Bowman	7 Ward
5A Orange	4A Caswell	3A Montgomery	7 Burke	7 Wells
5A Orleans	4A Catawba	3A Moore	6A Burleigh	7 Williams
5A Oswego	4A Chatham	4A Nash	7 Cass	OHIO
6A Otsego	4A Cherokee	3A New Hanover*	7 Cavalier	4A Adams
5A Putnam	3A Chowan	4A Northampton	6A Dickey	5A Allen
4A Queens	4A Clay	3A Onslow*	7 Divide	5A Ashland
		4A Orange		

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM-HUMID
DESIGNATIONS BY STATE, COUNTY AND TERRITORY

5A Ashtabula	5A Marion	3A Caddo	3A Oklahoma	5B Malheur
5A Athens	5A Medina	3A Canadian	3A Okmulgee	4C Marion
5A Auglaize	5A Meigs	3A Carter	3A Osage	5B Morrow
5A Belmont	5A Mercer	3A Cherokee	3A Ottawa	4C Multnomah
4A Brown	5A Miami	3A Choctaw	3A Pawnee	4C Polk
5A Butler	5A Monroe	4B Cimarron	3A Payne	5B Sherman
5A Carroll	5A Montgomery	3A Cleveland	3A Pittsburg	4C Tillamook
5A Champaign	5A Morgan	3A Coal	3A Pontotoc	5B Umatilla
5A Clark	5A Morrow	3A Comanche	3A Pottawatomie	5B Union
4A Clermont	5A Muskingum	3A Cotton	3A Pushmataha	5B Wallowa
5A Clinton	5A Noble	3A Craig	3A Roger Mills	5B Wasco
5A Columbiana	5A Ottawa	3A Creek	3A Rogers	4C Washington
5A Coshocton	5A Paulding	3A Custer	3A Seminole	5B Wheeler
5A Crawford	5A Perry	3A Delaware	3A Sequoyah	4C Yamhill
5A Cuyahoga	5A Pickaway	3A Dewey	3A Stephens	PENNSYLVANIA
5A Darke	4A Pike	3A Ellis	4B Texas	
5A Defiance	5A Portage	3A Garfield	3A Tillman	
5A Delaware	5A Preble	3A Garvin	3A Tulsa	
5A Erie	5A Putnam	3A Grady	3A Wagoner	
5A Fairfield	5A Richland	3A Grant	3A Washington	5A Adams
5A Fayette	5A Ross	3A Greer	3A Washita	5A Allegheny
5A Franklin	5A Sandusky	3A Harmon	3A Woods	5A Armstrong
5A Fulton	4A Scioto	3A Harper	3A Woodward	5A Beaver
4A Gallia	5A Seneca	3A Haskell	OREGON	5A Bedford
5A Geauga	5A Shelby	3A Hughes		5A Berks
5A Greene	5A Stark	3A Jackson		5A Blair
5A Guernsey	5A Summit	3A Jefferson		5A Bradford
4A Hamilton	5A Trumbull	3A Johnston		4A Bucks
5A Hancock	5A Tuscarawas	3A Kay	5B Baker	5A Butler
5A Hardin	5A Union	3A Kingfisher	4C Benton	5A Cambria
5A Harrison	5A Van Wert	3A Kiowa	4C Clackamas	6A Cameron
5A Henry	5A Vinton	3A Latimer	4C Clatsop	5A Carbon
5A Highland	5A Warren	3A Le Flore	4C Columbia	5A Centre
5A Hocking	5A Wayne	3A Lincoln	4C Coos	4A Chester
5A Holmes	5A Williams	3A Logan	5B Crook	5A Clarion
5A Huron	5A Wood	3A Love	4C Curry	6A Clearfield
5A Jackson	5A Wyandot	3A Major	5B Deschutes	5A Clinton
5A Jefferson	OKLAHOMA	3A Marshall	4C Douglas	5A Columbia
5A Knox		3A Mayes	5B Gilliam	5A Crawford
5A Lake		3A McClain	5B Grant	5A Cumberland
4A Lawrence		3A McCurtain	5B Harney	5A Dauphin
5A Licking		3A McIntosh	5B Hood River	4A Delaware
5A Logan	3A Adair	3A Murray	4C Jackson	6A Elk
5A Lorain	3A Alfalfa	3A Muskogee	5B Jefferson	5A Erie
5A Lucas	3A Atoka	3A Noble	4C Josephine	5A Fayette
5A Madison	4B Beaver	3A Nowata	5B Klamath	5A Forest
5A Mahoning	3A Beckham	3A Okfuske	5B Lake	5A Franklin
	3A Blaine		4C Lane	5A Fulton
	3A Bryan		4C Lincoln	5A Greene
			4C Linn	5A Huntingdon

(continued)

GENERAL REQUIREMENTS

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM-HUMID
DESIGNATIONS BY STATE, COUNTY AND TERRITORY

5A Indiana	3A Barnwell*	5A Bon Homme	6A Moody	4A Giles
5A Jefferson	3A Beaufort*	6A Brookings	6A Pennington	4A Grainger
5A Juniata	3A Berkeley*	6A Brown	6A Perkins	4A Greene
5A Lackawanna	3A Calhoun	6A Brule	6A Potter	4A Grundy
5A Lancaster	3A Charleston*	6A Buffalo	6A Roberts	4A Hamblen
5A Lawrence	3A Cherokee	6A Butte	6A Sanborn	4A Hamilton
5A Lebanon	3A Chester	6A Campbell	6A Shannon	4A Hancock
5A Lehigh	3A Chesterfield	5A Charles Mix	6A Spink	3A Hardeman
5A Luzerne	3A Clarendon	6A Clark	6A Stanley	3A Hardin
5A Lycoming	3A Colleton*	5A Clay	6A Sully	4A Hawkins
6A McKean	3A Darlington	6A Codrington	5A Todd	3A Haywood
5A Mercer	3A Dillon	6A Corson	5A Tripp	3A Henderson
5A Mifflin	3A Dorchester*	6A Custer	6A Turner	4A Henry
5A Monroe	3A Edgefield	6A Davison	5A Union	4A Hickman
4A Montgomery	3A Fairfield	6A Day	6A Walworth	4A Houston
5A Montour	3A Florence	6A Deuel	5A Yankton	4A Humphreys
5A Northampton	3A Georgetown*	6A Dewey	6A Ziebach	4A Jackson
5A Northumberland	3A Greenville	5A Douglas	TENNESSEE	
5A Perry	3A Greenwood	6A Edmunds	4A Anderson	4A Jefferson
4A Philadelphia	3A Hampton*	6A Fall River	4A Bedford	4A Johnson
5A Pike	3A Horry*	6A Faulk	4A Benton	4A Knox
6A Potter	3A Jasper*	6A Grant	4A Bledsoe	3A Lake
5A Schuylkill	3A Kershaw	5A Gregory	4A Blount	3A Lauderdale
5A Snyder	3A Lancaster	6A Haakon	4A Bradley	4A Lawrence
5A Somerset	3A Laurens	6A Hamlin	4A Campbell	4A Lewis
5A Sullivan	3A Lee	6A Hand	4A Cannon	4A Lincoln
6A Susquehanna	3A Lexington	6A Hanson	4A Carroll	4A Loudon
6A Tioga	3A Marion	6A Harding	4A Carter	4A Macon
5A Union	3A Marlboro	6A Hughes	4A Cheatham	3A Madison
5A Venango	3A McCormick	5A Hutchinson	3A Chester	4A Marion
5A Warren	3A Newberry	6A Hyde	4A Claiborne	4A Marshall
5A Washington	3A Oconee	5A Jackson	4A Clay	4A Maury
6A Wayne	3A Orangeburg	6A Jerauld	4A Cocke	4A McMinn
5A Westmoreland	3A Pickens	6A Jones	4A Coffee	3A McNairy
5A Wyoming	3A Richland	6A Kingsbury	3A Crockett	4A Meigs
4A York	3A Saluda	6A Lake	4A Cumberland	4A Monroe
RHODE ISLAND		6A Lawrence	4A Davidson	4A Montgomery
5A (all)	3A Spartanburg	6A Lincoln	4A Decatur	4A Moore
SOUTH CAROLINA		6A Lyman	4A DeKalb	4A Morgan
3A Abbeville	SOUTH DAKOTA		4A Dickson	4A Obion
3A Aiken	6A Aurora	6A Meade	3A Dyer	4A Overton
3A Allendale*	6A Beadle	5A Mellette	3A Fayette	4A Perry
3A Anderson	5A Bennett	6A Miner	4A Fentress	4A Pickett
3A Bamberg*		6A Minnehaha	4A Franklin	4A Polk
			4A Gibson	4A Putnam
				4A Rhea
				4A Roane

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM-HUMID
DESIGNATIONS BY STATE, COUNTY AND TERRITORY

4A Robertson	4B Briscoe	2B Edwards*	3B Hudspeth	2A McLennan*
4A Rutherford	2A Brooks*	3A Ellis*	3A Hunt*	2A McMullen*
4A Scott	3A Brown*	3B El Paso	4B Hutchinson	2B Medina*
4A Sequatchie	2A Burleson*	3A Erath*	3B Irion	3B Menard
4A Sevier	3A Burnet*	2A Falls*	3A Jack	3B Midland
3A Shelby	2A Caldwell*	3A Fannin	2A Jackson*	2A Milam*
4A Smith	2A Calhoun*	2A Fayette*	2A Jasper*	3A Mills*
4A Stewart	3B Callahan	3B Fisher	3B Jeff Davis	3B Mitchell
4A Sullivan	2A Cameron*	4B Floyd	2A Jefferson*	3A Montague
4A Sumner	3A Camp*	3B Foard	2A Jim Hogg*	2A Montgomery*
3A Tipton	4B Carson	2A Fort Bend*	2A Jim Wells*	4B Moore
4A Trousdale	3A Cass*	3A Franklin*	3A Johnson*	3A Morris*
4A Unicoi	4B Castro	2A Freestone*	3B Jones	3B Motley
4A Union	2A Chambers*	2B Frio*	2A Karnes*	3A Nacogdoches*
4A Van Buren	2A Cherokee*	3B Gaines	3A Kaufman*	3A Navarro*
4A Warren	3B Childress	2A Galveston*	3A Kendall*	2A Newton*
4A Washington	3A Clay	3B Garza	2A Kenedy*	3B Nolan
4A Wayne	4B Cochran	3A Gillespie*	3B Kent	2A Nueces*
4A Weakley	3B Coke	3B Glasscock	3B Kerr	4B Ochiltree
4A White	3B Coleman	2A Goliad*	3B Kimble	4B Oldham
4A Williamson	3A Collin*	2A Gonzales*	3B King	2A Orange*
4A Wilson	3B Collingsworth	4B Gray	2B Kinney*	3A Palo Pinto*
TEXAS	2A Colorado*	3A Grayson	2A Kleberg*	3A Panola*
2A Anderson*	2A Comal*	3A Gregg*	3B Knox	3A Parker*
3B Andrews	3A Comanche*	2A Grimes*	3A Lamar*	4B Parmer
2A Angelina*	3B Concho	2A Guadalupe*	4B Lamb	3B Pecos
2A Aransas*	3A Cooke	4B Hale	3A Lampasas*	2A Polk*
3A Archer	2A Coryell*	3B Hall	2B La Salle*	4B Potter
4B Armstrong	3B Cottle	3A Hamilton*	2A Lavaca*	3B Presidio
2A Atascosa*	3B Crane	4B Hansford	2A Lee*	3A Rains*
2A Austin*	3B Crockett	3B Hardeman	2A Leon*	4B Randall
4B Bailey	3B Crosby	2A Hardin*	2A Liberty*	3B Reagan
2B Bandera*	3B Culberson	2A Harris*	2A Limestone*	2B Real*
2A Bastrop*	4B Dallam	3A Harrison*	4B Lipscomb	3A Red River*
3B Baylor	3A Dallas*	4B Hartley	2A Live Oak*	3B Reeves
2A Bee*	3B Dawson	3B Haskell	3A Llano*	2A Refugio*
2A Bell*	4B Deaf Smith	2A Hays*	3B Loving	4B Roberts
2A Bexar*	3A Delta	3B Hemphill	3B Lubbock	2A Robertson*
3A Blanco*	3A Denton*	3A Henderson*	3B Lynn	3A Rockwall*
3B Borden	2A DeWitt*	2A Hidalgo*	2A Madison*	3B Runnels
2A Bosque*	3B Dickens	2A Hill*	3A Marion*	3A Rusk*
3A Bowie*	2B Dimmit*	4B Hockley	3B Martin	3A Sabine*
2A Brazoria*	4B Donley	3A Hood*	3B Mason	3A San Augustine*
2A Brazos*	2A Duval*	3A Hopkins*	2A Matagorda*	2A San Jacinto*
3B Brewster	3A Eastland	2A Houston*	2B Maverick*	2A San Patricio*
	3B Ector	3B Howard	3B McCulloch	3A San Saba*

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM-HUMID
DESIGNATIONS BY STATE, COUNTY AND TERRITORY

3B Schleicher	2B Zapata*	4C Cowlitz	5A Hampshire	7 Bayfield
3B Scurry	2B Zavala*	5B Douglas	5A Hancock	6A Brown
3B Shackelford		6B Ferry	5A Hardy	6A Buffalo
3A Shelby*	UTAH	5B Franklin	5A Harrison	7 Burnett
4B Sherman	5B Beaver	5B Garfield	4A Jackson	6A Calumet
3A Smith*	6B Box Elder	5B Grant	4A Jefferson	6A Chippewa
3A Somervell*	6B Cache	4C Grays Harbor	4A Kanawha	6A Clark
2A Starr*	6B Carbon	4C Island	5A Lewis	6A Columbia
3A Stephens	6B Daggett	4C Jefferson	4A Lincoln	6A Crawford
3B Sterling	5B Davis	4C King	4A Logan	6A Dane
3B Stonewall	6B Duchesne	4C Kitsap	5A Marion	6A Dodge
3B Sutton	5B Emery	5B Kittitas	5A Marshall	6A Door
4B Swisher	5B Garfield	5B Klickitat	4A Mason	7 Douglas
3A Tarrant*	5B Grand	4C Lewis	4A McDowell	6A Dunn
3B Taylor	5B Iron	5B Lincoln	4A Mercer	6A Eau Claire
3B Terrell	5B Juab	4C Mason	5A Mineral	7 Florence
3B Terry	5B Kane	6B Okanogan	4A Mingo	6A Fond du Lac
3B Throckmorton	5B Millard	4C Pacific	5A Monongalia	7 Forest
3A Titus*	6B Morgan	6B Pend Oreille	4A Monroe	6A Grant
3B Tom Green	5B Piute	4C Pierce	4A Morgan	6A Green
2A Travis*	6B Rich	4C San Juan	5A Nicholas	6A Green Lake
2A Trinity*	5B Salt Lake	4C Skagit	5A Ohio	6A Iowa
2A Tyler*	5B San Juan	5B Skamania	5A Pendleton	7 Iron
3A Upshur*	5B Sanpete	4C Snohomish	4A Pleasants	6A Jackson
3B Upton	5B Sevier	5B Spokane	5A Pocahontas	6A Jefferson
2B Uvalde*	6B Summit	6B Stevens	5A Preston	6A Juneau
2B Val Verde*	5B Tooele	4C Thurston	4A Putnam	6A Kenosha
3A Van Zandt*	6B Uintah	4C Wahkiakum	5A Raleigh	6A Kewaunee
2A Victoria*	5B Utah	5B Walla Walla	5A Randolph	6A La Crosse
2A Walker*	6B Wasatch	4C Whatcom	4A Ritchie	6A Lafayette
2A Waller*	3B Washington	5B Whitman	4A Roane	7 Langlade
3B Ward	5B Wayne	5B Yakima	5A Summers	7 Lincoln
2A Washington*	5B Weber		5A Taylor	6A Manitowoc
2B Webb*	VERMONT	WEST VIRGINIA	5A Tucker	6A Marathon
2A Wharton*	6A (all)	5A Barbour	4A Tyler	6A Marinette
3B Wheeler		4A Berkeley	5A Upshur	6A Marquette
3A Wichita	VIRGINIA	4A Boone	4A Wayne	6A Menominee
3B Wilbarger	4A (all)	4A Braxton	5A Webster	6A Milwaukee
2A Willacy*		5A Brooke	5A Wetzel	6A Monroe
2A Williamson*	WASHINGTON	4A Cabell	4A Wirt	6A Oconto
2A Wilson*	5B Adams	4A Calhoun	4A Wood	7 Oneida
3B Winkler	5B Asotin	4A Clay	4A Wyoming	6A Outagamie
3A Wise	5B Benton	5A Doddridge		6A Ozaukee
3A Wood*	5B Chelan	5A Fayette	WISCONSIN	6A Pepin
4B Yoakum	4C Clallam	4A Gilmer	6A Adams	6A Pierce
3A Young	4C Clark	5A Grant	7 Ashland	6A Polk
	5B Columbia	5A Greenbrier	6A Barron	

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM-HUMID
DESIGNATIONS BY STATE, COUNTY AND TERRITORY

6A Portage	7 Vilas	6B Carbon	7 Sublette	NORTHERN MARIANA ISLANDS
7 Price	6A Walworth	6B Converse	6B Sweetwater	
6A Racine	7 Washburn	6B Crook	7 Teton	
6A Richland	6A Washington	6B Fremont	6B Uinta	1A (all)*
6A Rock	6A Waukesha	5B Goshen	6B Washakie	PUERTO RICO
6A Rusk	6A Waupaca	6B Hot Springs	6B Weston	
6A Sauk	6A Waushara	6B Johnson	US TERRITORIES	1A (all)*
7 Sawyer	6A Winnebago	6B Laramie		VIRGIN ISLANDS
6A Shawano	6A Wood	7 Lincoln	AMERICAN SAMOA	
6A Sheboygan	WYOMING	6B Natrona		1A (all)*
6A St. Croix		6B Niobrara	GUAM	1A (all)*
7 Taylor	6B Albany	6B Park		
6A Trempealeau	6B Big Horn	5B Platte		
6A Vernon	6B Campbell	6B Sheridan		

SECTION 07 6200

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Formed wall sheet metal fabrications.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For sheet metal flashing and trim.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Distinguish between shop- and field-assembled work.
 - 3. Include identification of finish for each item.
- C. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Product certificates: For each type of flashing that is ANSI/SPRI/FM 4435/ES-1 tested.
- B. Product test reports: For each product, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.
- B. Special Warranty.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are SPRI ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.

1.7 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and [SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. SPRI Wind Design Standard: Manufacture and install roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
 1. Design Pressure: As indicated on Drawings.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B 209M, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
 1. Clear Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
 2. Exposed Coil-Coated Finish:

- a. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
3. Color: As selected by Architect from manufacturer's full range.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead soft, fully annealed; 4 (polished directional satin) finish.

2.3 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.
- B. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
- C. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- D. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

- F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 - 1. Obtain field measurements for accurate fit before shop fabrication.
 - 2. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 - 3. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
 - 2. Use lapped expansion joints only where indicated on Drawings.
- C. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- E. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.
- F. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- G. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

2.6 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high, end dams. Fabricate from the following materials:
 - 1. Stainless Steel: 0.016 inch thick.

3.1 UNDERLAYMENT INSTALLATION

- A. Underlayment: Install underlayment, wrinkle free, according to manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.

3.2 INSTALLATION, GENERAL

- A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
 - 1. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
 - 5. Install continuous cleats with fasteners spaced not more than 12 inches (300 mm) o.c.
 - 6. Space individual cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 - 7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
 - 8. Do not field cut sheet metal flashing and trim by torch.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
 - 1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
 - 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction. Prepare joints and apply sealants to comply with requirements in Section 07 9200 "Joint Sealants."

- G. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

3.3 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.4 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

END OF SECTION 07 6200

SECTION 07 9200

JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Nonstaining silicone joint sealants.
 - 2. Urethane joint sealants.
 - 3. Immersible joint sealants.
 - 4. Mildew-resistant joint sealants.
 - 5. Butyl Joint Sealants
 - 6. Latex joint sealants.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
 - 1. Include manufacturer's printed statement of VOC content in g/l for each sealant and sealant primer.
- B. Manufacturer's installation instructions: indicate special procedures required.
- C. Samples: For each kind and color of joint sealant required.
- D. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports: For each kind of joint sealant, for tests performed by a qualified testing agency.
- B. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.

- C. Preconstruction field-adhesion-test reports. Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- D. Sample warranties. For special warranties.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.
- B. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years documented experience and approved by the manufacturer.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

1.7 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- C. Include coverage in Warranties for installed sealants and accessories that fail to achieve air-tight seal, exhibit loss of adhesion or cohesion or do not cure.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.
- B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; Dow Corning® 795 Silicone Building Sealant.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.; Silpruf NB.
 - c. May National Associates, Inc.; a subsidiary of Sika Corporation; Bondaflex Sil 295 FPS NB.
 - d. Pecora Corporation; Pecora 895NST.
 - e. Sika Corporation; Joint Sealants; Sikasil WS-295.
 - f. Tremco Incorporated; Spectrem 2.
- C. Silicone, Nonstaining, S, NS, 100/50, T, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Dow Corning Corporation; Dow Corning® 790 Silicone Building Sealant.

2.3 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Corp. - Construction Chemicals; MasterSeal CR 195 (Pre-2014: Sonolastic Ultra.
 - b. Bostik, Inc; Chem-Calk 915.
 - c. ER Systems; an ITW Company; Pacific Polymers Elasto-Thane 230 MP.
 - d. Everkem Diversified Products, Inc.; AcuraSeal 50 Year Acrylic Urethane Caulk.
 - e. Pecora Corporation; Dynatrol I-XL.
 - f. Polymeric Systems, Inc; Flexiprene 1000.
 - g. Schnee-Morehead, Inc., an ITW company; Permathane SM7108.
 - h. Sika Corporation; Joint Sealants; Sikaflex Textured Sealant.
 - i. Tremco Incorporated; Dymonic.
- B. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Corp. - Construction Chemicals; MasterSeal SL 1 (Pre-2014: Sonolastic SL1).
 - b. Pecora Corporation; NR-201.
 - c. Polymeric Systems, Inc; Flexiprene 952.
 - d. Schnee-Morehead, Inc., an ITW company; Permathane SM7101.

- e. Sherwin-Williams Company (The); Stampede 1SL.

2.4 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Adfast; Adseal 4800.
 - b. Dow Corning Corporation; DOW CORNING® 786 SILICONE SEALANT -.
 - c. GE Construction Sealants; Momentive Performance Materials Inc.; SCS1700 Sanitary.
 - d. May National Associates, Inc.; a subsidiary of Sika Corporation; Bondaflex Sil 100 WF.
 - e. Pecora Corporation; Pecora 860.
 - f. Soudal USA; RTV GP.
 - g. Tremco Incorporated; Tremsil 200.

2.5 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C1311 nondrying, nonskinning, noncuring.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Pecora: BA-98.
 - b. Tremco: Trempro JS 773.

2.6 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Everkem Diversified Products, Inc.; SilTex 40 Siliconized Acrylic Latex Caulk.
 - b. Franklin International; Titebond UA 920 Sealant.
 - c. Pecora Corporation; AC-20.
 - d. Sherwin-Williams Company (The); 950A Siliconized Acrylic Latex Caulk, White.
 - e. Tremco Incorporated; Tremflex 834.

2.7 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Adfast.
 - b. Alcot Plastics Ltd.
 - c. BASF Corp. - Construction Chemicals.
 - d. Construction Foam Products; a division of Nomaco, Inc.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.8 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove laitance and form-release agents from concrete.
 - 2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces.

3.2 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with ASTM C 1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 1. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated. All sealant joints shall have a clean, smooth surface, uniform thickness and craftsman like aesthetic.

3.3 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 - 1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
 - b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.
 - 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.4 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: General purpose exterior sealant.
 - 1. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Joints between plant-precast architectural concrete units.
 - c. Control and expansion joints in unit masonry.
 - d. Joints in dimension stone cladding.
 - e. Joints between metal or aluminum frames and other materials.
 - f. Other exterior joints for which no other sealant is indicated or specified.
 - 2. Joint Sealant: Urethane, NS, 25, NT, M, G, A.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- B. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
 - 1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in stone flooring.
 - c. Control and expansion joints in tile flooring.
 - d. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Urethane, S, P, 25, T, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement. General purpose sealant.
 - 1. Joint Locations:
 - a. Control joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
 - c. Interior wall and ceiling control joints.
 - d. Other interior joints for which no other type of sealant is indicated or specified.
 - 2. Joint Sealant: Acrylic latex: Type NF, paintable.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Concealed mastics.
 - 1. Joint Locations:
 - a. Aluminum thresholds.
 - b. Sill plates.
 - c. Concealed sealant bead in sheet metal work.
 - d. Concealed sealant bead in siding overlaps.
 - e. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Butyl-rubber based, non-drying, non-skinning and non-curing.
 - 3. Joint-Sealant Color: As indicated by manufacturer's designations.
- F. Joint-Sealant Application: Exterior Joints in Metal Components.
 - 1. Joint Locations:

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- a. Joints in storefront and door exterior joints.
2. Joint Sealant: Silicone, ASTM C920, NS, 25, NT, A, G, M, O.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 07 9200

SECTION 08 1113

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Interior standard steel doors and frames.
2. Exterior standard steel doors and frames.

B. Related Requirements:

1. Section 08 7100 "Door Hardware" for door hardware for hollow-metal doors.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.3 PREINSTALLATION MEETINGS

1.4 ACTION SUBMITTALS

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

B. Sustainable Design Submittals:

1. Environmental Product Declaration (EPD): Provide a Type III EPD according to ISO 14025 for the following products:
 - a. Interior Standard Steel Doors and Frames
 - b. Exterior Standard Steel Doors and Frames
2. Health Product Declaration (HPD): Provide a Health Product Declaration according to the requirements of the "HPD Open Standard" for the following products:
 - a. Interior Standard Steel Doors and Frames
 - b. Exterior Standard Steel Doors and Frames

C. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.

3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.

- D. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.5 INFORMATIONAL SUBMITTALS

- A. Product test reports. For each type of fire-rated hollow-metal door and frame assembly for tests performed by a qualified testing agency indicating compliance with performance requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. Ceco Door; ASSA ABLOY.
 - b. DE LA FONTAINE.
 - c. Republic Doors and Frames.
 - d. Steelcraft; an Allegion brand.
 - e. Technical Glass Products.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
1. Smoke- and Draft-Control Assemblies: Provide assemblies with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.
- C. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than U-0.61 (climate zones 1-4) or U-0.37 (climate zones 5-8) when tested in accordance with ASTM C1363 or ASTM E1423.

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

- B. Heavy-Duty Doors and Frames for fire rated locations: SDI A250.8, Level 2; SDI A250.4, Level B. At locations indicated in the Door and Frame Schedule.

1. Doors:

- a. Type: As indicated in the Door and Frame Schedule.
- b. Thickness: 1-3/4 inches.
- c. Face: Uncoated steel sheet, minimum thickness of 0.042 inch.
- d. Edge Construction: Model 1, Full Flush
- e. Core: Manufacturer's standard.
- f. Fire-Rated Core: Manufacturer's standard core for fire-rated doors.

2. Frames:

- a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
- b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
- c. Construction: Slip-on drywall at gypsum walls and Face welded at CMU walls.

2.4 EXTERIOR STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

1. Frames:

- a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A60 coating.
- b. Construction: Face welded.

2.5 BORROWED LITES

- 1. Fabricate of uncoated steel sheet, minimum thickness of 0.042 inch.
- 2. Construction: Face welded.

- B. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.

- C. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.6 FRAME ANCHORS

- A. Jamb Anchors:

- 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.

2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
 3. Postinstalled Expansion Anchor: Minimum 3/8-inch-diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Material: ASTM A 879, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008 or ASTM A 1011; hot-dip galvanized according to ASTM A 153, Class B.

2.7 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot-Rolled Steel Sheet: ASTM A 1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- D. Metallic-Coated Steel Sheet: ASTM A 653, Commercial Steel (CS), Type B.
- E. Inserts, Bolts, and Fasteners: Hot dip galvanized according to ASTM A 153.
- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- H. Glazing: Comply with requirements in Section 08 8000 "Glazing."

2.8 FABRICATION

- A. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 2. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

- B. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 - 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
 - 3. Provide reinforcing for surface mounted closer hardware not requiring through bolts.
- C. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.
 - 1. Provide stops and moldings flush with face of door, and with beveled or square stops unless otherwise indicated.
 - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
 - 4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
 - 5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

2.9 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

- A. A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with SDI A250.11.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - b. Install frames with removable stops located on secure side of opening.
 2. Fire-Rated Openings: Install frames according to NFPA 80.
 3. Floor Anchors: Secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 4. Solidly pack mineral-fiber insulation inside frames.
 5. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
1. Non-Fire-Rated Steel Doors: Comply with SDI A250.8.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 3. Smoke-Control Doors: Install doors according to NFPA 105.
- D. Glazing: Comply with installation requirements in Section 08 8000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 CLEANING AND TOUCHUP

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08 1113

SECTION 08 4113

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior Storefront framing.
2. Storefront framing for punched openings.

B. Related Requirements:

1. Section 07 9200 "Joint Sealants: for joint sealants associated with aluminum -framed entrances and storefronts.
2. Section 08 7100 "Door Hardware" for door hardware not specified in this section.
3. Section 08 8000 "Glazing" for glass and glazing.

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.

B. Sustainable Design Submittals:

1. Environmental Product Declaration (EPD): Provide a Type III EPD according to ISO 14025 for the following products:
 - a. Storefront Systems
2. Health Product Declaration (HPD): Provide a Health Product Declaration according to the requirements of the "HPD Open Standard" for the following products:
 - a. Storefront Systems

C. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.

- d. Glazing.
 - e. Flashing and drainage.
 - 3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
 - 4. Include point-to-point wiring diagrams showing the following:
 - a. Power requirements for each electrically operated door hardware.
 - b. Location and types of switches, signal device, conduit sizes, and number and size of wires.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
- E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- F. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- C. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Sample Warranties: For special warranties.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures, including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: 5 years from date of Substantial Completion.
- B. Special Finish Warranty, Anodized and/or Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing, spandrel panels and venting windows (if any) and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 - 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.

- b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
 - C. Structural Loads:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
 - D. Deflection of Framing Members: At design wind pressure, as follows:
 - 1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
 - 2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.
 - a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.
- Retain "Cantilever Deflection" Subparagraph below for parapets and similar components.
- 3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
 - a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch for spans greater than 11 feet 8-1/4 inches or 1/175 times span, for spans of less than 11 feet 8-1/4 inches.
 - E. Structural: Test according to ASTM E 330 as follows:
 - 1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
 - 2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
 - 3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
 - F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
 - 1. Fixed Framing and Glass Area:
 - a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.
 - 2. Entrance Doors:
 - G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
 - 1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. or 15 lbf/sq. ft. for wind-force debris regions.
 - H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:
 - 1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft.
 - 2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

- I. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and as indicated on the drawings.
 - 1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
- J. Energy Performance: Certify and label energy performance according to NFRC as follows:
 - 1. Thermal Transmittance (U-factor): Fixed glazing and framing areas as a system shall have U-factor of not more than 0.56 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
 - 2. Condensation Resistance: Fixed glazing and framing areas as a system shall have an NFRC-certified condensation resistance rating of no less than 55 as determined according to NFRC 500.
 - 3. Outdoor-Indoor Transmission Class: Minimum 30.
- K. Windborne-Debris Impact Resistance if indicated on the drawings:
- L. Windborne-Debris Impact Resistance if indicated on the drawings: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone protection category indicated on the drawings.
 - 1. Large-Missile Test: For glazed openings located within 30 feet of grade.
 - 2. Small-Missile Test: For glazed openings located more than 30 feet above grade.
- M. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
 - 2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
 - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
 - b. Low Exterior Ambient-Air Temperature: 0 deg F.
 - c. Interior Ambient-Air Temperature: 75 deg F.

2.3 STOREFRONT SYSTEMS

- A. Basis-of-Design Product for Exterior Systems: Subject to compliance with requirements, provide Kawneer North America, an Arconic company; Trifab 451T or a comparable product by one of the following:
 - 1. EFCO Corporation.
 - 2. Oldcastle Building Envelope™.
 - 3. Trulite Glass & Aluminum Solutions, LLC.
 - 4. Tubelite Inc.
 - 5. YKK AP America Inc.
- B. Basis-of-Design Product for Interior Systems: Subject to compliance with requirements, provide Kawneer North America, an Arconic company; Trifab 450 or a comparable product by one of the following:
 - 1. EFCO Corporation.
 - 2. Oldcastle Building Envelope™.
 - 3. Trulite Glass & Aluminum Solutions, LLC.
 - 4. Tubelite Inc.
 - 5. YKK AP America Inc.

- C. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Exterior Framing Construction: Thermally broken.
 - 2. Interior Vestibule Framing Construction: Thermally Broken.
 - 3. Interior Framing Construction: Non-thermally Broken.
 - 4. Glazing System: Retained mechanically with gaskets on four sides, unless noted otherwise on drawings.
 - 5. Glazing Plane: Center – unless indicated otherwise on the drawings.
 - 6. Finish: As indicated on the drawings.
 - 7. Fabrication Method: Field-fabricated stick system.
 - 8. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 9. Steel Reinforcement: As required by manufacturer.
 - 10. Provide high performance flashing system.
- D. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- E. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.4 GLAZING

- A. Glazing: Comply with Section 08 8000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.

2.5 MATERIALS

- A. Sheet and Plate: ASTM B 209.
- B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
- C. Extruded Structural Pipe and Tubes: ASTM B 429.
- D. Structural Profiles: ASTM B 308.
- E. Steel Reinforcement:
 - 1. Structural Shapes, Plates, and Bars: ASTM A 36.
 - 2. Cold-Rolled Sheet and Strip: ASTM A 1008.
 - 3. Hot-Rolled Sheet and Strip: ASTM A 1011.
 - 4. Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

2.6 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.
- E. Rigid PVC Filler.

2.7 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Physical and thermal isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Provisions for field replacement of glazing from interior.
 - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate flush glazing without projecting stops.
- E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
- F. Storefront Framing: Fabricate components for assembly using systems recommended by the manufacturer to meet requirements specified.
- G. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- B. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - 1. Color: As selected by Architect from full range of industry colors and color densities.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions, to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 - 6. Seal perimeter and other joints watertight unless otherwise indicated.
- B. Metal Protection:
 - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
 - 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

- C. Set continuous sill members and flashing in full sealant bed, as specified in Section 07 9200 "Joint Sealants," to produce weathertight installation.
- D. Install components plumb and true in alignment with established lines and grades.
- E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.
- F. Install glazing as specified in Section 08 8000 "Glazing."

3.4 ERECTION TOLERANCES

- A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
 - 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
 - 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
 - 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inchwide, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inchwide, limit offset from true alignment to 1/8 inch.
 - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
 - 4. Location: Limit variation from plane to 1/8 inch in 12 feet; over total length.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Refer to Section 01 4000 "Quality Requirements" for procurement requirements and responsibilities regarding a qualified testing agency to perform tests and inspections.
- B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.
 - 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
 - a. Perform a minimum of two tests in areas as directed by Architect.
 - 2. Air Leakage: ASTM E 783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
 - a. Perform a minimum of two tests in areas as directed by Architect.
 - 3. Water Penetration: ASTM E 1105 at a minimum uniform static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and shall not evidence water penetration.
- C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

- D. Prepare test and inspection reports.

3.6 MAINTENANCE SERVICE

1. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

END OF SECTION 08 4113

SECTION 08 7100

DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Mechanical door hardware for the following:
 - a. Swinging doors.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product in each finish specified, in manufacturer's standard size.
- C. Door hardware schedule. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
- D. Keying schedule.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample warranty. For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data. For each type of door hardware to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and of an Architectural Hardware Consultant who is available during the course of the Work to consult Contractor, Architect, and Owner about door hardware and keying.

1. Scheduling Responsibility: Preparation of door hardware and keying schedule.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion unless otherwise indicated below:
 - a. Manual Closers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of door hardware from a single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- B. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the DOJ's "2010 ADA Standards for Accessible Design" and the local standards of the local and state jurisdiction having authority.
1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
 4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.

2.3 SCHEDULED DOOR HARDWARE

- A. Provide products for each door that comply with requirements indicated in Part 2 and door hardware schedule.

1. Door hardware scheduled is attached to specifications.

2.4 HINGES

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allegion plc
 - b. Baldwin Hardware Corporation
 - c. Bommer Industries, Inc
 - d. Hager Companies
 - e. McKinney Products Company; an ASSA ABLOY Group company
 - f. Stanley Commercial Hardware; a division of Stanley Security Solutions; Div of The Stanley Works.

2.5 CONTINUOUS HINGES

- A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch-thick, hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.
- B. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.
 1. Products: Subject to compliance; series 780
 - a. Allegion plc.
 - b. Bommer Industries, Inc.
 - c. Hager Companies; Series 780
 - d. McKinney Products Company; an ASSA ABLOY Group company.
 - e. Stanley Commercial Hardware; a division of Stanley Security Solutions.

2.6 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 1. Bored Locks: Minimum 1/2-inch latchbolt throw.
 2. Mortise Locks: Minimum 3/4-inch latchbolt throw.
 3. Deadbolts: Minimum 1-inch bolt throw.
- C. Lock Backset: 2-3/4 inches unless otherwise indicated.
- D. Lock Trim:
 1. Description: As indicated on Drawings.

2. Levers: Cast.
 3. Escutcheons (Roses): Wrought.
 4. Dummy Trim: Match lever lock trim and escutcheons.
- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 2. Rabbet Front and Strike: Provide on locksets for rabbeted meeting stiles.
- F. Bored Locks: BHMA A156.2; Grade 1 or Grade 2 as scheduled; Series 4000.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allegion plc.
 - b. Best Access Systems: Stanley Security Solutions, Inc.
 - c. DORMA USA, Inc.
 - d. SARGENT Manufacturing Company; ASSA ABLOY.
 - e. Stanley Commercial Hardware; a division of Stanley Security Solutions.
- G. Mortise Locks: BHMA A156.13; Operational Grade 1 or Operational Grade 2 as scheduled; stamped steel case with steel or brass parts; Series 1000.
1. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - a. Allegion plc.
 - b. Best Access Systems: Stanley Security Solutions, Inc.
 - c. DORMA USA, Inc.
 - d. SARGENT Manufacturing Company; ASSA ABLOY.
 - e. Stanley Commercial Hardware; a division of Stanley Security Solutions.

2.7 AUXILIARY LOCKS

- A. Bored Auxiliary Locks: BHMA A156.36: Grade 1 or Grade 2, as indicated; with strike that suits frame.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allegion plc.
 - b. Best Access Systems: Stanley Security Solutions, Inc.
 - c. SARGENT Manufacturing Company; ASSA ABLOY.
 - d. Stanley Commercial Hardware; a division of Stanley Security Solutions.

2.8 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: BHMA A156.3.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allegion plc.
 - b. Best Access Systems: Stanley Security Solutions, Inc.
 - c. DORMA ISA Inc.
 - d. SARGENT Manufacturing Company; ASSA ABLOY.
 - e. Stanley Commercial Hardware; a division of Stanley Security Solutions.

2.9 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver. Provide cylinders from same manufacturer of locking devices.
- B. Standard Lock Cylinders: BHMA A156.5; Grade 1 cores; face finished to match lockset.
 - 1. Core Type: Removable.
- C. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.
- D. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.10 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock. Incorporate decisions made in keying conference.
 - 1. Master Key System: Change keys and a master key operate cylinders.
 - a. Provide three cylinder change keys and five master keys.
 - 2. Grand Master Key System: Change keys, a master key, and a grand master key operate cylinders.
 - a. Provide three cylinder change keys and five each of master and grand master keys.
- B. Keys: Nickel silver.
 - 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: "DO NOT DUPLICATE."

2.11 KEY CONTROL SYSTEM

- A. Key Control Cabinet: BHMA A156.28; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, two sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of equal to actual quantity of keys plus 10% additional capacity.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. American Key Boxes and Cabinets
 - b. GE Security, Inc.
 - c. HPC, Inc.
 - d. Lund Equipment Co., Inc
 - e. MMF Industries
 - f. TelKee; Oasis International
 - 2. Wall-Mounted Cabinet: Grade 1 cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.

2.12 KEY LOCK BOX

- A. Key Lock Box: Exterior wall mount lock box with metal body and weather cover. Box shall have resettable combination push button design.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Master Lock Model Number 5423D.
 - 2. Size: 3 1/8 inch wide lock body
 - 3. Internal dimensions: 3 1/2 inch height, 2 1/4 inch width, 1 inch depth.
 - 4. Box to be located at or near a door as indicated on the drawings or at the Owners or Architects direction.
 - a. Rockwood Manufacturing Company; an ASSA ABLOY Group Company.

2.13 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force. Provide closers to be mounted utilizing hardware without the use of through bolts.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allegion plc
 - b. DORMA USA, Inc.
 - c. Hager Companies.
 - d. SARGENT Manufacturing Company; ASSA ABLOY.
 - e. Stanley Commercial Hardware; a division of Stanley Security Solutions.
- B. NOTE: SURFACE CLOSERS SHALL BE PLACED ON THE MORE PRIVATE SIDE OF THE DOOR.

2.14 MECHANICAL STOPS AND HOLDERS

- A. Wall- and Floor-Mounted Stops: BHMA A156.16.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allegion plc.
 - b. Baldwin Hardware Corporation.
 - c. Don-Jo Mfg., Inc.
 - d. Hager Companies.
 - e. Rockwood Manufacturing Company; an ASSA ABLOY Group Company.

2.15 OVERHEAD STOPS AND HOLDERS

- A. Overhead Stops and Holders: BHMA A156.8.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allegion plc.
 - b. DORMA USA, Inc.

- c. Hager Companies; Series 7000
- d. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
- e. SARGENT Manufacturing Company; ASSA ABLOY.

2.16 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. M-D Building Products, Inc.
 - b. National Guard Products, Inc.
 - c. Pemko Manufacturing Co.
 - d. Reese Enterprise, Inc.
- B. Maximum Air Leakage: When tested according to ASTM E 283 with tested pressure differential of 0.3-inch wg, as follows:
 - 1. Smoke-Rated Gasketing: 0.3 cfm/sq. ft. of door opening.
 - 2. Gasketing on Single Doors: 0.3 cfm/sq. ft. of door opening.
 - 3. Gasketing on Double Doors: 0.50 cfm per foot of door opening.

2.17 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. M-D Building Products, Inc.
 - b. National Guard Products, Inc.
 - c. Pemko Manufacturing Co.
 - d. Reese Enterprise, Inc.

2.18 AUXILIARY DOOR HARDWARE

- A. Auxiliary Hardware: BHMA A156.16.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allegion plc.
 - b. Baldwin Hardware Corporation.
 - c. Don-Jo Mfg., Inc.
 - d. Hager Companies.
 - e. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
 - f. Trimco.

2.19 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated on Drawings to comply with the following unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Custom Steel Doors and Frames: HMMA 831.
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
- C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Replace construction cores with permanent cores as indicated in keying schedule.
- E. Key Control System:
 - 1. Key Control Cabinet: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
 - 2. Key Lock Boxes: Install where indicated or approved by Architect to provide controlled access for fire and medical emergency personnel.
 - 3. Key Control System Software: Set up multiple-index system based on final keying schedule.
- F. Thresholds: Set thresholds for exterior doors and other doors indicated in mastic tape for full length.
- G. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- H. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 - 1. Do not notch perimeter gasketing to install other surface-applied hardware.
- I. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.2 ADJUSTING

- A. Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.3 DOOR HARDWARE SCHEDULE: See Section 08 7110

END OF SECTION 08 7100

GENERAL NOTES

- 1 ALL NON-CONCEALED CLOSERS ARE TO BE MOUNTED ON THE MORE PRIVATE SIDE OF THE DOOR UNO. NOTIFY ARCHITECT OF ANY CONFLICTS.
- 2 ALL DOORS/HARDWARE SETS TO RECEIVE WEATHERSTRIPPING OR SILENCERS. DOOR HARDWARE SUPPLIER TO COORDINATE.
- 3 LEVERS TO BE SCHLAGE SPARTA OR YALE PACIFIC BEACH, BRUSHED CHROME FINISH UNO ON DRAWINGS
- 4 ALUM STOREFRONT PUSH/PULL BARS BASIS OF DESIGN: KAWNEER ARCHITECTS CLASSIC
- 5 FLOOR STOPS ARE PREFERRED. DOOR HARDWARE SUPPLIER TO SUBMIT RECOMMENDED WALL STOP LOCATIONS WHERE FLOOR STOPS ARE NOT POSSIBLE/RECOMMENDED

HARDWARE SET	QUANTITY	HARDWARE	ALLEGION MODEL INFO	ASSA ABLOY MODEL INFO
EXT-MTL				
FRAME	HM			
DOOR	HM			
COMMON LOCATIONS	EXTERIOR EGRESSES			
EACH TO HAVE	1	CONT. HINGE (COORD. FINISH WITH DOOR COLOR)	IVES - 224HD	PEMKO - FMHD1
	1	PANIC HARDWARE	VON DUPRIN - 98-L	SARGENT - 8804 ETL
	1	RIM CYLINDER	AS REQUIRED	AS REQUIRED
	1	LATCH GUARD	IVES - LG1	ROCKWOOD - 320
	1	SURFACE CLOSER	LCN - 4050 SCUSH MC	NORTON - CPS7500 M
	1	KICK PLATE - 12"x 1"LDW, CS, B4E (VERIFY FINISH)	IVES - 8400	ROCKWOOD - K1050
	1	RAIN DRIP (COORD. FINISH WITH FRAME COLOR)	ZERO - 142	PEMKO - 346
	1	SEALS	ZERO - 488S-BK	PEMKO - S88BL
	1	DOOR SWEEP (COORD. FINISH WITH DOOR COLOR)	ZERO - 8198	PEMKO - 345_NB
	1	THRESHOLD	ZERO - 65A	PEMKO - 2005AV

HARDWARE SET	QUANTITY	HARDWARE	ALLEGION MODEL INFO	ASSA ABLOY MODEL INFO
INT-OFFICE FRAME DOOR COMMON LOCATIONS EACH TO HAVE	HM WD OR METAL OFFICES			
		HINGE	IVES - 5BB1	MCKINNEY - TA2314
	1	OFFICE LOCK	SCHLAGE - ND50	SARGENT - 10G05
	1	CYL/CORE	AS REQUIRED	AS REQUIRED
	1	FLOOR STOP	IVES - FS441	ROCKWOOD - 482
INT-IT/STOR FRAME DOOR COMMON LOCATIONS EACH TO HAVE	HM WD OR METAL IT/SERVER ROOMS, STORAGE ROOMS			
		HINGES	IVES - 5BB1	MCKINNEY - TA2314
	1	STOREROOM LOCK	SCHLAGE - ND80	SARGENT - 10G04
	1	CYL/CORE	AS REQUIRED	AS REQUIRED
	1	SURFACE CLOSER	LCN - 1450 REG (1450 CUSH @ OUT-SWINGING DOORS)	NORTON - CLP7500 M
	1	KICK PLATE - 12"x 1"LDW, CS, B4E (FINISH TO MATCH LEVER)	IVES - 8400	ROCKWOOD - K1050
	1	FLOOR STOP (AT IN-SWINGING DOORS)	IVES - FS441	ROCKWOOD - 482
INT-CLASSROOM FRAME DOOR COMMON LOCATIONS EACH TO HAVE	HM WD OR METAL CLASSROOMS NOT IN A SCHOOL			
		HINGE	IVES - 5BB1	MCKINNEY - TA2314
	1	CLASSROOM LOCK	SCHLAGE - ND50	SARGENT - 10G05
	1	CYL/CORE	AS REQUIRED	AS REQUIRED
	1	FLOOR STOP	IVES - FS441	ROCKWOOD - 482
INT-PASSAGE FRAME DOOR COMMON LOCATIONS EACH TO HAVE	HM WD OR METAL CORRIDORS			
		HINGES	IVES - 5BB1	MCKINNEY - TA2314
	1	PASSAGE LOCK	SCHLAGE - ND10	SARGENT - 10U15
	1	SURFACE CLOSER	LCN - 4050 REG ARM (4050 CUSH @ OUT-SWINGING DOORS)	NORTON - CLP7500 M
	1	FLOOR STOP	IVES - FS441	ROCKWOOD - 482

END OF SECTION

SECTION 08 8000

GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Glass for:
 - a. windows,
 - b. doors,
 - c. storefront framing,
 - 2. Glazing sealants and accessories.

1.2 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

1.3 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Environmental Product Declaration (EPD): Provide a Type III EPD according to ISO 14025 for the following products:
 - a. Glass Products
 - b. Insulating Glass Units
 - c. Laminated glass
 - 2. Health Product Declaration (HPD): Provide a Health Product Declaration according to the requirements of the "HPD Open Standard" for the following products:

- a. Glass Products
- b. Insulating Glass Units
- c. Laminated glass

- C. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
- D. Glazing Accessory Samples: For sealants and spacers, in 12-inch (300-mm) lengths.
- E. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Preconstruction adhesion and compatibility test report.
- B. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

- A. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
 - 1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

1.8 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AGC Glass Company North America, Inc.
 2. Cardinal Glass Industries.
 3. Guardian Glass SunGuard.
 4. Pilkington North America.
 5. Vitro Architectural Glass.

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the International Building Code and ASTM E 1300.
1. Design Wind Pressures: As indicated on Drawings.
 2. Design Snow Loads: As indicated on Drawings.
 3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- B. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
 2. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. NGA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
- B. Ultraclear Float Glass: ASTM C 1036, Type I, Class I (clear), Quality-Q3; and with visible light transmission of not less than 91 percent.
- C. Tinted Annealed Float Glass: ASTM C 1036, Type I, Class 2 (tinted), Quality-Q3.
- D. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- E. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- F. Reflective- and Low-E-Coated Vision Glass: ASTM C 1376.

2.5 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
 - 1. Sealing System: Dual seals.
 - 2. Perimeter Spacer: Manufacturer's standard spacer material and construction.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Technoform Glass Insulation NA.; TGI-Spacer
 - 2) Thermix; s brand of Ensinger USA; Thermix

2.6 GLAZING SEALANTS

- A. General:
 - 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
 - a. Bostik, Inc.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.
 - c. Pecora Corporation.

2.7 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 1. AAMA 804.3 tape, where indicated.
 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.8 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- E. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

- E. Provide spacers for glass lites where length plus width is larger than 50 inches.
- F. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- G. Set glass lites in each series with uniform pattern, draw, bow and similar characteristics. All safety glazing marks to be on bottom edge of unit.
- H. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

3.2 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.3 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.4 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.5 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.

3.6 GLASS SCHEDULE

- A. See drawings for Glazing schedule and glazing notes.

END OF SECTION 08 8000

SECTION 09 2216

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.

B. Related Requirements:

1. Section 05 4000 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; and roof rafters and ceiling joists.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of code-compliance certification for studs and tracks.
- B. Evaluation reports for firestop tracks, post-installed anchors, and power-actuated fasteners.

1.4 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association, or the Steel Stud Manufacturers Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653, G40, hot-dip galvanized unless otherwise indicated.
- B. Studs and Tracks: ASTM C 645.
 - 1. Steel Studs and Tracks:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) CEMCO; California Expanded Metal Products Co.
 - 2) Custom Stud.
 - 3) Jaimes Industries.
 - 4) MarinoWARE.
 - 5) MBA Building Supplies.
 - 6) MRI Steel Framing, LLC.
 - 7) Phillips Manufacturing Co.
 - 8) SCAFCO Steel Stud Company.
 - 9) Steel Construction Systems.
 - 10) Steel Network, Inc. (The).
 - 11) Telling Industries.
 - b. Base-Metal Thickness and individual member size must meet the requirements of ASTM C 754.
- C. Slip-Type Head Joints: Where indicated, provide one of the following:
 - 1. Single Long-Leg Track System: ASTM C 645 top track with 2-inch-deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within of the top of studs to provide lateral bracing.
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. MarinoWARE.
 - b. MRI Steel Framing, LLC.
 - c. SCAFCO Steel Stud Company.
 - d. Steel Construction Systems.
 - 2. Minimum Base-Metal Thickness: 0.0329 inches.

- E. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ClarkDietrich Building Systems.
 - b. MarinoWARE.
 - c. MRI Steel Framing, LLC.
 - d. SCAFCO Steel Stud Company.
 - e. Steel Construction Systems.
 - 2. Depth: 1-1/2 inches.
 - 3. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ClarkDietrich Building Systems.
 - b. Jaimes Industries.
 - c. MarinoWARE.
 - d. MRI Steel Framing, LLC.
 - e. SCAFCO Steel Stud Company.
 - f. Steel Construction Systems.
 - 2. Minimum Base-Metal Thickness: 0.0179 inches.
 - 3. Depth: As indicated on Drawings.
- G. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
 - 1. Asphalt-Saturated Organic Felt: ASTM D 226/D 226M, Type I (No. 15 asphalt felt), nonperforated.
 - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.2 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum ½-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- E. Direct Furring:

1. Screw to wood framing.
 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced o.c.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION 09 2216

SECTION 09 2900

GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Sound attenuation blankets.
3. Acoustical Joint Sealants

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Environmental Product Declaration (EPD): Provide a Type III EPD according to ISO 14025 for the following products:
 - a. Interior Gypsum Board
 - b. Exterior Gypsum Board for Ceilings, Soffits, or Other Applications.
2. Health Product Declaration (HPD): Provide a Health Product Declaration according to the requirements of the "HPD Open Standard" for the following products:
 - a. Interior Gypsum Board
 - b. Exterior Gypsum Board for Ceilings, Soffits, or Other Applications.

C. Samples: For each texture finish indicated on same backing indicated for Work.

1.3 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Abuse-Resistant Gypsum Board: ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Georgia-Pacific Gypsum LLC.
 - c. National Gypsum Company.
 - d. USG Corporation.
 - 2. Core: 5/8 inch, Type X.
 - 3. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements.
 - 4. Indentation: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
 - 5. Soft-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements.
 - 6. Long Edges: Tapered.
 - 7. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- B. Gypsum Board, Type X: ASTM C 1396.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum.
 - b. CertainTeed Corporation.
 - c. Continental Building Products, LLC.
 - d. Georgia-Pacific Gypsum LLC.
 - e. National Gypsum Company.
 - f. PABCO Gypsum.
 - g. Temple-Inland Building Products by Georgia-Pacific.
 - h. USG Corporation.
 - 2. Thickness: 5/8 inch.
 - 3. Long Edges: Tapered.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc
 - 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Control Joint.
 - g. F-bead where indicated on the drawings.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 - 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

- D. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- E. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Accumetric LLC.
 - b. Everkem Diversified Products, Inc.
 - c. Franklin International.
 - d. Grabber Construction Products.
 - e. Hilti, Inc.
 - f. Pecora Corporation.
 - g. Specified Technologies, Inc.
 - h. USG Corporation.
- F. Thermal Insulation: As specified in Section 07 2100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS

- A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- B. Comply with ASTM C 840.
- C. Control Joints:
 - 1. Locate control joints as indicated on the drawings. If not indicated comply with the following:
 - a. A control joint shall be installed where a partition, wall, or ceiling traverses a construction joint (expansion, seismic or building control element) in the base building structure.
 - b. Control joints shall be installed where a wall or partition runs in an uninterrupted straight plane exceeding 30 linear feet.
 - c. Control joints in interior ceilings with perimeter relief shall be installed so that linear dimensions between control joints do not exceed 50 ft and total area between control joints does not exceed 2500 sq ft.
 - d. Control joints in interior ceilings without perimeter relief shall be installed so that linear dimensions between control joints do not exceed 30 ft and total area between control joints does not exceed 900 sq ft.
 - e. Control joints in exterior ceilings and soffits shall be installed so that linear dimensions between control joints do not exceed 30 ft (9100 mm) and total area between control joints does not exceed 900 sq ft
- D. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

- E. For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- F. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- G. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- H. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile, panels that are substrate for acoustical tile or where indicated on Drawings.
 - 3. Level 3: Where indicated on Drawings.
 - 4. Level 4: At any and all panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 09900 "Painting."
 - 5. Level 5: Walls and ceilings to receive semi-gloss paint finish, gloss paint finish, vinyl wall covering, vinyl graphics and other areas specifically indicated on the drawings.
 - a. Primer and its application to surfaces are specified in Section 09 9000 "Painting."

3.2 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 09 2900

SECTION 09 5113

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for interior ceilings.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Environmental Product Declaration (EPD): Provide a Type III EPD according to ISO 14025 for the following products:
 - a. Acoustical Panels
 - b. Metal Suspension System
 - c. Acoustical Sealant
 - 2. Health Product Declaration (HPD): Provide a Health Product Declaration according to the requirements of the "HPD Open Standard" for the following products:
 - a. Acoustical Panels
 - b. Metal Suspension System
 - c. Acoustical Sealant
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:
 - 1. Acoustical Panels: Set of 6-inch-Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch-long Samples of each type, finish, and color.
 - 3. Clips: Full-size hold-down, impact, and seismic clips.
- D. Delegated-Design Submittal: For seismic restraints for ceiling systems.
 - 1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Ceiling suspension-system members.
 2. Structural members to which suspension systems will be attached.
 3. Method of attaching hangers to building structure.
 - a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
 4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
 5. Size and location of initial access modules for acoustical panels.
 6. Items penetrating finished ceiling and ceiling-mounted items including the following:
 - a. Lighting fixtures.
 - b. Diffusers.
 - c. Grilles.
 - d. Speakers.
 - e. Sprinklers.
 - f. Access panels.
 - g. Perimeter moldings.
 7. Show operation of hinged and sliding components covered by or adjacent to acoustical panels.
 8. Minimum Drawing Scale: 1/4 inch = 1 foot.
- B. Qualification Data: For testing agency.
- C. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 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. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.
 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.
 3. Hold-Down Clips: Equal to 2 percent of quantity installed.
 4. Impact Clips: Equal to 2 percent of quantity installed.

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design seismic restraints for ceiling systems.
- B. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Class A, B or C according to ASTM E 1264.
 - 2. Smoke-Developed Index: 50 or less.

2.3 ACOUSTICAL PANELS

- A. Manufacturers: Subject to compliance with requirements, provide products as indicated on the drawings. If manufacturers or products are not listed, provide products by one of the following:
 - 1. American Gypsum.
 - 2. Armstrong World Industries, Inc.
 - 3. CertainTeed Corporation.
 - 4. Rockfon (Roxul Inc.).
 - 5. Tectum Inc.
 - 6. USG Corporation.
- B. Acoustical Panel Standard: Manufacturer's standard panels according to ASTM E 1264.

2.4 METAL SUSPENSION SYSTEM

- A. Manufacturers: Subject to compliance with requirements, provide products as indicated on the drawings. If manufacturers or products are not listed, provide products by one of the following:
 - 1. Armstrong World Industries, Inc.
 - 2. CertainTeed Corporation.
 - 3. Rockfon
 - 4. USG Corporation
- B. Metal Suspension-System Standard: Manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635.

1. Suspension system shall be compatible with panel selected.
2. High-Humidity Finish: Where indicated, provide coating tested and classified for "severe environment performance" according to ASTM C 635.

2.5 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- B. Hold-Down Clips: Manufacturer's standard hold-down.
- C. Impact Clips: Manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.
- D. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical panels in place during a seismic event.
 1. Touch up paint to match panel and grid units.
 2. Acoustic sealant per 079005

2.6 METAL EDGE MOLDINGS AND TRIM

- A. Manufacturers: Subject to compliance with requirements, provide products by same manufacturer selected for Acoustical Panels. If none selected, choose from one of the following:
 1. Armstrong World Industries, Inc.
 2. CertainTeed Corporation.
 3. Fry Reglet Corporation
 4. Rockfon
 5. Gordon, Inc.
 6. USG Corporation
- B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated.
- B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C 636, seismic design requirements, and manufacturer's written instructions.
 - 1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 - 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 - 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 8. Do not attach hangers to steel deck tabs.
 - 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
 1. Arrange directionally patterned acoustical panels as follows:
 - a. As indicated on reflected ceiling plans.
 2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
 3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
 5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 6. Install hold-down, impact and seismic clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.
 7. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.
 8. Protect lighting fixtures and air ducts according to requirements indicated for fire-resistance-rated assembly.

3.4 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.

- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: See Section 01 4000 “Quality Requirements” for special inspection requirements and procurement and responsibility for inspector to perform inspections.
 - 1. Periodic inspection during the installation of suspended ceiling grids according to ASCE/SEI 7.

3.6 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 5113

SECTION 09 6513

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Thermoset rubber base.
 - 2. Rubber molding accessories.

1.2 ACTION SUBMITTALS

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

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 for more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Burke Mercer Flooring Products; a division of Burke Industries Inc.
 - 2. Flexco.
 - 3. Johnsonite; a Tarkett company.
 - 4. Roppe Corporation, USA.
- B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
 - 1. Style and Location:
 - a. Style A, Straight: Provide in areas with carpet or as indicated on the drawings.
 - b. Style B, Cove: Provide in areas with resilient floor coverings or as indicated on the drawings.
- C. Thickness: 0.125 inch.
- D. Height: 4 inches unless otherwise indicated on the drawings.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Preformed.
- G. Inside Corners: Preformed.
- H. Colors: As indicated on the drawings and selected by manufacturer's full range.

2.2 RUBBER MOLDING ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Same manufacturer as rubber base.
- B. Description: Nosings, reducer strips, carpet edge or other accessory if indicated on the drawings.
- C. Profile and Dimensions: As indicated on drawings.
- D. Locations: Provide rubber molding accessories in areas indicated.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-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. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until materials are the same temperature as space where they are to be installed.
- D. 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. Preformed Corners: Install preformed corners before installing straight pieces.

- G. Job-Formed Corners: Not permitted.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

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

END OF SECTION 09 6513

SECTION 09 6523
LUXURY VINYL TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Luxury Vinyl Tile.
 - 2. Acoustical underlayment.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and pattern specified.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Luxury Vinyl Tile: Furnish one box for every 30 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.7 DELIVERY, STORAGE, AND HANDLING

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

1.8 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 LUXURY VINYL TILE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. JJ Flooring
 - b. LSI Floors.
- B. Wearing Surface: As indicated on drawings.
- C. Thickness: 5mm.
- D. Size: as indicated on the drawings.
- E. Colors and Patterns: As indicated on the drawings.

2.3 ACOUSTICAL UNDERLAYMENT

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. JJ Flooring
- B. Model: SoundCheck SC100
- C. Material: Polyurethane Foam
- D. Thickness: 0.055 inches.

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated. LEED Only

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM 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 floor tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing.

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. 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 floor tiles until materials are the same temperature as space where they are to be installed.
 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 1. Lay tiles in pattern indicated on drawings.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 1. Lay tiles in pattern of colors and sizes indicated.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover floor tile until Substantial Completion.

END OF SECTION 09 6523

SECTION 09 9000

PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following substrates:
 - 1. Steel and iron.
 - 2. Galvanized metal.
 - 3. Aluminum (not anodized or otherwise coated).
 - 4. Wood.
 - 5. Fiberglass.
 - 6. Plastic.
 - 7. Gypsum board.

1.2 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted including MPI Product Number.
 - 2. Indicate VOC content.
- B. Sustainable Design Submittals:

1. Environmental Product Declaration (EPD): Provide a Type III EPD according to ISO 14025 for the following products:
 - a. Paint.
 2. Health Product Declaration (HPD): Provide a Health Product Declaration according to the requirements of the “HPD Open Standard” for the following products:
 - a. Paint.
 - C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
 1. Submit Samples on rigid backing, 8 inches square.
 2. Apply coats on Samples in steps to show each coat required for system.
 3. Label each coat of each Sample.
 4. Label each Sample for location and application area.
 - D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.
- 1.4 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. Paint: 5 percent, but not less than of each material and color applied.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.
- 1.6 FIELD CONDITIONS
- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
 - B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Benjamin Moore & Co.
 - 2. Pittsburgh Paints Co.
 - 3. Sherwin-Williams Company (The).
- B. Products: Subject to compliance with requirements, provide product listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Colors: As indicated on the drawings.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Wood: 15 percent.
 - 2. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer, but not less than the following:
 - 1. SSPC-SP 2.
 - 2. SSPC-SP 3.
 - 3. SSPC-SP 7/NACE No. 4.
 - 4. SSPC-SP 11.
- E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- G. Aluminum Substrates: Remove loose surface oxidation.
- H. Wood Substrates:
 - 1. Scrape and clean knots and apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- I. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed in equipment rooms (unless indicated otherwise):
 - a. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - 2. Paint the following work where exposed in occupied spaces or exterior to the building (unless indicated otherwise):

- a. Equipment, including panelboards.
 - b. Metal conduit.
 - c. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - d. Other items as directed by Architect.
3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 PAINTING SCHEDULE

- A. Painting Schedule provided in separate Specification Section.

END OF SECTION 09 9000

SECTION 09 9110 - PAINT SCHEDULE
PRAXIS3

Interior	Substrate	Manufacturer	Primer	Final Coat(s)	Sheen
Walls	Gypsum Board	Benjamin Moore	Ultra Spec 500 Interior Latex Primer, N534 (zero VOC)	Super Hide Interior Latex (low VOC) - 2 coats	Eggshell - N297
		Pittsburgh Paints Co	Speedhide Zero VOC Interior Latex Sealer 6-4900XI	Speedhide Zero VOC Interior Latex Wall Paint - 2 coats	Eggshell, 6-411ZV
		Sherwin Williams	ProMar 200 Zero VOC Latex Primer, B28W2600	ProMar 200 HP Zero VOC Latex Wall Paint - 2 coats	Eg-shell, B20-1900 Series
Interior Steel, Misc. Metal and Hollow Metal Frames and Doors	Steel	Benjamin Moore	Acrylic Metal Primer, HP1100	HP2210 Alkyd Urethane Enamel	Semi-Gloss
		Pittsburgh Paints Co	PITT-TECH Plus EP DTM Acrylic Primer 90-1908 Series	GLYPTEX Interior Alkyd Enamel	Semi-Gloss - 439-10 Series
		Sherwin Williams	ProCryl Universal Waterbased Primer, B66-1300 Series	Pro Industrial Acrolon 100 HS	Semi-Gloss - B65W series
Wood	Wood Doors, Frames, Trim	Benjamin Moore	284 Super Hide Latex Primer	283 Super Hide Latex Enamel - 2 coats	Semi-Gloss
		Pittsburgh Paints Co	Speedhide Zero VOC Interior Latex Primer 6-4900XI	Speedhide Zero Interior Latex Paint - 2 coats	Semi-Gloss, 6-5510 Series
		Sherwin Williams	Premium Wall & Wood Interior Latex Primer, B28W08111	ProMar 200 Zero VOC Latex Wall paint - 2 coats	Semi-Gloss, B31-02651

SECTION 09 9110 - PAINT SCHEDULE
PRAXIS3

Interior Ceilings	Substrate	Manufacturer	Primer	Final Coat(s)	Sheen
	Metal structure, exposed ducts, etc. (Dry Fog)	Benjamin Moore	Acrylic metal primer, HP1100	395 Latex Dryfall	Flat
		Pittsburgh Paints Co	PITT-TECH Plus EP DTM Acrylic Primer 90-1908 Series	Speedhide Super Tech WB Interior Dry Fog Latex	Flat - 6-725XI Series
		Sherwin Williams	ProCryl Universal Waterbased Primer, B66-1300 Series	Waterborne Acrylic Dryfall	Flat - B42 Series

SECTION 09 9110 - PAINT SCHEDULE
PRAXIS3

Exterior	Substrate	Manufacturer	Primer	Final Coat(s)	Sheen
Hollow Metal Frames and Doors	Steel	Benjamin Moore	Acrylic Metal Primer, HP1100	HP-2200 Alkyd Urethane Enamel	Gloss
		Pittsburgh Paints Co	PITT TECH Plus EP DTM Acrylic Prime/ Finish,(90- 1912) 90-1908 Series	GLYPTEX Alkyd Enamel	Gloss - 4139-10 Series
		Sherwin Williams	ProCryl Universal Waterbased Primer, B66- 1300 Series	Pro Industrial Urethane Alkyd Enamel - 2 coats	Gloss - B54-151 Series
Pipe Bollards	Steel	Benjamin Moore	Acrylic Metal Primer, HP1100	HP-2200 Alkyd Urethane Enamel	Gloss
		Pittsburgh Paints Co	PITT TECH Plus EP DTM Acrylic Prime/ Finish,(90- 1912) 90-1908 Series	GLYPTEX Alkyd Enamel	Gloss - 4139-10 Series
		Sherwin Williams	ProCryl Universal Waterbased Primer, B66- 1300 Series	Pro Industrial Urethane Alkyd Enamel - 2 coats	Gloss - B54-151 Series
Steel Detailing	Steel	Benjamin Moore	Universal Metal Primer, HP1320	HP-2200 Alkyd Urethane Enamel	Gloss
		Pittsburgh Paints Co	PITT TECH Plus EP DTM Acrylic Prime/ Finish,(90- 1912) 90-1908 Series	GLYPTEX Alkyd Enamel	Gloss - 4139-10 Series
		Sherwin Williams	Kem Kromik Universal Metal Primer, B50Z Series	Pro Industrial Urethane Alkyd Enamel - 2 coats	Gloss - B54-151 Series

SECTION 10 1423

ROOM-IDENTIFICATION PANEL SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes room-identification signs that are directly attached to the building.

1.2 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.3 COORDINATION

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For room-identification signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
- D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Room-Identification Signs: Full-size Sample.
 - 2. Variable Component Materials: Full-size Sample of each base material, character (letter, number, and graphic element) in each exposed color and finish not included in Samples above.
 - 3. Exposed Accessories: Full-size Sample of each accessory type.
 - 4. Full-size Samples, if approved, will be returned to Contractor for use in Project.
- E. Product Schedule: For room-identification signs. Use same designations indicated on Drawings or specified.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

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

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Variable Component Materials: 12 replaceable text inserts and interchangeable characters (letters, numbers, and graphic elements) of each type.
 - 2. Tools: One set(s) of specialty tools for assembling signs and replacing variable sign components.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify locations of anchorage devices and electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" the ABA standards of the Federal agency having jurisdiction and ICC A117.1.

2.2 ROOM-IDENTIFICATION SIGNS

- A. Room-Identification Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ACE Sign Systems, Inc.
 - b. Advance Corporation.
 - c. APCO Graphics, Inc.
 - d. ASI Sign Systems, Inc.
 - e. Best Sign Systems, Inc.
 - f. Diskey Architectural Signage Inc.
 - g. Vista System.
 - 2. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated over subsurface graphics to acrylic backing sheet to produce composite sheet.
 - a. Composite-Sheet Thickness: Manufacturer's standard for size of sign.
 - b. Subsurface Graphics (if any): Reverse halftone or dot-screen image.
 - c. Color(s): As selected by Architect from manufacturer's full range.
 - 3. Sign-Panel Perimeter: Finish edges smooth.
 - a. Edge Condition: Square cut.
 - b. Corner Condition in Elevation: Rounded.
 - 4. Mounting: adhesive or two-face tape.
 - 5. Text and Typeface: Accessible raised characters and Braille, typeface as selected by Architect from manufacturer's full range and variable content as scheduled. Finish raised characters to contrast with background color, and finish Braille to match background color.

2.3 SIGN MATERIALS

- A. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- B. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

- A. Adhesive: As recommended by sign manufacturer.
- B. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 4. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
 - 5. For signs scheduled to be mounted to glass substrates, provide back plate or other means to conceal attachment from opposite side of glass.
- B. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

- B. Accessibility: Install signs in locations on walls as indicated on Drawings and according to the accessibility standard.
- C. Mounting Methods:
 - 1. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
 - 2. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

3.2 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 1423

SECTION 10 2600
WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Corner guards.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

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

B. Shop Drawings: For each type of wall protection showing locations and extent.

1. Include plans, elevations, sections, and attachment details.

C. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:

1. Corner Guards: 12 inches long. Include examples of top caps.

1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of cover installed, but no fewer than two, 48-inch-long units.

2. Mounting and Accessory Components: Amounts proportional to the quantities of extra materials. Package mounting and accessory components with each extra material.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
 - b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.
 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain wall-protection products of each type from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 450 or less.

2.3 CORNER GUARDS

- A. Surface-Mounted, Metal Corner Guards: Fabricated as one piece from formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Babcock-Davis.
 - b. Construction Specialties, Inc.
 - c. Nystrom, Inc.
 2. Material: Stainless-steel sheet, Type 304.
 - a. Thickness: Minimum 0.0500 inch.

- b. Finish: Directional satin, No. 4.
- 3. Wing Size: Nominal 1-1/2 by 1-1/2 inches.
- 4. Corner Radius: 1/8 inch.
- 5. Mounting: Flat-head, countersunk screws through factory-drilled mounting holes.

2.4 FINISHES

- A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing wall and door protection.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. Installation Quality: Install corner protection according to manufacturer's written instructions, level, plumb, and true to line without distortions.
- B. Mounting Heights: Install wall and door protection in locations and at mounting heights indicated on Drawings.
- C. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.
 - 1. Provide anchoring devices and suitable locations to withstand imposed loads.
 - 2. Adjust top caps as required to ensure tight seams.

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END OF SECTION 10 2600

SECTION 10 4413
FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes fire-protection cabinets for portable fire extinguishers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For fire-protection cabinets.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data: For fire-protection cabinets to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

1.5 SEQUENCING

- A. Apply decals or vinyl lettering on field- painted fire-protection cabinets after painting is complete.
- B. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 - PRODUCTS

2.1 FIRE-PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Larsens Manufacturing Company
 - b. Nystrom, Inc.
 - c. Potter Roemer LLC.
- B. Cabinet Material: Cold-rolled steel sheet.
- C. Recessed Cabinet:
 1. Provide a fully recessed cabinet where depth of framing allows at each location.
 2. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).
- D. Cabinet Trim Material: Steel sheet.
- E. Door Material: Steel sheet.
- F. Door Style: Vertical duo panel with frame.
- G. Door Glazing: Clear float glass.
- H. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
- I. Accessories:
 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
 3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
 - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER".
 - 1) Location: Applied to cabinet glazing.
 - 2) Application Process: Pressure-sensitive vinyl letters.
 - 3) Lettering Color: Black
 - 4) Orientation: Vertical.
- J. Materials:
 1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
 - a. Finish: Baked enamel, TGIC polyester powder coat, HAA polyester powder coat, epoxy powder coat, or polyester/epoxy hybrid powder coat, complying with AAMA 2603.
 - b. Color: As selected by Architect from manufacturer's full range of industry colors and color densities.

2. Stainless Steel: ASTM A 666, Type 304.
 - a. Finish: No. 4 directional satin finish.
3. Clear Float Glass: ASTM C 1036, Type I, Class 1, Quality q3, 6 mm thick.

2.2 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.
- B. Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
- C. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
- D. Identification: Apply decals or vinyl lettering at locations indicated.
- E. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

3.2 SCHEDULES

- A. Provide recessed cabinets w/extinguisher at finished steel stud framed walls as indicated above.

END OF SECTION 10 4413

SECTION 10 4416
FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data: For fire extinguishers to include in maintenance manuals.

1.6 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

- 1. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Amerex Corporation.
 - b. Ansul Incorporated; Tyco International.
 - c. Babcock-Davis.
 - d. Badger Fire Protection.
 - e. Guardian Fire Equipment, Inc.
 - f. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - g. Kidde Residential and Commercial Division.
 - h. Larsens Manufacturing Company.
 - i. Nystrom, Inc.
 - j. Potter Roemer LLC.
 - k. Pyro-Chem; Tyco Fire Suppression & Building Products.
 - 2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type: UL-rated 10 pound nominal capacity, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Install fire extinguishers in cabinets in locations indicated and in compliance with requirements of authorities having jurisdiction.

END OF SECTION 10 4416

SECTION 12 3661

SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid surface material countertops.
 - 2. Solid surface material backsplashes.
 - 3. Solid surface material end splashes.
 - 4. Solid surface window stools.

1.3 ACTION SUBMITTALS

- A. Product Data: For countertop materials.
- B. Sustainable Design Submittals:
 - 1. Environmental Product Declaration (EPD): Provide a Type III EPD according to ISO 14025 for the following products:
 - a. Solid Surface Materials.
 - 2. Health Product Declaration (HPD): Provide a Health Product Declaration according to the requirements of the "HPD Open Standard" for the following products:
 - a. Solid Surface Materials.
- C. 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.
- D. Samples for Verification: For the following products:
 - 1. Countertop material, 6 inches square.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.5 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.

1.6 QUALITY ASSURANCE

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

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Panolam Surface Systems.
 - b. Avonite Surfaces.
 - c. E. I. du Pont de Nemours and Company.
 - d. Formica Corporation.
 - e. LG Chemical, Ltd.
 - f. Wilsonart LLC.
 - 2. Type: Provide Standard type or Veneer type made from material complying with requirements for Standard type, as indicated unless Special Purpose type is indicated.
 - 3. Colors and Patterns: As scheduled or indicated on the drawings.
- B. Particleboard: ANSI A208.1, Grade M-2.
- C. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 COUNTERTOP 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: Premium.
- B. Configuration:

1. Front: Straight, slightly eased at top.
 2. Backsplash: Straight, slightly eased at corner.
 3. End Splash: Matching backsplash.
- C. Countertops: 3/4-inch-thick, solid surface material with front edge built up with same material.
- D. Backsplashes: 3/4-inch-thick, solid surface material.
- E. 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.
- F. Joints: Fabricate countertops without joints where possible.

2.3 WINDOW STOOLS

- A. Window stools to be ½ inch thick with size as indicated on the drawings.
1. Color to be as scheduled or indicated on the drawings.

2.4 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer.

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. 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.
- C. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

1. Install metal splines in kerfs in countertop edges at joints where indicated. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
 2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned, and joints are of specified width.
- D. 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.
- E. 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.
- F. Apply sealant to gaps at walls; comply with Section 07 9200 "Joint Sealants."

END OF SECTION 12 3661

SECTION 13 3419
METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manufacturer Engineered Structural-steel framing.
2. Metal roof panels.
3. Foamed-insulation-core metal wall panels.
4. Thermal insulation.
5. Accessories.

1.2 DEFINITIONS

- A. Terminology Standard: See MBMA's "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in standards referenced by this Section.

1.3 COORDINATION

- A. Coordinate sizes and locations of concrete foundations and casting of anchor-rod inserts into foundation walls and footings. Anchor rod installation, concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."
- B. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS

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

1. Review methods and procedures related to metal building systems including, but not limited to, the following:
 - a. Condition of foundations and other preparatory work performed by other trades.
 - b. Structural load limitations.
 - c. Construction schedule. Verify availability of materials and erector's personnel, equipment, and facilities needed to make progress and avoid delays.
 - d. Required tests, inspections, and certifications.
 - e. Unfavorable weather and forecasted weather conditions and impact on construction schedule.

2. Review methods and procedures related to metal roof panel assemblies including, but not limited to, the following:
 - a. Compliance with requirements for purlin and rafter conditions, including flatness and attachment to structural members.
 - b. Structural limitations of purlins and rafters during and after roofing.
 - c. Flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
 - d. Temporary protection requirements for metal roof panel assembly during and after installation.
 - e. Roof observation and repair after metal roof panel installation.
3. Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:
 - a. Compliance with requirements for support conditions, including alignment between and attachment to structural members.
 - b. Structural limitations of girts and columns during and after wall panel installation.
 - c. Flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
 - d. Temporary protection requirements for metal wall panel assembly during and after installation.
 - e. Wall observation and repair after metal wall panel installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of metal building system component.
 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Metal roof panels.
 - b. Foamed-insulation-core metal panels.
 - c. Metal soffit panels.
 - d. Thermal insulation and vapor-retarder facings.
- B. Shop Drawings: Indicate components by others. Include full building plan, elevations, sections, details and the following:
 1. Anchor-Rod Plans: Submit anchor-rod plans and templates before foundation work begins. Include location, diameter, and minimum required projection of anchor rods required to attach metal building to foundation. Indicate column reactions at each location.
 2. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
 3. Metal Roof and Wall Panel Layout Drawings: Show layouts of panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, clip spacing, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.

- a. Show roof-mounted items including roof hatches, equipment supports, pipe supports and penetrations, lighting fixtures, and items mounted on roof curbs.
 - b. Show wall-mounted items including personnel doors, windows, louvers, and lighting fixtures.
4. Accessory Drawings: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:
 - a. Flashing and trim.
 - b. Gutters.
 - c. Downspouts.
- C. Samples for Initial Selection: For units with factory-applied finishes.
- D. Samples for Verification: For the following products:
 1. Panels: Nominal 12 inches long by actual panel width. Include fasteners, closures, and other exposed panel accessories.
 2. Flashing and Trim: Nominal 12 inches long. Include fasteners and other exposed accessories.
 3. Vapor-Retarder Facings: Nominal 6-inch-square Samples.
- E. Delegated-Design Submittal: For metal building systems.
 1. Include analysis data indicating compliance with performance requirements and design data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For erector and manufacturer.
- B. Welding certificates.
- C. Letter of Design Certification: Signed and sealed by a qualified professional engineer meeting the requirements of Section 01 4000 Quality requirements. Include the following:
 1. Name and location of Project.
 2. Order number.
 3. Name of manufacturer.
 4. Name of Contractor.
 5. Building dimensions including width, length, height, and roof slope.
 6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
 7. Governing building code and year of edition.
 8. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
 9. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
 10. Building-Use Category: Indicate category of building use and its effect on load importance factors.

- D. Erector Certificates: For qualified erector, from manufacturer.
- E. Material Test Reports: For each of the following products:
 - 1. Structural steel including chemical and physical properties.
 - 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 3. Tension-control, high-strength, bolt-nut-washer assemblies.
 - 4. Shop primers.
 - 5. Nonshrink grout.
- F. Source quality-control reports.
- G. Field quality-control reports.
- H. Surveys: Show final elevations and locations of major members. Indicate discrepancies between actual installation and the Contract Documents. Have surveyor who performed surveys certify their accuracy.
- I. Sample Warranties: For special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panel finishes to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer.
 - 1. Accreditation: Manufacturer's facility accredited according to the International Accreditation Service's AC472, "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems."
 - 2. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in jurisdiction where Project is located.
- B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3, "Structural Welding Code - Sheet Steel."
- D. Land Surveyor Qualifications: A professional land surveyor who practices in jurisdiction where Project is located and who is experienced in providing surveying services of the kind indicated.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect foam-plastic insulation as follows:
 - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
 - 3. Complete installation and concealment of foam-plastic materials as rapidly as possible in each area of construction.

1.10 FIELD CONDITIONS

- A. Weather Limitations: Proceed with panel installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.

1.11 WARRANTY

- A. Special Warranty on Metal Panel Finishes: Manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 10 years from date of Substantial Completion.
- B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Butler Manufacturing Company; a division of BlueScope Buildings North America, Inc.
 - 2. Ceco Building Systems; an NCI company.
 - 3. Chief Buildings; Chief Industries, Inc.
 - 4. Kirby Building Systems; a Nucor Company.
 - 5. Metallic Building Company.

6. Nucor Building Systems.
 7. Varco-Pruden Buildings; a division of BlueScope Buildings North America, Inc.
- B. Source Limitations: Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer.

2.2 SYSTEM DESCRIPTION

- A. Provide a complete, integrated set of mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.
- B. Primary-Frame Type:
1. Rigid Clear Span: Solid-member, structural-framing system without interior columns.
- C. End-Wall Framing: Engineer end walls to be expandable. Provide primary frame, capable of supporting full-bay design loads, and end-wall columns or as indicated on the drawing.
- D. Secondary-Frame Type: Manufacturer's standard purlins and joists and flush-framed girts.
- E. Eave Height: As indicated on the drawings.
- F. Bay Spacing: As indicated on the drawings.
- G. Roof Slope: As indicated on the drawings.
- H. Roof System: Minimum .025-inch metal thickness, standing seam profile, lapped edges fitted with continuous gaskets.
- I. Exterior Wall System: Minimum .025-inch metal thickness, flat profile indicated, 2 1/2 inch deep, lapped edges fitted with continuous gaskets.

2.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal building system.
- B. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."
1. Design Loads: As indicated on Drawings.
 2. Deflection and Drift Limits: Design metal building system assemblies to withstand serviceability design loads without exceeding deflections and drift limits recommended in AISC Steel Design Guide No. 3 "Serviceability Design Considerations for Steel Buildings."
 3. Deflection and Drift Limits: No greater than the following:
 - a. Purlins and Rafters: Vertical deflection of 1/180 of the span.

- b. Girts: Horizontal deflection of 1/180 of the span.
 - c. Metal Roof Panels: Vertical deflection of 1/180 of the span.
 - d. Metal Wall Panels: Horizontal deflection of 1/180 of the span.
 - e. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.
 - f. Lateral Drift: Maximum of 1/100 of the building height.
- C. Seismic Performance: Metal building system shall withstand the effects of earthquake motions as indicated on the drawings.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- E. Fire-Resistance Ratings: Where assemblies are indicated to have a fire-resistance rating, provide metal panel assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 or ASTM E 108 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory," FM Global's "Approval Guide," or from the listings of another qualified testing agency.
- F. Fire Propagation Characteristics: Exterior wall assemblies containing foam plastics pass NFPA 285 fire test.
- G. Structural Performance for Metal Roof and Wall Panels: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
 - 1. Wind Loads: As indicated on Drawings.
- H. Air Infiltration for Metal Roof Panels: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 1680 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft.
- I. Air Infiltration for Metal Wall Panels: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft.
- J. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E 1646 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 2.86 lbf/sq. ft.
- K. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft.

L. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with wind uplift pressures as indicated on the drawings.

2.4 STRUCTURAL-STEEL FRAMING

A. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings."

B. Bolted Connections: Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts."

C. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.

D. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafters, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.

1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.

a. Slight variations in span and spacing may be acceptable if necessary to comply with manufacturer's standard, as approved by Architect.

2. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted.

3. Rigid Modular Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide interior columns fabricated from round steel pipes or tubes, or shop-welded, built-up steel plates.

4. Truss-Frame, Clear-Span Frames: Rafter frames fabricated from joist girders, and I-shaped column sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted.

5. Truss-Frame Modular Frames: Rafter frames fabricated from joist girders, and I-shaped column sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide interior columns fabricated from round steel pipes or tubes, or shop-welded, built-up steel plates.

6. Long-Bay Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide interior columns fabricated from round steel pipes or tubes, or shop-welded, built-up steel plates.

7. **Frame Configuration: As indicated on the drawings.**

E. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:

1. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural-steel sheet.

2. End-Wall Rafters: C-shaped, cold-formed, structural-steel sheet; or I-shaped sections fabricated from shop-welded, built-up steel plates or structural-steel shapes.

- F. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, prepainted with coil coating, to comply with the following:
1. Purlins: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; minimum 2-1/2-inch-wide flanges.
 - a. Depth: As needed to comply with system performance requirements.
 2. Girts: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 40 to 50 degrees from flange, with minimum 2-1/2-inch-wide flanges.
 - a. Depth: As required to comply with system performance requirements.
 3. Eave Struts: Unequal-flange, C-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; to provide adequate backup for metal panels.
 4. Purlin and Girt Clips: Manufacturer's standard clips fabricated from steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
 5. Framing for Openings: Channel shapes; fabricated from cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings and head, jamb, and sill of other openings.
 6. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.
- G. Anchor Rods: Headed anchor rods as indicated in Anchor Rod Plan for attachment of metal building to foundation.
- H. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.
1. Clean and prepare in accordance with SSPC-SP2.
 2. Coat with manufacturer's standard primer. Apply primer to primary and secondary framing to a minimum dry film thickness of 1 mil.
 - a. Prime secondary framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil on each side.

2.5 METAL ROOF PANELS

- A. Standing-Seam, Vertical-Rib, Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.
1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.025-inch nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Exterior Finish: Two-coat fluoropolymer.

- b. Color: As selected by Architect from manufacturer's full range.
- 2. Clips: Two-piece floating to accommodate thermal movement.
- 3. Joint Type: Panels snapped together.
- 4. Panel Coverage: 16 inches.
- 5. Panel Height: 2 inches.
- 6. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.6 FOAMED-INSULATION-CORE METAL WALL PANELS

- A. Concealed-Fastener, Foamed-Insulation-Core Metal Wall Panels: Formed with tongue-and-groove panel edges; designed for sequential installation by interlocking panel edges and mechanically attaching panels to supports using concealed clips or fasteners.
 - 1. Panel Thermal-Resistance Value (R-Value): as indicated on drawings.
 - 2. Facing Material: Fabricate panel with exterior and interior facings of same material and thickness. Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.024-inch (0.61-mm) nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Exterior Surface: smooth, flat.
 - b. Exterior Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
 - 3. Panel Coverage: 12 inches (914 mm) nominal.
 - 4. Panel Thickness: 2 inches.
 - 5. Insulation Core: Modified polyisocyanurate or polyurethane foam using a non-CFC blowing agent, foamed-in-place or board type, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.
 - a. Closed-Cell Content: 90 percent when tested according to ASTM D6226.
 - b. Density: 2.0 to 2.6 lb/cu. ft. (32 to 42 kg/cu. m) when tested according to ASTM D1622.
 - c. Compressive Strength: Minimum 20 psi (140 kPa) when tested according to ASTM D1621.
 - d. Shear Strength: 26 psi (179 kPa) when tested according to ASTM C273/C273M.
 - 6. Fire-Test-Response Characteristics: Class A according to ASTM E108.
 - 7. Surface-Burning Characteristics: Flame-spread index of 25 or less and a smoke-developed index of 450 or less, per ASTM E84.
- B. Finishes:
 - 1. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.7 METAL SOFFIT PANELS

- A. General: Provide factory-formed metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.
- B. Metal Soffit Panels: Match profile and material of metal wall panels.
- C. Finish: Match finish and color of metal wall panels
- D. Concealed-Fastener, Flush-Profile, Metal Soffit Panels: Formed with vertical panel edges and flush surface; with flush joint between panels; with 1-inch-wide flange for attaching interior finish; designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps.
- E. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.030-inch nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
- F. Exterior Finish: Fluoropolymer.
- G. Color: Selected by Architect from manufacturer's full range
- H. Panel Coverage: 12 inches
- I. Panel Height: 1 inch

2.8 THERMAL INSULATION

- A. Faced Metal Building Insulation: ASTM C991, Type II, glass-fiber-blanket insulation; 0.5-lb/cu. ft. density; 2-inch-wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.
- B. Retainer Strips: For securing insulation between supports, 0.025-inch nominal-thickness, formed, metallic-coated steel or PVC retainer clips colored to match insulation facing.
- C. Vapor-Retarder Facing: ASTM C 1136, with permeance not greater than 0.02 perm when tested according to ASTM E 96/E 96M, Desiccant Method.
 - 1. White Vinyl film facing, fiberglass scrim reinforcement, and kraft-paper backing.
- D. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
- E. Simple-Saver roof insulation system. Add Simple-Saver roof insulation (by Thermal Design, Inc.) to the building insulation package to reach the required R-Value as stated in the drawings. This shall include the Syseal fabric liner and the UVMAX coated steel straps as required for a complete system.

2.9 ACCESSORIES

2.9 ACCESSORIES

- A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.
 - 1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
- B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
 - 2. Clips: Manufacturer's standard, formed from steel or stainless-steel sheet, designed to withstand negative-load requirements.
 - 3. Cleats: Manufacturer's standard, mechanically seamed cleats formed from steel sheet.
 - 4. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 - 5. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
 - 6. Thermal Spacer Blocks: Where metal panels attach directly to purlins, provide thermal spacer blocks of thickness required to provide 1-inch standoff; fabricated from extruded polystyrene.
- C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and rakes, fabricated of same material as metal wall panels.
 - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 - 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- D. Flashing and Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating; finished to match adjacent metal panels.
 - 1. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.

2. Opening Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating. Trim head and jamb of door openings, and head, jamb, and sill of other openings.
- E. Gutters: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch-long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."
 1. Gutter Supports: Fabricated from same material and finish as gutters.
 2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.
- F. Downspouts: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-foot-long sections, complete with formed elbows and offsets.
 1. Mounting Straps: Fabricated from same material and finish as gutters.
- G. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.
- H. Materials:
 1. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.
 2. Fasteners for Metal Roof Panels:
 - a. Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM sealing washer.
 - b. Self-drilling, Type 410 stainless steel or self-tapping, Type 304 stainless-steel or zinc-alloy-steel hex washer head, with EPDM washer under heads of fasteners bearing on weather side of metal panels.
 3. Fasteners for Metal Wall Panels:
 - a. Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with EPDM sealing washers bearing on weather side of metal panels.
 - b. Fasteners for Metal Wall Panels: Self-drilling, Type 410 stainless steel or self-tapping, Type 304 stainless-steel or zinc-alloy-steel hex washer head, with EPDM sealing washers bearing on weather side of metal panel.
 4. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
 5. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

6. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
7. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
8. Metal Panel Sealants:
 - a. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene-compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape of manufacturer's standard size.
 - b. Joint Sealant: ASTM C 920; one part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by metal building system manufacturer.

2.10 FABRICATION

- A. General: Design components and field connections required for erection to permit easy assembly.
 1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
 2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.
- B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.
- C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
 1. Make shop connections by welding or by using high-strength bolts.
 2. Join flanges to webs of built-up members by a continuous, submerged arc-welding process.
 3. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin web or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
 4. Weld clips to frames for attaching secondary framing if applicable, or punch for bolts.
 5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary framing with specified primer after fabrication.
- D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll forming or break forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
 1. Make shop connections by welding or by using non-high-strength bolts.
 2. Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary framing with specified primer after fabrication.

- E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
 - 1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

2.11 SOURCE QUALITY CONTROL

- A. Special Inspection: Owner will engage a qualified special inspector to perform source quality control inspections and to submit reports.
 - 1. Accredited Manufacturers: Special inspections will not be required if fabrication is performed by an IAS AC472-accredited manufacturer approved by authorities having jurisdiction to perform such Work without special inspection.
 - a. After fabrication, submit copy of certificate of compliance to authorities having jurisdiction, certifying that Work was performed according to Contract requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.
 - 1. Engage land surveyor to perform surveying.
- C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.
- B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION OF STRUCTURAL FRAMING

- A. Erect metal building system according to manufacturer's written instructions and drawings.
- B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.
- C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.
- D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.
- F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.
 - 1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt type and joint type specified.
 - a. Joint Type: Snug tightened or pretensioned as required by manufacturer.
- G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.
 - 1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
 - 2. Locate and space wall girts to suit openings such as doors and windows.
 - 3. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.
- H. Steel Joists and Joist Girders: Install joists, girders, and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders," joist manufacturer's written instructions, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
 2. Space, adjust, and align joists accurately in location before permanently fastening.
 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
 4. Joist Installation: Bolt joists to supporting steel framework using carbon-steel bolts unless otherwise indicated.
 5. Joist Installation: Bolt joists to supporting steel framework using high-strength structural bolts unless otherwise indicated. Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for high-strength structural bolt installation and tightening requirements.
 6. Joist Installation: Weld joist seats to supporting steel framework.
 7. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.
- I. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
1. Tighten rod and cable bracing to avoid sag.
 2. Locate interior end-bay bracing only where indicated.
- J. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.
- K. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.4 METAL PANEL INSTALLATION, GENERAL

- A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Examination: Examine primary and secondary framing to verify that structural-panel support members and anchorages have been installed within alignment tolerances required by manufacturer.
1. Examine roughing-in for components and systems penetrating metal panels, to verify actual locations of penetrations relative to seams before metal panel installation.
- D. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.

- a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.
 2. Install metal panels perpendicular to structural supports unless otherwise indicated.
 3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Locate metal panel splices over structural supports with end laps in alignment.
 6. Lap metal flashing over metal panels to allow moisture to run over and off the material.
- E. Lap-Seam Metal Panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in predrilled holes.
1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
- F. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
- G. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel manufacturer.
1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.5 METAL ROOF PANEL INSTALLATION

- A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
1. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.
- B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.
1. Install clips to supports with self-drilling or self-tapping fasteners.
 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
 4. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.

5. Rigidly fasten eave end of metal roof panels and allow ridge end free movement for thermal expansion and contraction. Predrill panels for fasteners.
 6. Provide metal closures at peaks, rake edges, and rake walls.
- C. Lap-Seam Metal Roof Panels: Fasten metal roof panels to supports with exposed fasteners at each lapped joint, at location and spacing recommended by manufacturer.
1. Provide metal-backed sealing washers under heads of exposed fasteners bearing on weather side of metal roof panels.
 2. Provide sealant tape at lapped joints of metal roof panels and between panels and protruding equipment, vents, and accessories.
 3. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps and on side laps of nesting-type metal panels, on side laps of ribbed or fluted metal panels, and elsewhere as needed to make metal panels weatherproof to driving rains.
 4. At metal panel splices, nest panels with minimum 6-inch end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.
- D. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.
- E. Metal Roof Panel Installation Tolerances: Shim and align metal roof panels within installed tolerance of 1/4 inch in 20 feet on slope and location lines and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
 2. Shim or otherwise plumb substrates receiving metal wall panels.
 3. Rigidly fasten base end of metal wall panels and allow eave end free movement for thermal expansion and contraction. Predrill panels.
 4. Flash and seal metal wall panels with weather closures at eaves and rakes, and at perimeter of all openings. Fasten with self-tapping screws.
 5. Install screw fasteners in predrilled holes.
 6. Install flashing and trim as metal wall panel work proceeds.
 7. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated on Drawings; if not indicated, as necessary for waterproofing.
 8. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
 9. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
- B. Insulated Metal Wall Panels: Install insulated metal wall panels on exterior side of girts. Attach panels to supports at each panel joint using concealed clip and fasteners at maximum 42 inches o.c., spaced not more than manufacturer's recommendation. Fully engage tongue and groove of adjacent insulated metal wall panels.

1. Install clips to supports with self-tapping fasteners.
 2. Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels as weather seal.
- C. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 feet, noncumulative; level, plumb, and on location lines; and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 THERMAL INSULATION INSTALLATION

- A. General: Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.
1. Set vapor-retarder-faced units with vapor retarder toward warm side of construction unless otherwise indicated. Do not obstruct ventilation spaces except for firestopping.
 2. Tape joints and ruptures in vapor retarder and seal each continuous area of insulation to the surrounding construction to ensure airtight installation.
 3. Install factory-laminated, vapor-retarder-faced blankets straight and true in one-piece lengths, with both sets of facing tabs sealed, to provide a complete vapor retarder.
 4. Install blankets straight and true in one-piece lengths. Install vapor retarder over insulation, with both sets of facing tabs sealed, to provide a complete vapor retarder.
- B. Blanket Roof Insulation: Comply with the following installation method:
1. Two-Layers-between-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Install layer of filler insulation over first layer to fill space between purlins formed by thermal spacer blocks. Hold in place with bands and crossbands below insulation.
 - a. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.
 2. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.
 3. Install Simple Saver insulation according to manufacturer's instructions. Straight and taught without wrinkles or deformations.
- C. Blanket Wall Insulation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal wall panels fastened to secondary framing.
1. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.
 2. Sound-Absorption Insulation: Where sound-absorption requirement is indicated for metal liner panels, cover insulation with polyethylene film and provide inserts of wire mesh to form acoustical spacer grid

3.8 ACCESSORY INSTALLATION

3.9 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 - 2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 - 3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible and set units true to line and level. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 - 1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- C. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.
 - 1. Provide elbows at base of downspouts to direct water away from building.

3.10 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform field quality control special inspections and to submit reports.
- B. Product will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.11 CLEANING AND PROTECTION

3.11 CLEANING AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing, bearing plates, and accessories.
 - 1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or by SSPC-SP 3, "Power Tool Cleaning."
 - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
- C. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
 - 1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 13 3419

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

1.0 GENERAL

1.01 DESCRIPTION

- A. This Division 23 and the accompanying drawings cover the provision of all labor, equipment, appliances, and materials and performing all operations in connection with the construction of the air conditioning, ventilating, heating, fire suppression and plumbing systems as specified herein and as shown.
- B. The General Provisions and Division 01, including the general, supplementary and other conditions and other Divisions, as appropriate, apply to work specified in this Division.

1.02 INTENT OF DRAWINGS AND SPECIFICATIONS

- A. The implied and stated intent of the drawings and specifications is to establish minimum acceptable standards for materials, equipment and workmanship, and to provide operable mechanical systems complete in every respect.
- B. The engineering drawings are diagrammatic, intended to show general arrangement and sizes of system components, and shall not be scaled. Rather, the architectural and structural drawings shall govern space constraints, dimensions and finishes. All offsets and fittings which will be necessary to accomplish the finished installation shall be provided at no additional cost or increase in the Contract.

1.03 SPACE PRIORITY

- A. Ensure optimum use of available space for materials and equipment installed above ceilings. Allocate space in the order of priority as listed below except as otherwise detailed. Items are listed in the order of priority, with items of equal importance listed under a single priority number.
 - 1. Gravity flow piping systems
 - 2. Vent piping systems
 - 3. Recessed lighting fixtures
 - 4. Concealed HVAC terminals and equipment
 - 5. Air duct systems
 - 6. Sprinkler piping systems
 - 7. Pressurized piping systems
 - 8. Electrical conduit, wiring, control air tubing
- B. Order of space priority does not dictate installation sequence. Installation

sequence shall be as required to install all affected trades.

- C. The work of this Division 23 shall not obstruct access for installation, operation and maintenance of the work of any other Division.
- D. All major items of equipment shall be arranged so as to provide a minimum of 28" clear aisle space. Additional space shall be provided between and around equipment for maintenance and proper operation as shown in the Equipment Manufacturer's literature.

1.04 COORDINATION

- A. Coordinate all work under this Division 23 with work under all other Divisions, providing adjustment as necessary.
- B. Coordination of space requirements with respect to Division 26 shall be performed such that:
 - 1. No equipment, piping or ductwork, other than electrical, shall be installed within 42" of switchboards or panelboards.
 - 2. No piping or ductwork which ever operates at a temperature in excess of 120°F shall be installed within 3" of any electrical conductor.
- C. All items mounted in or below the ceiling, and all items penetrating the ceiling, shall be coordinated with the architectural reflected ceiling plans. If any items are not shown on these plans, or any items need to be relocated for coordination purposes, prepare a reflected ceiling plan and submit it to the Architect for approval.
- D. Variable-Frequency Drives shall be provided under Division 23 and installed by Division 26. See specification 26 29 23 Variable – Frequency Motor Controllers.
- E. Fused disconnects shall be provided under this Division 23 for all equipment connected directly to bus duct, and rating shall match bus duct rating. Coordinate with Division 26.

1.05 CODE COMPLIANCE

- A. All workmanship and materials provided under this Division 23 shall comply with all laws, ordinances, codes and regulations of all Federal, State and Local Authorities Having Jurisdiction.
- B. All fire suppression, plumbing, heating, ventilating, and air conditioning materials and workmanship shall comply with the current codes.

- C. Secure and pay all fees associated with all permits and licenses required for execution of the Contract. Arrange for all inspections required by City, County, State and other Authorities Having Jurisdiction, and deliver certificates of approval to the Architect.
- D. The code requirements are strictly a minimum and shall be met without incurring additions to the Contract. Where requirements of the drawings or specifications exceed the code requirements, the work shall be provided in accordance with these drawings or specifications. In the event of conflict or ambiguity between the various codes, the most stringent requirement shall govern.

1.06 ELECTRICAL REQUIREMENTS AND INTERFACE

- A. All electrical equipment and wiring provided under this Division 23 shall comply with the electrical system characteristics indicated on the electrical drawings and specified in Division 26.
- B. Electric controls, contactors, starters, pilot lights, push buttons, etc., shall be provided complete as part of the motor, heater or other equipment which it operates. All electrical components shall be in conformance with the requirements of the National Electrical Code and Division 26. Starters shall be wye-delta, closed transition type. Reference Division 26 and the electrical engineering drawings for those motor starters provided under that Division 26. All starters not shown shall be provided under this Division 23. Unless specified otherwise under other individual equipment Sections, motor starters shall conform to the following minimum requirements:
 - 1. Starters for motors 1/3 horsepower or smaller shall be manual unless remote or automatic starting is required, in which case the starters shall be magnetic, full voltage, non-reversing, single-speed, unless otherwise indicated. All other starters shall be magnetic.
 - 2. Each starter for a three-phase motor shall be furnished with three (3) overload relays sized for the full load running current of the motor actually provided. Provide an external "HAND-OFF-AUTO" selector switch with red "RUNNING" light. Provide a green pilot light to indicate motor "STOPPED". Each pilot light shall have a legend plate indicating reason for signal.
 - 3. Each overload relay shall have a normally open alarm contact which will close only when actuated by an overload (not to be confused with N.O. or N.C. auxiliary contacts). These contacts shall be properly wired to their respective blue pilot light provided on the starter front cover and having a "TRIPPED" legend plate.

4. Individually mounted motor starters shall be in a NEMA Type 1 general purpose enclosure in unfinished areas and shall be flush mounted in all finished areas. All starters mounted in exterior areas shall have a NEMA 3R enclosure. Each starter shall have a laminated nameplate to indicate equipment unit number, function and circuit number.
 5. All motor starters, push buttons and pilot lights shall be of the same Manufacturer as the switchboard and shall be General Electric, Square D, Siemens I.T.E., or Westinghouse.
- C. Motor starters for the following equipment shall be provided under this Division 23 by the Manufacturer of the equipment:
1. Packaged air conditioning equipment
 2. Water chillers
 3. Other equipment hereinafter specified in other Sections to be provided with integral starters
- D. Unless otherwise noted or specified in individual Sections, all 3-phase motors shall be standard NEMA continuous duty "B" type, with Class B insulation, open drip-proof frame for indoor service, TEFC for outdoor service and a service factor of 1.15. All motors 5 HP and larger shall be U.S. Motors Hi-Efficiency Model or Reliance XE Hi-Efficiency Model.
- E. All power wiring and final connections to equipment shall be provided under Division 26.
- F. Control components, all interlocks, (VAVs, actuators, smoke dampers, fire/smoke dampers, motor-operated dampers, fire alarm motors, etc.) and control wiring (277 volt, single phase and less) shall be provided under this Division 23 as required to achieve the specified control sequences. All electrical connections shall be specifically coordinated with Division 26 and any necessary scope included as part of Division 23.
- G. All control wiring over 30 volts shall be installed by a licensed Electrician working under this Division 23.

1.07 SLEEVES, SEALS AND ESCUTCHEONS

- A. Sleeves shall be provided through all pipe and ductwork penetrations of concrete or masonry walls, elevated floors and roofs, except those piping penetrations for equipment, etc.
- B. Sleeves shall be fabricated from Schedule 40 steel pipe through 10" and Standard Wall steel pipe for sleeve sizes 12" and larger. All sleeves penetrating exterior walls, underground walls, pit or vault walls shall be provided with a 3" x 3/8" thick waterstop ring welded completely to the midpoint of the sleeve.

- C. All sleeves penetrating exterior walls, underground walls, pit or vault walls and elevated floors shall be packed and sealed watertight.
- D. Sleeves through roofs shall extend above the roof surface and be flashed watertight.
- E. Sleeves through walls shall be cut and finished flush with each surface of the wall in which they are installed.
- F. Sleeves through floors in mechanical rooms or other back of house spaces shall be installed with the top no less than 1/2" above the finished floor to allow for leak protection. Space between the top of the fire-stopping and top of the sleeve shall be packed with mineral wool and caulked to not allow water ponding within the sleeve.
- G. Sleeves shall be sized to provide a minimum of 1/2" clearance between the inside surface of the sleeve and the outside finished surface of the pipe plus any insulation specified.
- H. Fire-stops shall be provided as specified herein. All annular spaces between piping and sleeves, which do not require fire-stops, shall be packed with mineral wool and caulked.
- I. Provide round, chrome-plated escutcheons on all exposed piping and ductwork penetrations passing through walls, floors, partitions and ceilings. Escutcheons shall be painted and caulked in coordination with Architect. Note that escutcheons should be only attached to the wall as piping and ductwork may move slightly during operation.

1.08 FIRESTOPS

- A. Where piping, conduit, etc. pass through fire partitions, fire walls and floors, a firestop shall be provided that will ensure an effective barrier against the spread of fire, smoke and gases. Firestop material shall be packed tight and completely fill gaps between the ductwork, piping, conduit, etc. and the perimeter of their rough openings.
- B. All penetrations shall be in accordance with UL 1479 or ASTM E 814 listed systems, and products used shall be specifically applicable for the appropriate installation conditions. Assemblies shall provide a minimum rating equal to the construction penetrated. Products shall be by HILTI, 3M, or ProSet.
- C. Installation shall be by a Qualified Installer. Installer shall be certified, licensed, or otherwise qualified by the Firestopping Manufacturer as having the necessary training to install the Manufacturer's specific product.

- D. Installer shall have at least one of the following qualifications:
 - 1. FM 4991 Approved Contractor
 - 2. UL Approved Contractor
 - 3. HILTI, 3M, or ProSet Accredited Fire Stop Specialty Contractor
- E. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach label permanently on both sides of penetrated construction in a visible location. The label shall include the following:
 - 1. The words "Warning – Through Penetration Firestop System-Do Not Disturb"
 - 2. Through Penetration firestop system designation and Manufacturer
 - 3. Date of Installation

1.09 CORE DRILLING

- A. Cutting of holes through concrete and masonry shall be by diamond core or concrete saw. Pneumatic hammer, impact electric and hand or manual hammer type drills will not be allowed, except as permitted by the Architect where required by limited working space. Locate holes such that they will not affect structural sections such as ribs or beams. Holes shall be laid out well in advance of the installation. These layout locations shall be approved by the Architect prior to drilling.

2.0 PRODUCTS

2.01 BID BASIS AND SUBSTITUTION PROCEDURES

- A. Manufacturer names, series and model numbers, as noted or specified, are for the purpose of describing type, capacity, and quality of equipment, materials and products to be used. Unless "or equal" is specifically stated, bids shall be based only on the specified "basis of design" Manufacturer. The listing of a particular manufacturer as an "equal" or "acceptable substitute" manufacturer shall not be misconstrued as approving nor allowing the substitution of that Manufacturer's standard product in place of the basis of design. No consideration will be given to a product, which would require dimensional, spatial or aesthetic changes to the project. "Acceptable substitute" and "equal" manufacturers shall only bid those products, which exactly match the size and other characteristics of the specified basis of design. Any changes to other disciplines and trades of work required by an "or equal" or "substitute" product shall be duly considered and priced accordingly prior to bidding or pricing. The decision as to whether or not a proposed substitute or "equal" product is actually equal to that specified shall rest solely with the Architect.
- B. Requests to provide "equal" products in lieu of those specified shall be submitted to the Architect in writing at least ten (10) days prior to final pricing and

execution of the Contract. No consideration will be given to substitute products after final pricing and execution of the Contract.

- C. Any "or equal" product or proposed product substitution which will cause a change in the appearance, dimensions or design of any part of the building, its structure, electrical system or any other engineered systems shall be accompanied by a scaled drawing and written description of the required change(s) for approval by the Architect. If deemed necessary by the Architect, Owner, or AHJ, design changes shall be signed and sealed by a registered Professional Engineer, currently licensed in this State. This shall be performed under the Contractor's scope who selects the substitution.
- D. Any and all changes due to a substitution of basis of design equipment including but not limited to electrical connection, physical size, access, duct or piping connections, controls, etc. shall be solely the responsibility of substituting Contractor.

2.02 MINIMUM STANDARDS

- A. Every piece of energy consuming equipment, all fire suppression products and life safety equipment shall comply with the following standards as applicable; especially in regard to prevailing codes:
 - 1. Factory Mutual Laboratories (FM)
 - 2. Industrial Risk Insurers (IRI)
 - 3. Underwriters Laboratories, Inc. (UL)
 - 4. ADC: Air Diffusion Council
 - 5. AGA: American Gas Association
 - 6. AMCA: Air Moving and Conditioning Association, Inc.
 - 7. ANSI: American National Standards Institute
 - 8. API: American Petroleum Institute
 - 9. AHRI: Air Conditioning, Heating, and Refrigeration Institute
 - 10. ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers
 - 11. ASME: American Society of Mechanical Engineers
 - 12. ASTM: American Society of Testing and Materials
 - 13. AWWA: American Water Works Association
 - 14. IBR: Institute of Boiler and Radiator Manufacturers
 - 15. MSS: Manufacturers Standardization Society
 - 16. NBBPVI: National Board of Boiler and Pressure Vessel Inspectors
 - 17. NEMA: National Electrical Manufacturer's Association
 - 18. OSHA: Occupational Safety & Health Administration
 - 19. PDI: Plumbing Drainage Institute
 - 20. PPI: Plastic Pipe Institute
 - 21. SMACNA: Sheet Metal and Air Conditioning Contractors National Association, Inc.

3.0 EXECUTION

3.01 SUBMITTALS

- A. Before preparing submittals, study all Contract Drawings and specifications in detail, obtain manufacturer's recommended instructions, and have submittals prepared based on specific equipment and material proposed for installation. An officer of the Contracting Firm shall sign all shop drawings (certifying conformance with plans and specifications) before submitting to the Architect or releasing to the field.
- B. The submittal process shall not be utilized as an avenue to substitute products after the execution of the contract. Should an unspecified or unequal product be submitted, it will be rejected. If a second attempt at substitution is made during the resubmittal of the same product, then no more reviews of that product will be performed without direct compensation to the Engineer being paid for the additional services required for the third review and any further reviews.
- C. All submittals shall be submitted and returned electronically.
- D. Submittals will not be accepted for review unless they:
 - 1. Comply with the requirements of Division 1
 - 2. Include complete information pertaining to all appurtenances and accessories
 - 3. Are submitted as complete packages which pertain to all related items in Division 23. Separate packages shall be submitted as follows:
 - a. All HVAC equipment and components
 - b. The automatic controls and EMS
 - 4. Are properly marked with equipment, service, or function identification as related to the project and are marked with pertinent specification paragraph number
- E. Submit catalog information, factory assembly drawings, field installation drawings and certifications as required for complete explanation and description of all items of equipment. The submittal data shall provide ample, unquestionable compliance with the Contract Documents.
- F. Review of submittals shall not be construed as authorizing any deviations from the plans and specifications unless such deviations are clearly identified and separately submitted in the form of a letter that is enclosed with the submittals.
- G. Submittals are required on all manufactured equipment, especially energy consuming equipment. Submittals shall include, but are not limited to, the following items of equipment:
 - 1. Ductwork and Piping Insulation
 - 2. Packaged Rooftop Units including proposed controller and points list

3. Air Distribution Devices
4. Ductwork Accessories (Including All Dampers)
5. Fans
6. Unit, Wall, Ceiling, Duct, Etc. Heaters
7. Louvers and Hoods
8. T&B Company Certifications and Final Report
9. Control Diagrams, System, and Components
10. Ductwork and Piping Shop Drawings
11. Firestopping Products and Applicable UL Firestop Details

3.02 INSTALLATION REQUIREMENTS

- A. All equipment shall be installed in strict conformance with the recommendations of the Equipment Manufacturer, as indicated on the Drawings and as specified.
- B. Provide installation manuals for each piece of equipment. Submit in separately bound volumes after review of submittals.
- C. Provide supplementary steel framing and welded steel equipment support stands as required for proper hanging and support of the mechanical systems. Steel angles, channels and tubing utilized for such framing shall be selected for a maximum deflection of 1/360th of the span.
- D. All roof curbs shall be a minimum of 12" high and selected for the various roof pitches. Curbs installed on roofs having pitches of not more than 1/4" per foot may be standard curbs shimmed level with steel channels or Zs to provide suitable support and flashing surfaces.

3.03 CLEANING, LUBRICATION AND ADJUSTMENT

- A. The exterior surfaces of all mechanical equipment, piping, ductwork, conduit, etc., shall be cleaned and free of all dirt, grease, oil, paint splatter, and other construction debris.
- B. Ducts, plenums, and air unit casings shall be cleaned of all debris and either vacuumed or blown free of all rubbish, dirt, and dust before installing grilles, registers or diffusers.
- C. Bearings that require lubrication shall be lubricated in strict accordance with the manufacturer's recommendations.
- D. All control equipment shall be adjusted to the settings required for the performance specified.
- E. Fans shall be adjusted to the speed indicated by the Manufacturer to meet the installed final system pressure at the airflows indicated. Any additional sheaves

and belts required for final adjustments shall be provided with no increase in the Contract amount.

- F. Any fans operated during construction shall have temporary filters. Temporary filters shall be changed regularly to minimize contamination of the equipment and duct systems. Permanent filters shall be installed prior to final inspection.
- G. All coils shall be thoroughly cleaned and combed prior to final inspection.
- H. All materials, equipment, etc. subject to weather, corrosion, dust, debris, water etc. to be installed or utilized for the project shall be fully protected. This is inclusive of piping and duct openings and internal fan ventilation intakes and discharges. This Division's scope includes protection and remediation of any and all Division materials, etc. including cleaning, vacuuming, dusting, etc. required for a clean system and operation. Insulation and equipment with electrical connections subject to water shall be replaced in their entirety. Coordinate with all other trades and schedules.

3.04 PAINTING

- A. All uncoated and uninsulated steel surfaces exposed to sight inside the building, such as piping, equipment hangers and supports which are not provided with factory prime coat or galvanizing, shall be cleaned and painted with one coat of rust inhibiting primer. In addition, all surfaces in finished spaces shall also be painted with two coats of finish paint in a colour selected by the Architect.
- B. All ductwork surfaces, piping, supports, etc. visible through grilles, registers and diffusers in finished areas shall be painted flat black. All ductwork, equipment, piping, supports, air distribution, etc. visible in exposed finished areas shall be painted a colour selected by the Architect, except that nameplates shall not be painted.
- C. Steel items exposed outside the building, such as equipment supports, uninsulated piping and hangers, which are not factory painted or galvanized, shall be cleaned and painted with one coat of rust inhibiting primer and two coats of asphaltic base aluminum paint. Insulated steel pipes outside the building shall be cleaned and painted with one coat of rust inhibiting primer before installing insulation.
- D. Factory painted equipment that has been scratched or marred shall be repainted to match the original factory color.

3.05 DUCTWORK AND PIPING LEAK TESTING

- A. Insulated, underground, and concealed ductwork and piping shall be tested for leaks in place before backfilling, concealing or covering. Tests shall be conducted in the presence of the Architect or their designated Representative.

- B. All low pressure ductwork (design operating pressure of 1.0" WC ESP or less) shall be tested by the operation of the system to which it is connected.
- C. All medium and high pressure ductwork (operating pressure of more than 1.0" WC ESP) shall be tested at 1.5 times the design operating pressure of the system to which it is connected, or at the total fan pressure at shut-off, whichever is greater, up to the maximum pressure classification of the associated ductwork system.
- D. All visible and audible air leaks from the ductwork systems shall be repaired.
- E. All refrigerant piping shall be 100% tested with the applicable ASHRAE standard – latest version.
- F. All leaks shall be repaired by tightening, remaking joints, or replacing pipe and fittings. Caulking of joints shall not be permitted.

3.06 RECORD (AS-BUILT) DRAWINGS

- A. At the completion of the project, provide a set of reproducible prints to the Architect which reflects all changes, deviations and revisions made to the original design documents. Locations of all underground piping and utilities shall be clearly shown and dimensioned from permanent reference points such as building column lines. Record drawings shall be produced in electronic format compatible with AUTOCAD. Furnish electronic copies of all drawings in dwg. format, and two (2) bond copies of all drawing sheets. As-Builts for electronic incorporation by the Design Team, as applicable, shall be redline mark-ups of the Construction Documents.

3.07 OPERATING AND MAINTENANCE MANUALS AND INSTRUCTIONS

- A. Complete operating and maintenance manuals shall be provided to the Owner. Four copies shall be provided. Each copy shall be bound in a separate 3-ring, loose-leaf notebook. Operating instructions shall be provided for each mechanical system, and shall each include a brief system description, a simple schematic and a sequence of operation. Operating and maintenance instructions shall be provided for each piece of equipment. A control system wiring diagram shall be included in each operating and maintenance manual.
- B. Prior to final acceptance or beneficial occupancy, provide the services of a Competent Technician for not less than one (1) day to instruct the Owner in the operation of the mechanical systems.

3.08 TESTING AND BALANCING

- A. Testing and balancing of the HVAC system shall be performed in accordance with the standards of AABC and shall be performed under the direct supervision of a Certified Test and Balance Engineer as specified in Section 23 05 93. Note that this work is to be performed under a separate Contract directly under the General Contractor. Submit four (4) copies of the test and balance report directly to the Architect.

3.09 PIPING SUPPORTS

- A. Pipe hangers or supports shall be provided within 18" of each horizontal fitting, equipment connection, valve, etc. and within 18" of the centerline of horizontal or vertical changes in direction summing to 90° or more. Specific attention is called to vertical turns into risers.

- B. Piping supports shall be provided, at a minimum, in accordance with the greater of the below or at code minimum. Where the below or code does not address support for specific piping, supports shall be in accordance with manufacturer's requirements.

Piping Material	Max. Horz. Spacing	Max. Vert. Spacing
Cast-iron pipe	5'	15'
Copper pipe	12'	10'
Copper tubing ≤ 1-1/4" dia.	6'	10'
Copper tubing ≥ 1-1/2" dia.	10'	10'
PVC pipe	4'	10'*

*Midstory guide required for piping 2" diameter and smaller

- C. Riser clamps shall be provided at each floor penetration. For pressurized piping systems except refrigerant suction and liquid service, provide vibration isolation at all riser clamps with two (2) pad-type mountings consisting of a minimum 3/8" thick ribbed or waffled elastomeric pads bonded between minimum 16-gauge galvanized steel separator plates. Pads shall be sized for a deflection of 0.12" to 0.16". Pads shall be minimum 3" x 3" square.

3.10 WARRANTY

- A. All work provided under this Division 23 shall be subject to a minimum one year warranty. The warranty shall include prompt repair or replacement of equipment or system failures and shall include all parts, refrigerant, and labor. In addition, all compressors shall carry an additional four year parts-only warranty. Extended warranties shall be provided on all other equipment so specified in other Sections.

3.11 BIM MODELING AND COLLISION DETECTION

- A. The Contractor shall utilize 3D modeling for coordination and collision / interference detection software simulation. This model will be used for coordination, collision detection and inference from all trades: mechanical,

plumbing, electrical, fire protection, etc. BW&A will provide 2D plans of the mechanical, plumbing and electrical as well as 3D models of major system infrastructure prepared during the project design phases. The extent of modeling varies and is not to be used for shop drawings or to replace required Contractor coordination. Each SubContractor is responsible for preparation of a 3D/BIM model of their system for Contractor collision detection and coordination. This model shall be used for As-Built documentation for the Owner. Contractor 3D Model shall be the latest version of Revit, Navisworks, or equal.

- B. Upon completion of the BIM Model, provide the Engineer a full set of shop drawings for their review. Shop drawings shall meet the below requirements.

3.12 COORDINATION DRAWINGS

- A. All Contractors and SubContractors, as applicable, shall be responsible for the preparation of electronic drawings 1/4" per foot scale shop drawings of all building levels.
- B. The General Contractor shall manage and control the coordination process. The General Contractor Team shall be responsible for all documents and file distribution.
- C. Each trade shall mark conduit, pipe, duct, and equipment with elevations on electronic drawings provided by the Sheet Metal SubContractor.
- D. Each Contractor and SubContractor shall date the drawings when received. Sequence of transmittal of the drawings shall be as follows:
1. From Fire Protection SubContractor with all fire protection work shown to Mechanical SubContractor
 2. From Mechanical SubContractor with all mechanical piping work shown to Electrical SubContractor
 3. From Electrical SubContractor with all electrical work shown to Mechanical SubContractor
 4. This process shall iterate as needed for full and final coordination by all parties
- E. Each trade shall sign and date final coordination drawings. The General Contractor shall maintain up-to-date drawings at the job Site and shall provide one set of prints of final coordinated drawings to Mechanical, Plumbing, Fire Protection, and Electrical SubContractors, and the Owner's Representative.
- F. Each Contractor and SubContractor shall coordinate all work with other trades prior to installation.
- G. Any field changes shall be similarly coordinated and documented in the As-Builts.

- H. Upon completion of the coordination drawings, provide the Engineer a full set of shop drawings for their review. Shop drawings shall meet the below requirements.

3.13 SHOP DRAWINGS

- A. Shop drawings per the submittal requirements shall be submit to the Design Team with adequate time for multiple rounds of review. Shop drawings shall show “As-Built” conditions including elevations, offsets, transitions, and accessories. Shop drawings shall indicate all code and manufacturer’s recommended clearances, access, and coordinate the clearance and access requirements with all other trades.
- B. Shop drawings that use keynotes direct from the Design Documents shall not be acceptable as they do not demonstrate coordination with all other trades, necessary transitions, etc.
- C. Shop drawings shall be provided as complete packages in parallel with all trades to document coordination. Floor-by-floor or otherwise piecemeal shop drawings are generally not acceptable.

3.14 BID REQUIREMENTS

- A. The Contractor shall include all systems, equipment and accessories shown on the plans and specifications.
- B. The Contractor is responsible for providing all design documents to all SubContractors. All systems, equipment and accessories shall be included in the bid, whether shown on the SubContractor applicable plans or other design documents.
- C. Should any discrepancy occur in the Design Documents, the Contractor shall provide a request for clarification prior to bid or note the discrepancy in the bid and provide an appropriate cost allowance in the bid.
- D. The Contractor shall acknowledge that the Design Documents are diagrammatic and shall provide all systems, equipment and accessories required for a complete facility. Any areas that appear to be void of systems or inappropriate systems shall be noted in the bid. No post bid change order shall be considered for areas or discrepancies not noted in the bid.
- E. All installation coordination and means and methods and labor and materials required for proper system installation shall be included.
- F. These requirements are in addition to bid procedures and requirements of the RFP or general specifications.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

1.0 GENERAL

1.01 DESCRIPTION

- A. All work specified in this Section is governed by the Common Work Results for HVAC Section 23 05 00.
- B. This Section 23 05 93 and the accompanying drawings cover the provision of all labor, equipment, appliances, and materials and performing all operations in connection with the testing and balancing (T&B) of the heating, ventilating and air conditioning (HVAC) systems as specified herein and as shown. These systems include, but are not limited to, the following:
 - 1. Supply distribution systems
 - 2. Return and exhaust air systems
 - 3. Heating, ventilating and air conditioning equipment (all scheduled equipment as a minimum)
 - 4. Hydronic systems

1.02 INTENT

- A. It is the intent of this Section of the specifications to provide a complete operable and balanced HVAC system as shown and specified which is reasonably airtight, comfortable and free of objectionable noise and vibration.

1.03 SCOPE OF WORK

- A. HVAC test and balance shall be performed by an Independent Agency certified by the Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) under direct contract to the General Contractor. All work performed by this Agency shall be performed by qualified Technicians under the direct supervision of an AABC or NEBB Certified Test and Balance Engineer. The Agency shall be independent and shall not be associated in any way with the installing HVAC SubContractor.
- B. The Test and Balance shall be performed by one (1) of the following companies:

(GA T&B)
 - 1. Westside Test and Balance
Contact: Colby Griggs (770) 562-2051
westside@westsidetestandbalance.com

2. Research Air Flo
Contact: Joel Shannon (770) 452-8292
Contact: (919) 387-5788 (Raleigh)
Contact: (704) 321-0491 (Charlotte)
joel@researchairflo.com
3. TAB Services
Contact: Matthew Connor (404) 329-1001
mconnor@tabservices.com
- C. HVAC Test and Balance shall be performed in accordance with the 7th edition of the AABC National Standards, 2016 for Total System Balance or the NEBB Procedural Standards for TAB of Environmental Systems, 8th Edition, 2015 together with the NEBB TAB Manual for Technicians, 2nd Edition.
- D. The final Test and Balance report shall serve to substantiate compliance with the intent of the Contract Documents, specifically the HVAC systems.
- E. HVAC Test and Balance shall not begin until the systems are substantially complete.
- F. Upon the completion of the Test and Balance work, the Agency shall submit four (4) copies of the complete HVAC Test and Balance Report directly to the Architect.
- G. The Agency, as a part of its contract with the General Contractor, shall act as an Authorized Inspection Agency, responsible to the General Contractor and the Architect and shall, during the test and balance, list those items which require correction or have not been installed in accordance with the Contract Documents.
- H. The Agency shall plainly mark the settings of all valves, dampers and other adjustable devices. If a balancing device is provided with a memory stop, it shall be set, locked and marked.
- I. The Agency shall record all of the final set points on all variable speed drives.

1.04 SUBMITTALS

- A. The name and certification of the Agency, along with the name and certification of the Certified Test and Balance Engineer, shall be submitted to the Architect for review within 30 days after the award of the General Contract.
- B. The selected Agency shall submit to the Owner:
 1. Procedural Manual
 2. Report Forms
 3. AABC or NEBB Performance Guaranty

4. Instrument List and Calibration Dates
 5. Schedule
 6. Floorplans as Needed to Uniquely Identify Device Locations
- C. A reviewed copy of each of the above shall be returned to the Agency before the HVAC Test and Balance begins.
- D. If a complete submittal in accordance with these requirements is not received within 60 days from award of the General Contract, then the Architect reserves the right to select the Agency.

2.0 PRODUCTS

2.01 (Not applicable).

3.0 EXECUTION

3.01 GENERAL CONTRACTOR'S DUTIES

- A. The General Contractor shall provide the following, within 10 days after his receipt, to the Agency:
1. Contract Drawings
 2. Contract applicable specification Division 23 (others as applicable)
 3. Addenda
 4. Change orders
 5. Reviewed submittals
- B. The General Contractor shall start-up and maintain the HVAC systems and shall continue the operation of the HVAC systems during each day of testing and balancing. Start-up and operation shall include, as a minimum, the following:
1. All equipment operable and in safe condition.
 2. Temperature control system complete.
 3. Proper thermal overload protection in place for electrical equipment.
 4. Ductwork leakage rates not exceeding those specified and all duct systems clean of debris.
 5. Air transfer systems shall have:
 - a. Correct fan rotation and RPM.
 - b. Coil fins cleaned and combed.
 - c. Filters clean and in place.
 - d. Access doors closed.
 - e. All dampers in place and open.
 - f. All grilles, registers and diffusers installed.
- C. Provide sufficient time before final completion date so that testing and balancing can be accomplished. Coordinate the submitted T&B schedule.

- D. Provide immediate labor and tools to make required corrections and repairs without undue delay.
- E. The General Contractor and his SubContractors shall cooperate fully with the Agency to provide the following:
 - 1. Access to HVAC system components.
 - 2. The right to adjust the systems.
- F. Any conditions which prevent a proper HVAC Test and Balance shall be reported by the Agency to the General Contractor and Architect within 7 days of their discovery.
- G. If it is determined by the Agency and confirmed by the Architect that drive changes or additional balancing dampers are required, the Contractor shall obtain and install all necessary components.
- H. The Agency shall cooperate with the Architect and the Contractor and all his SubContractors to perform the work in such a manner as to meet the job schedule.
- I. The Agency shall verify that all system components are in place and in proper working order prior to leaving the project.
- J. All reported and recorded data shall represent true measured conditions.
- K. Where equipment uses variable speed drives, and where feasible, VFDs shall be used as the primary balancing method prior to adjustment or balancing of valves, dampers, etc.

END OF SECTION

SECTION 23 07 13

DUCT INSULATION

1.0 GENERAL

1.01 DESCRIPTION

- A. All work specified in this Section is governed by the Common Work Results for HVAC Section 23 05 00.
- B. This Section 23 07 13 and the accompanying drawings cover the provisions of all labor, equipment, appliances, and materials and performing all operations in connection with the construction of the ductwork systems as specified herein and as shown. These systems include, but are not limited to, the following:
 - 1. Insulation for typical ductwork
 - 2. Duct liner
 - 3. Insulation for ductwork outside

1.02 INTENT

- A. It is the intent of this Section of the specifications to provide a complete operable duct system as shown and specified which is reasonably airtight, free of noise, vibration and sweating, and fabricated so as to fit into the space allotted and to exhibit a minimum resistance to airflow.

2.0 PRODUCTS

2.01 DUCT LINER

- A. Duct liner shall be one inch thick, 1 ½ lb. density (3 lb. density on medium- and high-pressure supply air systems except that 1 lb. density is acceptable if the liner is at least $R \geq 4.2$ and $NRC \geq 0.65$) fibrous glass with one face coated with a black fire retardant compound. The permanent composite fire and smoke hazard rating of the liner shall be stenciled on the liner face and shall be:
 - 1. Maximum Flame Spread 25
 - 2. Maximum Smoke Developed 50

2.02 TYPICAL DUCT INSULATION

- A. Duct insulation shall be 2.2" thick, minimum 3/4 lb. density fiberglass, installed $R \geq 6.0$, with an FSKL 0.00035" thick aluminum foil jacket, reinforced with fiberglass scrim. Thermal conductivity shall be a maximum of $K = 0.29$ at 75°F mean temperature, or a maximum of $K=0.27$ at 25% compression.
- B. Insulation adhesive shall be Benjamin Foster 85-20. Tape shall be aluminum foil

and shall be SMACNA listed and labeled.

- C. The composite NFPA 90A and 90B, ASTM E84, UL rating of the installed insulation shall not exceed 25/50.
- D. The grease exhaust ductwork shall have zero-clearance to combustibles wrap from the hood connection to discharge termination. Coordinate the insulation with all required access panels, drains, etc. as required by NFPA 96.

2.03 INSULATION FOR DUCTWORK OUTSIDE

- A. See specification 23 31 00 for duct construction installed outside the building and exposed to weather. Note requirement for soldered or welded duct. Ductwork installed outside shall be provided with a cover as noted below with water-proof coating and seams. Seams shall be located so as to not be subject to water flow. Cover shall be painted a light colour as selected by the Owner. All ductwork installed outside shall be constructed with sloped top "watershed" design with a slope of not less than 2% to avoid ponding water. Any ductwork supports connected directly to the ductwork shall also abide by the insulation requirements below.
 - 1. Ductwork conveying conditioned air shall, in addition, have minimum R-12 insulation of one of following options:
 - a. 3" thick, 3 PCF density rigid fiberglass board insulation, finished with waterproof mastic and glass fiber with aluminum jacket. Jacket shall have waterproof silicone caulk joints and seams. Seam opening shall be installed facing downward.
 - b. 3" thick, 3 PCF density rigid fiberglass board insulation with foil-kraft facing with Polyguard, or equal, finished with waterproof mastic and glass fiber with aluminum jacket. Jacket shall have waterproof silicone caulk joints and seams. Seam opening shall be installed facing downward.
 - c. 2" thick polyisocyanurate board insulation finished with waterproof mastic and glass fiber with aluminum jacket. Jacket shall have waterproof silicone caulk joints and seams. Seam opening shall be installed facing downward.
 - 2. As an alternate to single wall duct and exterior insulation, ductwork installed outside may be double-walled meeting SMACNA requirements, R-12 insulation between walls, and the exterior wall shall be corrosion-coated for outside installation. Ductwork shall be weathertight.
 - 3. Ductwork installed outside but not exposed to weather, such as in covered

loading docks and parking decks more than 15' from exterior openings, and conveying unconditioned air, shall not be required to be covered or insulated. See Section 23 31 00 for coating required for seacoast area installations.

4. Access into ductwork installed outside shall be located inside the building where feasible. Where outside access is required, access shall be through removable cover and insulation to match the above requirements. Removable areas shall be permanently labeled on the outside and shall be insulated to minimize exposure to water infiltration.

3.0 EXECUTION

3.01 INSTALLATION

- A. Ductwork shall be installed in strict accordance with SMACNA, UL, and NFPA standards.
- B. Duct liner shall be provided throughout all return air, transfer, and plenums. Duct liner shall also be provided for the following minimum distances, through the first elbow(s), or as otherwise indicated on the drawings, whichever is greater, downstream of each unit indicated below:
 1. Packaged rooftop unit – 25 ft
 2. Self-contained air conditioning unit – 25 ft
 3. Central air handling unit – 25 ft
 4. Split system air handling unit – 5 ft
 5. Water-source heat pump – 5 ft
 6. Fan coil unit – 5 ft
 7. Terminal unit – 5 ft
- C. Straight runs only shall be factored into the above distance requirements. Elbows, etc. within the length shall be lined but shall not count towards the length requirement.
- D. Duct liner shall not be installed within six inches of a damper, including fire and/or smoke dampers. Metal nosings are required on the upstream side of the exposed insulation. Where lining has been interrupted, external insulation is required.
- E. Duct liner shall be cut to provide overlapped and compressed longitudinal corner joints. Liner shall be installed with the coated surface facing the air stream. Duct liner shall be adhered to the ductwork with a 100% coverage of the sheet metal surfaces using a fire-retardant adhesive applied by spraying. Coat all exposed leading edges and all transverse joints with fire retardant adhesive. The liner shall be additionally secured using metal pins welded to the duct and speed washers. All leading edges shall be secured with sheet metal airfoils.

- F. Inside the vapor barrier of the building: All supply air ductwork which is not lined shall be insulated. All outside air ductwork shall be insulated. Insulation shall be cut slightly longer than circumference of duct to insure full thickness at corners. All insulation shall be applied with edges tightly banded. Insulation shall be adhered to duct with fire resistant adhesive. Adhesive shall be applied so that insulation conforms to duct surfaces uniformly and firmly. In addition to the adhesive, the insulation shall be additionally secured to the bottom of all ducts 18" or wider by means of welded pins and speed clips. The protruding end of the pins shall be cut off flush after the speed clips have been applied. The vapor barrier facing shall be thoroughly sealed with tape where the pins have pierced through. All joints shall be sealed with 2" wide SMACNA tape. Any cuts or tears shall be sealed with SMACNA tape.
- G. All outside air ductwork located in conditioned or semi-conditioned spaces shall be externally insulated similar to supply ductwork.
- H. All conditioned air ductwork, including partially conditioned energy recovery ventilator outside air supply to the building and exhaust ductwork, installed in spaces that are ventilated only, i.e. penthouses, shall be insulated.

END OF SECTION

SECTION 23 31 00

HVAC DUCTS, ACCESSORIES, AND CASINGS

1.0 GENERAL

1.01 DESCRIPTION

- A. All work specified in this Section is governed by the Common Work Results for HVAC Section 23 05 00.
- B. This Section 23 31 00 and the accompanying drawings cover the provisions of all labor, equipment, appliances, and materials and performing all operations in connection with the construction of the ductwork systems as specified herein and as shown. These systems include, but are not limited to, the following:
 - 1. Supply air ductwork
 - 2. Return, transfer and relief air ductwork
 - 3. Exhaust ductwork
 - 4. Outside air ductwork
 - 5. Ductwork accessories

1.02 INTENT

- A. It is the intent of this Section of the specifications to provide a complete operable duct system as shown and specified which is reasonably airtight, free of noise, vibration and sweating, and fabricated so as to fit into the space allotted and to exhibit a minimum resistance to airflow.

1.03 DESIGN AND CONSTRUCTION - DUCTWORK

- A. Ductwork shall be provided in strict accordance with the third edition - 2005 - of the SMACNA HVAC Duct Construction Standards - Metal and Flexible, NFPA No. 90A, 90B, 91 and 96, and UL 181. **Where SMACNA tables have an option between different gauges and supports, the heavier gauge shall be used.**
- B. Ductwork dimensions shown are net, clear, inside dimensions with no allowance shown for duct liner. All ductwork specified to be lined shall be 2" larger than shown in each dimension to compensate for the liner. Ductwork shall be square, rectangular, round, spiral or flat oval as noted. Conversion of duct shapes and sizes shown shall be accomplished without increasing air velocities or friction losses and is subject to prior approval by the Architect and Engineer.
- C. Elbows shall be either full radius type (inside radius equal to duct width), five-gore radiused flat-oval type or, in low pressure systems only, mitered with double-thickness turning vanes except that lined ductwork for low pressure returns and transfers shall not have turning vanes.

- D. Abrupt changes in duct sizes and shapes shall not be permitted. The total angle of diverging transitions shall be not more than 15 degrees; converging transitions shall be not more than 30 degrees unless otherwise noted or required due to structural constraints.
- E. Offsets, transitions, rises and drops are not individually called out on the Design Drawings. They shall be provided as required to fit the ductwork into the allocated spaces.
- F. Transition rectangular ductwork on bottom and sides. Maintain top of ductwork level and as high as possible.
- G. "Medium pressure ductwork" shall be constructed for 3" WC static pressure class at 4000 FPM velocity with Class A seals. Applications shall include:
 - 1. All supply air ductwork from the packaged rooftop unit
 - 2. All ductwork between central ventilation fans (such as outside air, toilet exhaust, pressure relief, energy recovery units, 100% outdoor air units)
 - 3. All ductwork in systems subject to more than 1" WC.
- H. All other ductwork shall be constructed for standard 1" WC static pressure class at 2500 FPM with Class C seals and is herein defined as "low pressure ductwork".
- I. Provide the following types of ductwork material for the services indicated:
 - 1. Galvanized sheetmetal: supply, return, exhaust, and relief of conditioned and outside air

2.0 PRODUCTS

2.01 GALVANIZED SHEETMETAL

- A. Galvanized sheetmetal shall be lock-forming grade G90-ASTM A 653 hot dip galvanized steel sheets. Sheetmetal shall be galvanized with not less than 0.90 ounces of zinc per square foot on both sides of the sheet.
- B. Galvanized sheetmetal installed outside the building and subject to weather shall be soldered or welded. See Section 23 07 13 for additional information about covering and insulation.
- C. Galvanized sheetmetal installed outside the building and not exposed to weather, such as in covered loading docks and parking decks, may match the construction of ductwork inside the building.
- D. Galvanized sheetmetal ductwork outside the building within 20 miles of the

seacoast shall have corrosion coating appropriate to the installation location.

2.02 SPIRAL DUCT

- A. Spiral duct shall be utilized for all flat-oval and round ductwork in medium and high-pressure systems.
- B. Spiral duct shall be the product of United McGill Corporation, R.V. Money, Eastern Sheet Metal, or an approved equal.
- C. Spiral duct with internal ribs is not acceptable.
- D. Spiral duct shall conform to SMACNA 2005 Standards. Lighter gauges, etc. due to standing ribs are not acceptable.
- E. Spiral duct in exposed ceiling applications shall have slip fittings, minimum Class 3 for 2" WG negative pressure to 10" WG positive pressure, with EPDM gaskets. Coordinate assembly with ductwork insulation.

2.03 DAMPERS

- A. Manual Volume Dampers
 - 1. Single blade butterfly dampers are acceptable up to 12" round or 12" x 12" square. Dampers larger than these dimensions shall be multi-blade type. Single blade dampers shall be constructed of 16 gauge or heavier galvanized sheetmetal.
 - 2. No multi-blade damper blade shall exceed 8" in width. All multiple blade dampers shall be constructed of 16 gauge galvanized steel or heavier. The damper frame shall be 16 gauge or heavier. The damper action shall be opposed-blade type.
 - 3. Each blade shall pivot on a 1/2" cadmium plated, cold-rolled steel axle which pivots within self-lubricating, Oilite bronze bearings.
 - 4. The top and bottom edges of each rectangular damper blade shall be crimped for stiffness.
 - 5. The operating rod for all dampers shall be extended outside the damper frame for attachment of an operator. Each operator shall have a position indicator and locking quadrant.
 - 6. All dampers utilized for introduction of outside air shall have flexible, gasketed edge and end seals. The leakage rate shall be less than 4 CFM per SF of face area against a 1" WC differential pressure, based on a

nominal 48" x 48" damper size.

7. All dampers utilized for exhaust or relief air shall have flexible, gasketed edge and end seals. The leakage rate shall be less than 4 CFM per SF of face area against a 1" WC differential pressure, based on a nominal 48" x 48" damper size.
8. Dampers to be installed in insulated ductwork shall have standoffs sufficient to allow for insulation and vapor barrier integrity.
9. Manual volume dampers shall be as manufactured by Louvers & Dampers, Inc., Pottorff, Greenheck, Nailor, Ruskin, or an approved equal.

B. Control Dampers

1. Control dampers shall be of the same construction as manual volume dampers, except that no manual operator and quadrant is required. The operating rod shall be suitable for operation by an automatic pneumatic or electric operator.

C. Fire Dampers

1. Fire dampers shall be UL-listed and labeled for 1 1/2 or 3 hours, in accordance with the installation location, and shall be provided with 160°F links or linkages appropriate for the service. Dampers installed within ducts shall be Type B or Type C with the blades out of the air stream. Areas indicated shall be net, clear, open areas.
2. Fire dampers shall be appropriate for the installation location and application. All fire dampers in supply, return, exhaust, etc. shall be dynamic-type.
3. Fire dampers shall be as manufactured by Louvers & Dampers, Inc., Pottorff, Greenheck, Nailor, Ruskin, or an approved equal.

D. Smoke Dampers

1. Smoke dampers shall be UL-listed as Class 1 low-leakage smoke dampers. Smoke dampers shall be 24V and wired under this Division.
2. Smoke dampers shall be appropriate for the installation location and application. All fire dampers in supply, return, exhaust, etc. shall be dynamic-type.
3. Smoke dampers shall be as manufactured by Prefco, Louvers & Dampers, Inc., Pottorff, Greenheck, Nailor, Ruskin, or an approved equal.

E. Fire/Smoke Dampers

1. Fire/smoke dampers may be combined into a combination fire/smoke dampers. All provisions of the above shall apply. Fire/smoke dampers shall be UL-listed.

F. Backdraft Dampers

1. Backdraft dampers shall be sized according to their installation location and noted pressure setting. Damper pressure setting shall be adjustable and shall be accessible from outside ductwork or via access hatch, as applicable.

2.04 LOW-PRESSURE DUCT BRANCHES

- A. Splitter dampers shall be provided at all low-pressure ductwork branches. All low-pressure ductwork branches shall be radiused or 45 degree take-offs; straight taps are unacceptable. The length of the damper blade shall be the same as the width of the widest duct section at the split, but in no case shall blade length be less than 12". Each operator rod shall have a locking swivel joint.

2.05 FLEXIBLE DUCT

- A. Flexible ductwork shall be Class 1, UL 181 air duct and meet NFPA 90A and 90B Standards.
- B. The internal duct surface shall be acoustically rated, core layers bonded to a coated steel wire helix. The external jacket shall be a fiberglass, bi-directionally reinforced, metallized vapor barrier with a standing, triple ply seam. Fiberglass insulation shall be provided between the duct surface and the jacket to achieve a minimum R-4.2. Any flex duct outside the building thermal envelope shall be R-8 in Climate Zones 1-4 and R-12 in Climate Zones 5-8.
- C. Flexible ductwork shall be suitable for 10" WG positive pressure and 0.5" WG negative pressure in sizes 4" through 12" ID, and 6" WG positive pressure and 0.5" WG negative pressure in sizes 14-16" ID.
- D. Flexible ductwork, insulation and insulation cover shall be suitable for ceiling return air plenum installation and shall comply with all applicable codes and standards regarding such ceiling plenum installations.
- E. Flexible duct shall be ATCO or an approved equal.
- F. The maximum allowable installed length of flexible ductwork shall be as follows:

1. 8'-0" on low-pressure supply air systems limited to short runouts and end of runs connected to round neck supply diffusers and registers.
 2. 4'-0" on medium and high-pressure supply air systems limited to the runouts from the sheetmetal ductwork to each terminal unit.
 3. 2'-0" on connections from round neck grilles to sheetmetal ductwork on return, exhaust and transfer ductwork.
- G. Provide a spin-in fitting with integral scoop and volume damper at all flexible run-out connections in low-pressure supply air ductwork only, except locations where spin-in fittings would project more than 50% into the projecting ductwork dimension. Adhesive fittings are acceptable provided they are also screwed to the ductwork and sealed with mastic.
- H. Flexible ductwork shall not pass through wall, floors, or ceilings.

2.06 TERMINAL UNIT RUNOUTS

- A. Medium and high-pressure runouts to terminal units shall be connected to the trunk duct with factory-welded laterals, conical tees or bellmouth fittings; abrupt round to rectangular taps are strictly prohibited and shall be rejected.
- B. Terminal unit runouts shall be the largest of the associated terminal unit inlet size, the size noted on the drawings, or the scheduled runout size.

2.07 FLEXIBLE CONNECTIONS

- A. Provide flexible duct connections at the inlet and outlet of each belt-driven fan, indoor unit, fan coil unit, air handling unit, etc., and at all other locations indicated. Flexible connections shall be fabricated from a glass fabric coated on both sides with neoprene. Minimum weight shall be 30 oz. per sq. yard. Flexible connections shall be used for vibration isolation only and shall not be used to correct connection misalignment.

2.08 DUCT HARDWARE

- A. Duct hardware shall be as manufactured by Young Regulator or an approved equal.

2.09 ACCESS DOORS

- A. A duct access door shall be provided at each fire and smoke damper. Access doors shall be designed for 1.5 times the pressure of the duct in which they are mounted. Access doors shall be of sufficient size to provide access to the dampers for resetting the blades and replacing the links. Access doors in medium and high-

pressure ductwork shall be installed downstream of fire dampers and shall be implosion type. Where access is provided through gypsum board walls or ceilings, furnish access door for installation under Division 09. Coordinate with Division 09 and Architect. Each door shall match the fire-rating of the wall or ceiling indicated.

- B. Access shall be provided to duct-mounted smoke detector locations. Access shall allow inspection and maintenance of all aspects of the detector. Access doors shall meet the requirements of A, above, as needed.

3.0 EXECUTION

3.01 INSTALLATION

- A. Ductwork shall be installed in strict accordance with SMACNA, UL, and NFPA standards.
- B. All ductwork installed outside the building shall be secured to the structure. Coordinate with the Structural Engineer as needed. It is the Contractor's responsibility to design and coordinate all supports. All supports shall be designed to withstand all code-required wind and seismic loads.
- C. Flexible ducts utilized in the low-pressure ductwork systems shall be installed without kinks or bends which are less than a centerline radius equal to or greater than twice the diameter of the flexible duct being installed. Also, in the runouts from the medium or high-pressure ductwork to the terminal units, the flexible ducts shall be installed with a variance of no more than 1" per foot of installed length off a straight and level line from the centerline of the sheetmetal ductwork runout or tap to the centerline of the terminal unit inlet. The size of the flexible ductwork connected to each terminal unit shall be the equivalent size of the larger of the following:
 - 1. The inlet size of the terminal unit valve
 - 2. The runout size indicated on the drawings

Should the runout size indicated on the drawings differ from the inlet size of the terminal unit valve, or where the inlet to the terminal unit is rectangular, the transition shall be made with sheetmetal and shall occur at the inlet to the terminal unit.

- D. All low pressure ductwork downstream of VAV units shall be left uncapped for balancing until tenant fit-up affects the units.
- E. All intersections (crossing) of low-pressure and medium-pressure ductwork shall be made with offsets in the low-pressure ductwork only. The medium pressure ductwork shall be ran straight and level.

- F. Electric duct heaters shall be installed as indicated and in conformance with the manufacturer's recommendations. Coordinate the actual units to be provided with all trades. The heater shall be tested and adjusted after installation to provide the capacities indicated.
- G. Ductwork labels, including factory labels, tags, etc. except equipment nameplates shall be removed to the satisfaction of the Architect in all exposed areas.
- H. Dampers shall be adjustable. Where dampers are not or will not be accessible without access panels, provide and install remote balancing cable control system, Young Regulator or equal. Adjustment shall be from a nearby accessible area.

END OF SECTION

SECTION 23 37 13

DIFFUSERS, REGISTERS, AND GRILLES

1.0 GENERAL

1.01 DESCRIPTION

- A. All work specified in this Section is governed by the Common Work Results for HVAC Section 23 05 00.
- B. This Section 23 37 13 and the accompanying drawings cover the provisions of all labor, equipment, appliances and materials, and performing all operations in connection with the construction and installation of air distribution devices as specified herein and as shown. These units include, but are not limited to the following:
 - 1. Ceiling Diffusers (CD)
 - 2. Return Air Grilles (RAG)
 - 3. Supply Registers (SR)
 - 4. Return Air Registers (RAR)

1.02 INTENT

- A. It is the intent of this Section of the specifications to provide complete, operable, adjusted air distribution devices as shown and specified which are free of excessive noise, vibration and airflow fluctuations.

1.03 SELECTION CRITERIA

- A. All air distribution devices shall be selected in accordance with the following minimum criteria unless otherwise noted below or on the drawings:
 - 1. Method of mounting shall be compatible with the ceiling, wall or duct surface which it mounts on or in; i.e. lay-in, surface mounting, plaster frame, duct collar, etc. The architectural drawings shall be referenced to determine the mounting method for each device. All flanges on surface mounted devices shall be provided with a gasket.
 - 2. Finish of all ceiling mounted devices shall be selected to match the color of the adjacent ceiling. Finish of all wall mounted devices shall be primer which is compatible with the finish coating specified for the adjacent wall; finish coat will be applied under Division 9.

1.04 BASIS OF DESIGN

- A. The basis of design is Titus. Any proposed substitutions shall be proven equal in

all respects to the equipment specified as the basis of design. Any modifications to ductwork, controls, ceilings, building structure, etc., that result from any substitution shall be coordinated with all trades. This coordination shall occur before delivery of equipment and any modifications shall be performed without incurring additions to the Contract.

1.05 ACCEPTABLE MANUFACTURERS

- A. Acceptable manufacturers are Price, Carnes, Metal Aire, Krueger, Nailor, and Titus, provided that their units, performance, appearance and physical characteristics are equal in all respects for this specific project.

2.0 PRODUCTS

2.01 DESCRIPTION

A. Ceiling Diffusers (CD)

- 1. Ceiling diffusers shall be perforated face diffusers equipped with fully adjustable pattern controls, capable of providing one-way, two-way, two-way corner, three-way, and four-way air patterns; Titus PAS. Diffuser performance data shall be in accordance with ADC equipment test code 162R4. The perforated face shall be hinged for easy access to pattern controls and duct accessories. The maximum NC level at design airflow shall not exceed 35 when measured in a direct field 5'-0" from the face of the device.
- 2.

B. Return Air Grilles (RAG)

- 1. Return air grilles shall match the ceiling diffusers in the area or shall be hollow core, perforated face, lay-in type, selected to match the CDs; with the largest neck size available UON Titus PAR. Opposed blade dampers shall be provided with each RAG. Performance data shall be in accordance with ADC 162R4. All other characteristics shall be equal to the ceiling diffusers.

C. Supply Registers (SR)

- 1. Supply registers shall be surface mounted, steel with aluminum blades, adjustable double-deflection type complete with opposed blade dampers for balancing purposes. The outermost set of deflection blades shall be parallel to the long dimension of the SR and the innermost set of deflection blades shall be parallel to the short dimension of the SR. The

registers shall be tested in accordance with ADC standards and shall be selected to provide design airflow at a maximum NC of 35. SRs shall be Titus 272R.

D. Return Air Registers (RAR)

1. Return air registers shall be surface mounted, steel registers with curved hemmed edge blades with an opposed blade damper. Damper blades shall be gang operated by means of a key which can be removed after balancing. RARs shall be Titus 350ZRL (steel), except RARs shown on the return air boot detail with upturned blades shall be Titus 350RL, sized as indicated.

3.0 EXECUTION

3.01 INSTALLATION

- A. Air distribution devices shall be installed as indicated and in conformance with the manufacturer's recommendations. The color, frame, and border types shall be coordinated with Architectural requirements and shall be selected to install in the finished surface indicated.
- B. All air distributions devices to be reused shall be installed the same way as indicated for new devices. All existing color, frame, and border types shall modified as required to match new device requirements.
- C. All air distribution devices with blade orientations shall be coordinated with Architect. Specific attention is called to devices in exposed ceiling areas, including wall-mounted.

3.02 ADJUSTMENT

- A. Grilles, registers, diffusers, etc. shall be tested and adjusted to provide the scheduled air flow capacities.
- B. All devices shall have adjustable and accessible volume dampers. Where dampers are not or will not be accessible without access panels, provide and install remote balancing cable control system, Young Regulator or equal. Adjustment shall be from the face of the air distribution device, coordinated with the Air Distribution Manufacturer. Coordinate the location and size of the damper with the installation.
- C. In all slot diffuser applications, the inactive sections of the slot shall be finished with perforated steel, painted flat black, selected to match the SDs. These sections shall be open to the plenum as a return air path. Inactive sections shall have an insulated light shield.

END OF SECTION

SECTION 26 01 00

ELECTRICAL GENERAL

PART 1 - GENERAL

1.1 SCOPE

- A. Division 26 includes all Specifications in the 260000 Series and the accompanying Electrical Drawings. Provide all labor, materials and equipment, and all necessary operations to provide the complete scope of the electrical systems intended under this Division. Division 26 is not a stand alone document, but a part of the complete Project Documents.
- B. Attention is called to the fact that there are many interfaces between the work required in this Division and the work required in other Divisions. Provide the necessary interface and coordination with other Divisions to provide a complete project.

1.2 EXISTING CONDITIONS

- A. Attention is called to the fact that the work is to be performed within an existing, operational facility. Prior to the submission of bids, each bidder shall visit the project site, thoroughly investigate and be familiar with all existing conditions, which will affect their work; especially the work to be performed above the existing ceilings.
- B. When this project is finished, the work under this Division shall be complete in every respect, completely integrated with all the existing systems, and left in perfect operating condition. The electrical service to the building shall not be interrupted at any time without written coordination of the building's Owner. All existing electrical equipment removed during the project shall be removed from the site after inspection of the building's Owner. All existing electrical systems required to be operating at the project's completion or required to remain in use during the project shall be reconnected, replaced, rerouted or otherwise made to fit with proper workmanship techniques and left in safe working order.
- C. Connect new work to existing work in a neat and workmanlike manner. Where an existing structure must be cut or existing utilities interfere, such obstructions shall be bypassed, removed, replaced or relocated, patched and repaired. Work

disturbed or damaged shall be replaced or repaired to its prior condition.

- D. Prior to the start of any demolition or construction, secure the services of a qualified, EPA Certified asbestos abatement agency to check the existing insulation, etc. for asbestos. Should asbestos be found, do not proceed with demolition or construction; notify the Architect in any case in writing of the agency's findings.

1.3 CODES AND REGULATIONS

- A. All work under this Division shall comply with all local building codes, laws, regulations, ordinances and the requirements of the 2023 National Electrical Code.
- B. Where conflicts of installation requirements occur between the aforementioned codes, regulations or the Contract Documents, the most restrictive shall govern.
- C. Obtain all permits and licenses and pay all fees required by local authorities. Arrange for all necessary inspections required by the authorities having jurisdiction and provide written certificates of approval to the project Owner or his designated representative.

1.4 DEFINITIONS

- A. Contract Documents: The complete set of project Drawings and Specifications.
- B. Provide: Furnish, install and connect.
- C. Work: All materials installed, including all labor to provide complete system.
- D. Wiring or Wired: All wire or cable installed in conduit from panelboard to equipment and connected at both ends with all required boxes, connectors, couplings, etc.
- E. Conduit: Rigid steel conduit intermediate metal conduit (I.M.C.), electrical metallic tubing (EMT) plastic conduit (PVC), electrical non-metal tubing (ENT), or flexible steel conduit.

1.5 DRAWINGS AND SPECIFICATIONS

- A. The Drawings and Specifications together are to be considered as the Contract Documents. Any work shown in one and not shown in the other, or implied by

either, shall be provided to give a complete project.

- B. Should any conflicts exist between the Drawings and Specifications or there is an item shown/called for which is not clearly defined, immediately submit a request for clarification. No additional monies will be granted later when a conflict is resolved or an item is more clearly defined.
- C. The Drawings are schematic and are not intended to show the exact location outlets, etc. or the routing of conduit.
- D. The exact location of equipment requiring electrical connections (mechanical equipment, elevators, lights, etc.) shall be as located by other Divisions of the Contract Documents. Refer to the Architectural, Structural and Mechanical Documents for dimensions and details of building construction and provide work described in this Division so that it conforms to the details of the project. The right is reserved to relocate any receptacle, switch or other outlet a maximum of 10'-0" before it is permanently installed without incurring additions to the Contract amount.

1.6 SITE VISIT

- A. Visit the site and become familiar with all aspects of the site and existing conditions before submitting Contract price.
- B. No allowance will be made for lack of knowledge of existing conditions.

1.7 DEVIATIONS

- A. No deviations from the Contract Documents shall be made without the full knowledge and written consent of the Architect.
- B. If the existing conditions make it desirable to modify the Contract Documents in regard to any item, provide a written request to the Architect.

PART 2 - PRODUCTS

2.1 STANDARDS FOR MATERIALS AND WORKMANSHIP

- A. All materials used shall be new and shall be stamped with the label of Underwriters Laboratories, Inc. (UL).

- B. All materials shall meet the standards of the following associations and institutes where applicable:
 - 1. National Fire Protection Association (NFPA)
 - 2. American Society of Testing Materials (ASTM)
 - 3. American National Standards Institute (ANSI)
 - 4. National Electrical Manufacturer's Association (NEMA)
 - 5. Institute of Electrical and Electronic Engineers (IEEE)
- C. Manufacturer's names and catalog numbers specified herein are intended to describe the material and set the standard of quality. All bids shall be based on material specified. Requests for approval of material not specified shall be considered if the request is in written form and submitted to the Architect no later than fourteen (14) days before bid date. All requests shall conform with the provisions of the general and supplementary conditions.
- D. Samples of materials requested to be substituted shall be furnished upon the request of the Architect.

2.2 SHOP DRAWINGS AND SUBMITTAL

- A. The Engineer's review of shop drawings or submittals is a cursory review to check for general compliances of submittals with the design intent of the Contract Documents. The Engineer's review does not relieve the Contractor of his responsibility of complying with the Contract Documents. All coordination of the work in strict compliance with the Contract Documents is the sole responsibility of the Contractor.
- B. The following items shall be submitted for review:
 - 1. Conduit and wire
 - 2. Grounding system
 - 3. Devices
 - 4. Coverplates
 - 5. Panelboards
 - 6. Fuses
 - 7. Overcurrent devices
 - 8. Ground fault system
 - 9. Disconnect switches
 - 10. Lighting fixtures
 - 11. Lighting control system

12. Dimming system
 13. Life safety system
 14. Emergency system
 15. Motor control center
- C. All shop drawings and submittals shall be submitted in compliance with the requirements of the general and supplementary conditions. No more than four (4) copies of submittal data will be reviewed. Any additional copies will be returned unmarked. The responsibility of copying review comments on any additional copies will rest solely with the contractor.
- D. All submittals shall bear the name of the manufacturer to be used.
- E. All shop drawings and submittals shall include a stamped indication signifying that the submittal has been reviewed for compliance with the Contract Documents by the Contractor. This stamped indication also represents the fact that the Contractor has checked this submittal for its interaction with all other Divisions and certifies by his signature or initials that all coordination has taken place. The stamp shall include the date, name of the Contracting Firm, the signature of the Contractor, certification of compliance and approval. This stamp shall be on the submittal before the Engineer will review it.
- F. The engineer will review an individual submittal not more than twice. If the submittal is rejected again on the second review, the contractor will bare all responsibility for paying for the engineer's time for additional reviews. Such payments to the engineer shall be withheld from the next monthly pay application.

2.3 RECORD (AS-BUILT) DRAWINGS AND MAINTENANCE MANUALS

- A. At job completion, submit to the Architect, a set of prints showing all deviations from the Contract Documents. The Drawings shall also have dimensions locating all underground conduits.
- B. At job completion, submit to the Architect, three (3) sets of maintenance and instruction manuals for all equipment furnished on the project.

PART 3 - EXECUTION

3.1 COORDINATION

- A. Coordinate all space requirements with all other Divisions before installing any

work. Install work such that adequate space will be allotted for all other work from other Divisions to be installed and also will allow room for future access for repair and maintenance.

- B. Any work installed without proper coordination shall be relocated at the Architect's direction without increasing the Contract price.
- C. During the bidding process or the pricing for a guaranteed maximum price, coordinate with all other Divisions for the total amount of work required in Division 26. Any work shown or implied in another Division requiring work in Division 26 shall be included in the Contract price regardless of whether or not it is addressed in Division 26.

3.2 PROTECTION OF MATERIALS

- A. All equipment shall have the original finish when the building is turned over to the Owner.
- B. Protect equipment during construction from dirt, water, chemical, mechanical damage, etc. Protect all conduit openings so that no foreign material will enter the conduit.

3.3 TESTS, DEMONSTRATION AND INSTRUCTIONS

- A. Test all systems described in this Division in the presence of the Owner or a designated representative upon completion of the work. Demonstrate that the installation is in accordance with Contract Documents.
- B. Any work found not to be in compliance with the Contract Documents shall be repaired or replaced without incurring any additions to the Contract price.
- C. Provide to the Owner, all instruction on maintenance and operation of all systems and equipment provided under this Division. Provide all necessary tools and personnel to thoroughly present these instructions.

3.4 GUARANTEE

- A. All systems, equipment, components, work, etc. provided under this Division shall be covered by a one year guarantee starting at the time of final acceptance of the work by the Owner. Any defects in the work, systems, equipment or components found during this year shall be corrected at no charge. The

guarantee shall include providing all necessary cutting, patchwork, repainting, etc. to make the work complete and new.

- B. Present this guarantee and any additional warranties or guarantees on furnished equipment or systems to the Architect. All equipment or system guarantees are in addition to the general guarantee.

END OF SECTION

260923 LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following lighting control devices:
 - 1. Outdoor photoelectric switches.
 - 2. Indoor occupancy sensors.
 - 3. Lighting contactors.
- B. Related Sections include the following:
 - 1. Division 26 Section "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.3 DEFINITIONS

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

1.4 QUALITY ASSURANCE

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

1.5 COORDINATION

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 OUTDOOR PHOTOELECTRIC SWITCHES

- A. Description: Solid state, with SPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.

1. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.
2. Time Delay: 15-second minimum, to prevent false operation.

2.2 INDOOR OCCUPANCY SENSORS

A. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.

1. 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 15 minutes.
2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
4. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
6. Bypass Switch: Override the on function in case of sensor failure.
7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; keep lighting off when selected lighting level is present.

B. PIR Type: Ceiling mounting; detect occupancy by sensing a combination of heat and movement in area of coverage.

1. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.
2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

2.3 LIGHTING CONTACTORS

A. Description: Electrically operated and electrically held complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served,

including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).

2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.

2.4 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 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 – EXECUTION

3.1 SENSOR INSTALLATION

- A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 CONTACTOR INSTALLATION

- A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

- A. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size shall be 1/2 inch.
- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

- A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."
- B. Identify controlled circuits in lighting contactors.
- C. Label time switches and contactors with a unique designation.

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.

END OF SECTION

SECTION 26 10 00

ELECTRICAL BASIC MATERIALS & METHODS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. All work specified in this Section shall comply with the provisions of Section 26 01 00.
- B. This Section describes the basic electrical materials and installation methods that are acceptable and applicable to Division 26.

PART 2 - PRODUCTS

2.1 CONDUIT

- A. Galvanized rigid steel conduit shall be low carbon, hot-dipped galvanized both inside and out with threaded joints.
- B. Intermediate metal conduit (IMC) shall be steel, galvanized both inside and out with threaded joints.
- C. Electrical metallic tubing (EMT) shall be steel, galvanized both inside and out.
- D. Plastic conduit (PVC) shall be schedule 40 PVC heavy wall type. A grounding conductor shall be provided.
- E. Electrical non-metallic tubing (ENT) shall be of such material that it is resistant to moisture, chemical atmospheres and is flame retardant. A grounding electrode conductor shall be provided.
- F. Flexible metal conduit shall be flexible steel conduit tubing and shall meet Underwriters Laboratories Standard for Flexible Steel Conduit.
- G. Liquid-tight flexible metal conduit and liquid-tight non-metallic conduits shall be liquid-tight and sunlight resistant.
- H. Steel conduit approved manufacturers are Allied, Triangle and Republic.
- I. PVC and ENT conduit approved manufacturers are Carlon and Triangle.

2.2 CONDUIT FITTINGS

- A. Rigid conduit and IMC conduit fittings shall be zinc-coated, ferrous metal and taper threaded type.
- B. EMT fittings shall be zinc-coated steel and hexnut compression or set-screw type. EMT connectors shall have insulated throats.
- C. PVC fittings, elbows and cement shall be produced by the same manufacturer. All joints shall be solvent welded in accordance with the manufacturer's recommendations.
- D. Conduit connections to switchboards, motor control centers, transformers, panel cabinets, and pull boxes shall have grounding wedge lugs between the bushing and the box or locknuts designed to bite into the metal.
- E. Each conduit end shall be provided with either an insulated throat connector or separate locknut and insulated bushing. Bushing shall be installed before any wire is pulled.
- F. Conduit fittings approved manufacturers are Raco, Steel City, O.Z. Gedney, Thomas & Betts and Appleton.
- G. Expansion fittings shall be provided in all conduit which crosses and expansion joint.

2.3 CONDUCTORS

- A. Conductors shall be copper of 98% conductivity, 600 volt insulation. Sizes specified are AWG gauge for No. 4/0 and smaller and circular mils (MCM) for all sizes larger than no. 4/0. Conductors No. 10 and smaller shall be solid and type "THHN" or "THWN" insulation. No. 8 and larger shall be stranded and type "THW" or "XHHW" insulation.
- B. Aluminum conductors may be used for service lateral conductor if the same or larger capacity of the conductors specified. Aluminum conductors shall be Alcan 8000 series, Stabily or approved equal.

2.4 OUTLETS

- A. Outlet boxes and covers shall be of such form and dimensions as to be adapted to their specified usage, locations, size and quantity of conduit, and size and

quantity of conductors entering the boxes. In special "Fire Rated" partitions, outlets shall comply with ASTM No. E119.

- B. Flush ceiling outlets for surface or pendant mounted lighting fixtures shall be one-piece 4" square or octagonal pressed steel boxes. Boxes for devices in unfinished masonry walls or stud walls shall be pressed steel, square corner, sectional switch boxes, or shall be 4" square box with a square cornered tile wall cover, set flush with masonry construction. Boxes in concrete ceiling slab shall be octagonal, shallow concrete boxes. Welded boxes are not acceptable.
- C. All outlet boxes in plaster or masonry walls or ceiling shall be provided with plaster rings.
- D. Junction boxes and all outlets not indicated as containing wiring devices or lighting fixtures shall have covers. Covers for outlets in walls shall be as specified for wall switches and receptacles.
- E. Outlet boxes exposed to the weather and outlet boxes for vaportight lighting fixtures and devices shall be of cast iron corrosion resistant type.
- F. Outlet box approved manufacturers are Appleton, Racor, Steel City, or Crouse-Hinds.

2.5 DISCONNECT SWITCHES

- A. Disconnect switches shall be "heavy-duty" type, enclosed switches of quick-make, quick-break construction. Switches shall be horsepower rated for 600 volts AC as required. Lugs shall be UL listed for copper and aluminum.
- B. Padlocking provisions shall be provided for padlocking in the OFF position.
- C. Switches shall be furnished in NEMA 1 General purpose enclosure unless noted otherwise. Switches located on the exterior of the building or in "wet" locations shall have NEMA 3R enclosures.
- D. Fused disconnect switches shall have rejection type fuse clips with dual element, current limiting fuses of rating shown.
- E. Disconnect switches shall be mounted to structure. Disconnect switches shall not be mounted to mechanical equipment or ductwork.

2.6 NAMEPLATES

- A. Nameplates shall have 3/8" high engraved letters.
- B. 120 or 208 volts: white core laminated bakelite with black finish.
- C. 277 or 480 or higher volts: white core laminated bakelite with red finish.
- D. Nameplate shall indicate the panel name and the name of the device or equipment where the power supply/feeder originates.

2.7 WALL SWITCHES

- A. Wall switches shall be plastic, totally enclosed, quiet type, self-grounding, 277 volts and 20A rating and shall match existing if possible and equal the following (or equal by Leviton, P&S, or Cooper):
 - 1. Single Pole: Hubbell No. CS1221
 - 2. Double Pole: Hubbell No. CS1222
 - 3. Three-Way: Hubbell No. CS1223
 - 4. Four-Way: Hubbell No. CS1224
- B. Color shall be as selected by architect.
- C. Flush motor switches with red pilot light and with overload protection for fractional horsepower motors shall be Hubbell No. HBL1221PL.
- D. Key switches shall be Hubbell No. HBL1221L 20A Series or approved equal by P&S or Leviton.

2.8 WALL MOUNTED OCCUPANCY SWITCHES

- A. The passive infrared sensor shall be a completely self-contained control system that replaces a standard toggle switch. Sensor shall have ground wire for safety. Switching mechanism shall be a latching air gap relay, compatible with electronic ballasts, compact fluorescent and inductive loads. Triac and other harmonic generating devices shall not be allowed.
- B. Sensor shall cover up to 1000 sq. ft. for walking motion, with a field of view of 180 degrees.
- C. Sensor shall have system which provides superior 180 degree coverage.
- D. Sensor shall operate at 120 VAC or 277 VAC.

- E. Sensor shall have no minimum load requirement and shall be capable of switching from 0 to 500 watt incandescent; 0 to 800 watts fluorescent or 1/6 hp @ 120 VAC, 60 Hz; and 0 to 1200 watts fluorescent or 1/3 hp @ 277 VAC, 60 Hz.
- F. For accuracy and consistency, sensor shall have a DIP switch controlled, digital time delay adjustable from 15 seconds to 30 minutes.
- G. Sensor shall have standard 5 year warranty and shall be UL and CUL listed.
- H. Sensor shall be Wattstopper WI Series, Leviton Decora Series, or approved equal by engineer.

2.9 RECEPTACLES

- A. Duplex receptacles shall be plastic, two-pole, three wire, self-grounding, side wired, 125 volts and 15A rating and shall match existing if possible and be equal to the following (or equal by Leviton, P&S, or Cooper):
 - 1. Standard receptacle: Hubbell No. 5362 Series
 - 2. Tamper resistant type: Hubbell No. CR20*TR Series
 - 3. Isolated ground type: Hubbell No. CR5352IG Series
 - 4. Hospital grade (HG) type: Hubbell No. HBL8300 Series
 - 5. HG Tamper resistant type: Hubbell No. HBL8300SG Series
 - 6. GFCI: Hubbell No. GF20*LA Series
 - 7. GFCI HG: Hubbell No. GFR8300H*LA
 - 8. GFCI HG tamper resistant: Hubbell No. GFR8300H*TR
- B. Single receptacles shall be two-pole, three wire, self-grounding, side wired, 125 volts and 20A rating and shall be equal to the following (or equal by Leviton, P&S, or Cooper):
 - 1. Standard receptacle: Hubbell No. HBL5361 Series
 - 2. Isolated ground type: Hubbell No. IG5361 Series
- C. Color shall be as selected by the Architect.
- D. Receptacles in all patient care areas shall be hospital grade type per NEC article 517.18.
- E. Receptacles in all pediatric care areas shall be tamper resistant type per NEC article 517.18(C).

2.10 COVERPLATES

- A. Coverplates for flush mounted devices shall be brushed finished stainless steel standard size, Hubbell "P" Series or equal by Leviton, P&S, or Cooper.
- B. Telephone and data outlet coverplates shall have same finish as above.
- C. Coverplates for exterior devices shall be self-closing, die-cast aluminum Hubbell WP8M or equal by Leviton, P&S, or Cooper.

2.11 PLYWOOD BACKBOARDS

- A. Provide plywood backboards where shown. Backboards shall be minimum 3/4" thick and sized as shown or to accommodate equipment indicated to be mounted thereon.
- B. Secure plywood to the building structure and paint with two coats of gray paint.

2.12 SMOKE AND FIRE STOP FITTINGS

- A. Smoke and Fire Stop Fittings shall be UL listed for that purpose. The fittings used to seal conduit either on the outside of the conduit, busway or cable or internally shall have heat activated intumescent material, which expands to fill all voids. Smoke and fire stop fittings shall be O.Z./Gedney "FIRE-SEAL" or Dow Corning silicone RTV foam with an hourly fire-rating equal to or higher than the rating of the floor, ceiling or wall through which the cable or conduit passes. The seals for conduit shall be of the flanged type.

2.13 FLOOR OUTLETS

- A. Floor outlets shall be single gang floor boxes, Hubbell B2436 Series, complete with cast iron body, vertical angular adjustment, brushed brass frame, brushed brass floor plate and gasket. Larger than standard tappings shall be furnished where required. Adjacent boxes shall be installed on minimum 7" centers.
- B. Duplex floor receptacle outlets shall have Hubbell No. S3825 floor plate, a No. SB3083 carpet plate where installed in carpeted floor and a Hubbell CR5262 Series duplex receptacle. Single floor receptacle outlets shall have a S2625 plate and Hubbell single receptacle. Equal manufacturers shall be Leviton, P&S, or Cooper.

2.14 FUSES

- A. Provide all fuses. All fuses shall be of the same manufacturer. All fuses shall be of the high interrupting rating (200,000 Amps), current limiting type and manufactured by Bussmann. Fuses shall be provided for each fuse cutout and the specified quantity of fuses shall be furnished for spares.
- B. Circuits 0 to 600 ampere shall be protected by rejection type, current limiting BUSSMANN LOWPEAK Dual Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts). All dual-element fuses shall have separate overload and short-circuit clearing chamber. The fuse must hold 500% of rated current for a minimum of 10 seconds and be listed by Underwriter's Laboratories, Inc., with an interrupting rating of 200,000 amperes RMS symmetrical. The fuses shall be UL Class RK-1.
- C. Circuits 601 to 6000 ampere shall be protected by current limiting BUSSMANN HI-CAP Time-Delay Fuses KRP-C. Fuses shall employ "O" rings as positive seals between the end bells and the glass melamine fuse barrel. The terminals shall be opened. Fuses shall be time-delay and must hold 500% of rated current for a minimum of 4 seconds, clear 20 times rated current in 0.1 seconds or less and be listed by Underwriter's Laboratories, Inc., with an interrupting rating of 200,000 amperes RMS symmetrical. The fuses shall be UL Class L.
- D. Furnish and turn over to the Owner a minimum of one (1) set of spare fuses (set consisting of three fuses) for each type and rating of fuse used. When the number of fuse sets of the same type and rating actually installed exceeds five (5) sets, furnish an additional spare set of fuses for each five (5) or fraction thereof.
- E. Provide a cabinet in which to store all spare fuses, Bussmann Catalog No. SFC
- F. Acceptable manufacturers are Bussmann or equal by Littelfuse.

PART 3 - EXECUTION

3.1 CONDUIT

- A. Rigid steel (or IMC) shall be used for service entrance and all feeders and branch circuits where exposed to damage.
- B. EMT shall be used for branch circuits, fire alarm and telephone when not underground or in concrete in contact with the earth.
- C. Schedule 40 PVC may be used for all underground feeders, service entrance

conductors when encased in 4" of concrete on all sides, or under the lowest floor slab.

ENT may be used for branch circuits in concealed areas which is not used as an environmental air plenum.

- D. Conduit shall be continuous from outlet to outlet, from outlet to cabinet, junction box and pull box. Conduit shall enter and be secured to all boxes, etc., in such a manner that each system will be electrically continuous from service to all outlets such that a good ground is provided. All conduit from cabinets and junction boxes shall terminate in approved outlet boxes or conduit fittings. Conduit connections to any box which has no threaded hub shall be double locknuttet.
- E. Provide junction boxes or pull boxes where shown and where necessary to avoid excessive runs or too many bends between outlets. The conduit sizes shown may increase if desired to facilitate the pulling of cables.
- F. All conduit shall be concealed unless indicated otherwise. Install exposed conduit parallel with or at right angles to the building walls and support from walls or ceilings at intervals required by Code with approved galvanized iron clamps or hangers. Concealed conduit above the ceiling shall be supported independent of ceiling construction. Where ceilings of lay-in type are used, conduit must be installed high enough to permit removal of ceiling panels and lighting fixtures. Use threaded rods and hangers for supporting single conduit. Use trapeze hangers consisting of double-nutted threaded rods and "Unistrut" channels or angles of 12 gauge minimum steel for supporting multiple conduit.
- G. Minimum size conduit for branch circuits shall not be smaller than 1/2". Home runs shall extend from outlets shown to panel designated. Home runs shown shall not be combined. Home run conduit shall not be smaller than 3/4".
- H. At couplings, conduit ends shall be threaded so that they meet in the coupling. Right and left hand couplings shall not be used; conduit couplings of the Erikson Type shall be used at locations requiring such joints.
- I. All conduit for future use, for telephone wire, or for data communication cable, shall be left with No. 16 gauge wire pulled in them or a pull line as manufactured by Ideal, and the ends securely corked or capped.
- J. Expansion fittings shall be installed in all conduit which pass through the cross-sectional area of expansion joints.

- K. Provide non-hardening elastic type duct seal compound, Neer No. DC., 3M Co. "Scotchfil", or Gardner Bender duct seal, for each conduit entering the building from outside and for each conduit passing from one space into another which is normally at a lower temperature.
- L. Provide watertight conduit hubs on conduit terminating in a box or cabinet exposed to the weather.
- M. Space in sleeves or around conduit that pass through fire resistive or fire rated walls, partitions, floors or ceilings shall be closed by packing with an unlabelled fire resistive material that will maintain the rating of the barrier penetrated.

3.2 FLEXIBLE CONDUIT

- A. PVC extruded cover flexible conduit shall be used in making short flexible connections to rotating or vibrating machinery or equipment. The flexible conduit at these locations shall be as short as possible, but shall have a minimum length of 12".
- B. A green stranded bonding jumper shall be installed outside of all flexible conduit that extends directly from a non-flex conduit to a rotating or vibrating machine. Where a junction box is used, the green stranded bonding jumper shall be installed inside the flexible conduit and attached to the junction box and to the machine. When the bonding jumper is installed outside of the flexible conduit, plastic wire straps shall be used 6" o.c. to secure the jumper to the flexible conduit.
- C. Flexible metal (MC) conduit system may be utilized where concealed in walls and/or millwork only. MC Cable shall run from point of exit from wall or millwork to nearest structurally supported junction box. MC cable will not be permitted to be installed in the above ceiling space and shall not pass through a fire rated partition. Conductor colors of the MC cable shall comply with 26 10 00 3.4 D.
 - 1. MC cable shall be constructed to have an insulated, copper ground conductor. Sheathing with a bare aluminum conductor shall not be used as the ground.
 - 2. MC cable in patient care areas shall be hospital grade (HCF) to comply with NEC 517.13.

3.3 CONDUIT PROTECTION

- A. All conduit installed in the ground outside the building exterior line (with the exception of exterior lighting circuits) shall be encased in 4" of concrete on all sides. Concrete shall be a minimum of 3000 P.S.I. mix. All threaded joints in rigid conduit that is encased in concrete shall have a U.L. listed joint compound applied. All conduit installed outside the building underground shall be buried a minimum of 30" below finished grade but in no case shall be buried deeper than 48". Where conduit is installed below the ground floor slab inside the building exterior line, the conduit shall be run between the floor slab and the vapor barrier. These conduits shall be installed in the slab itself where feasible. When a conduit duct bank must be installed then the entire duct bank shall be encased in concrete and installed per Appendix B of the NEC. Derating of conductors in the underslab duct bank shall be the responsibility of the contractor. Conduit installed in any slab, where permitted above, shall be above the bottom steel and below the top steel.
- B. Conduit shall be secured in place and protected where necessary to prevent damage to work during construction. The ends of all conduit shall be plugged to avoid filling with any foreign matter. All conduit shall be blown out and swabbed clear of water and trash prior to pulling wire.
- C. Provide identifying marker tape the entire length of each conduit installed in the ground outside the building. The tape shall be constructed of inert polyethylene, resistant to acids, alkalis, etc., in the soil, and shall be a minimum 4 mil thickness. The tape shall be yellow, 6" wide, and shall have the words, "CAUTION - ELECTRIC LINE BURIED BELOW," imprinted with contrasting permanent ink. The imprint shall repeat itself for the entire length of the tape. The tape shall be buried at a maximum of 18" below finished grade, above a portion of the earth fill shall be "Terra Tape" as manufactured by Reef Industries, Inc., P.O. Box 33248, Houston, Texas 77033 (1-800-231-6074).

3.4 WIRING

- A. All conductors shall be installed in conduit. No conductors shall be pulled into the conduit until the conduit system is complete and plaster had dried. Wire pulling lubricants shall be Gardner-Bender "Wireaide" or Ideal "Yellow 77".
- B. Conductors shall be continuous from outlet to outlet and from outlet to junction box or pull box. All splices and joints shall be carefully and securely made to be mechanically and electrically solid with pressure type connectors, Gardner Bender "Winggard" or Ideal "Wingnut". Tape shall be "Scotch" No. 33 for indoor and No. 88 for outdoor or Gardner Bender No. 95-661. Where

connection is made to any terminals of more than 30 amperes capacity and where conductors larger than No. 10 are connected to any terminal, copper terminal lugs shall be bolted to the conductors. Where multiple connections are made to the same terminal, individual lugs for each conductor shall be used. Aluminum conductors, if used for service conductors, shall be made with high compression lugs as manufactured by Square D, Ideal or MAC.

- C. Each conduit shall have a minimum of two (2) conductors pulled in unless that particular conduit is noted as being for systems other than electrical circuitry and/or future use or unless noted otherwise.
- D. Conductors for lighting and receptacle circuits shall have color coded jackets. The wiring shall be color coded with the same color used with its respective phase through the entire job as follows:

208/120 Volt System

Phase A - Black
Phase B - Red
Phase C - Blue
Neutral - White
Ground - Green

480/277 Volt System

Phase A - Brown
Phase B - Orange
Phase C - Yellow
Neutral - Gray
Ground - Green

- E. The feeder and service entrance conductors shall be color coded by the use of colored plastic tape applied within 6" of each conductor end.
- F. Branch circuit conductors shall not be smaller than No. 12 and where the home run from center of load exceeds 100'-0", the conductors from home run outlet to panel shall be No. 10 minimum.
- G. For branch circuits terminating in outlet without device, leave minimum of 12" of slack wire coiled for connection of equipment. All conductors shall be identified with proper circuit numbers at terminals, junction boxes at panelboards within 6" of conductor ends.

3.5 OUTLETS

- A. Provide galvanized steel or cast type boxes for all outlets.
- B. Where outlet boxes are used to support lighting fixtures, the outlet box shall be anchored to the structural members of the building per NEC 370-13.
- C. Outlet boxes shall be flush mounted unless they are specifically shown as being

used with exposed conduit or are located above a ceiling.

- D. Where outlets are supplied from conduit run in or below floor slabs, the conduit shall be stubbed up at the location shown and the wall built up around the conduit.
- E. Cuts for outlet boxes in masonry walls shall be made so that the coverplate will completely cover the cut. The mounting height of switch, receptacle and other outlets may be varied slightly, with the Architect's approvals, so that the outlet box, top or bottom, will occur at a masonry joint.
- F. The edge of all outlet boxes shall be flush with the surface in which they are recessed. The devices that fit into the outlet boxes shall be screwed tight before the coverplate is installed and the coverplate shall not be used as a means of tightening the devices in place.
- G. Where outlets are shown as being adjacent and different mounting heights are specified for each, they shall be mounted one directly over the other, on the centerline of the group.

3.6 NAMEPLATES

- A. Provide specified nameplates on the main switchboard, distribution panels, feeder switches, feeder breakers, panelboards motor control centers, disconnect switches, contactors, starters, transformers, start-stop push buttons and motor switches.
- B. Provide nameplates on every device in the main switchboard, distribution panels and motor control centers.
- C. Nameplates for surface mounted equipment shall be installed on the exterior of equipment with sheetmetal screws. Nameplates for flush or recessed mounted equipment shall be installed on the inside of the panel door or cover with epoxy cement.

3.7 WALL SWITCHES AND RECEPTACLES

- A. Where more than one device is indicated at a location, the devices shall be gang-mounted in combined multi-gang boxes and covered jointly by a common coverplate. Provide barriers as required by the devices and voltages being used.

3.8 COVERPLATES

- A. All junction boxes, outlet boxes, multi-gang switch boxes, utility boxes, etc., shall be covered with a coverplate. The coverplate shall be a finished plate as specified unless designated otherwise.
- B. Coverplates shall be mounted vertically unless designated otherwise.

3.9 GROUNDING

- A. Ground connections shall be in accordance with the 2023 National Electrical Code.
 - 1. Provide a grounding electrode system consisting of a minimum of three (3) copperweld rods, 3/4" x 10'-0", driven 24" below grade a minimum of 72" apart in the form of an equilateral triangle, bonded together with No. 4/0 conductors. Install rods a minimum of 36" clear of foundation walls to effect the building ground. If the resistance to ground exceeds 25 ohms, additional rods shall be driven and bonded together until a reading of 25 ohms or less to ground is obtained. After completion of the grounding system, measure the system ground resistance with a "Megger Earth Tester". Submit directly to the Architect two (2) copies of each test report certified by the testing technician and the Owner's representative.
 - 2. Extend from the electrodes to the main service disconnect with a No. 4/0 copper insulated ground conductor in a 1" conduit and connect to the neutral bar, housing and frame.
 - 3. Provide a No. 4/0 copper insulated conductor across the water meter with the conductor attached with clamps to the water line on each side of the meter.
 - 4. Provide a No. 4/0 copper insulated ground conductor in a 1" conduit from cold water entrance pipe ahead of first valve to the main service disconnect and connect to the neutral bar, housing and frame.
 - 5. Where nonmetallic insulating couplings or dielectric flanges are used in metallic water piping systems, provide a No. 4/0 copper, insulated ground conductor across the couplings with the conductor attached with clamps to the water line on each side of the coupling.
 - 6. All ground connections in the building system ground shall be done with Cadweld.

7. All ground clamps shall be equipped with compression type cable lugs independent of the compression device clamping the pipe or rod.
 8. All steel conduit entering the main service disconnect shall have threaded conduit insulated grounding bushings. All bushings shall be bonded together and bonded to the main grounding bus with a No. 4 bare conductor.
- B. Provide an insulated green bonding jumper from the grounding lug of all receptacles to a Steel City "GEE" clip or a sheet metal screw in the outlet box. The ground wire installed behind the device mounting screws will not be acceptable.
- C. Provide one (1) #6 AWG ground in 3/4" conduit from the system ground to the telephone company main distribution frame or service cabinet and to each telephone backboard.
- D. Provide a signal reference grounding grid under the raised floor in the computer room. The signal reference grid shall be as manufactured by Cadweld and shall include the following as a minimum:
1. The signal reference grid shall be 2" wide, 26 AWG gage copper strips on 2' centers in both directions. The grid shall be laid out such that the raised floor pedestals are centered in each 2' x 2' square.
 2. All crossovers shall have a welded joint.
 3. The grid shall be in sections (16' wide as a maximum and rolled on tubes with the outside of the roll protected for shipment.
 4. A 2" wide, 26 AWG gage x 72" copper strip with 5/16" hole in one end (for connection to the computer equipment) shall be installed for each piece of equipment and the connection to the equipment provided.
 5. All ground connections shall be the Cadweld process.
 6. Every sixth pedestal in each direction shall be connected to the grid using #6 AWG, 7 strand copper conductor.
 7. The grid is not required to be bonded to the floor. However, if any section does not lie flat, a mastic may be used. Consider this step only after all connections are made.

8. All columns within and at the perimeter of the room shall be bonded to the grid at the shortest path using a #6 AWG, 7 strand copper conductor.
9. All conduits, pipes, ducts, miscellaneous steel, etc., shall be bonded to the grid using a #6 AWG, 7 strand copper conductor.
10. The installation of the signal reference grid shall be in compliance with Cadweld's installation recommendations.

3.10 TELEPHONE CONDUIT SYSTEM

- A. Telephone service shall include wood backboards and equipment cabinets with service entrance conduit as shown.
- B. Telephone service entrance cable, all branch cabling and telephone instruments shall be provided by the telephone equipment vendor.
- C. Provide an outlet and conduit system for the telephones as shown and leave the same in readiness for wiring by others. Provide pull line in all telephone conduit. Terminate all conduit at a uniform height with smooth insulated bushings at the telephone wood backboards.
- D. Telephone wall outlets shall be pressed steel sectional switch boxes, wall mounted at the locations indicated. Coverplate shall have a bushed hole.
- E. Telephone floor outlets shall be floor boxes as specified at the locations indicated.

3.11 CONNECTION TO EQUIPMENT

- A. Equipment furnished by the Owner or under other Sections, such as mechanical equipment, elevators, escalators, signs, kitchen equipment, etc., will be installed by others. Provide electrical service and make the electrical circuit connection to this equipment.
- B. Provide PVC insulated flexible cord sets for all cord and plug connected building appliances and equipment. Cords shall be sized in accordance with electrical circuits indicated. Multiple conductor cords shall be "SO" cable with PVC jacket and green insulated ground conductor.

3.12 CORING, CUTTING AND PATCHING

- A. Set sleeves for conduit accurately before the concrete floors are poured, or set boxes on the forms so as to leave openings in the floors in which the required sleeves can be subsequently located. Fill in the voids around the sleeves with concrete.
- B. Should the performance of this preliminary work be neglected and should cutting be required in order to install conduit, then the expense of the cutting and restoring of surfaces to their original conditions shall be accomplished without incurring additions to the Contract.

3.13 EQUIPMENT ANCHORING

- A. All items of electrical equipment, such as switchboards, motor control centers, transformers, standby generator, etc., shall be securely anchored to the building structure. The anchoring shall be accomplished by utilizing a minimum size of 3/8" steel anchor bolts in the structure and to the item of equipment. A minimum of two (2) anchor bolts shall be provided on each side of each item of equipment with the following exceptions:

Exception No. 1: If the equipment manufacturer includes more than two (2) anchor holes per side in the base or base frame of the equipment item, then there shall be one anchor for each anchor hole.

Exception No. 2: If the equipment manufacturer recommends a particular quantity greater than two (2) per side, then that quantity of anchors shall be provided.

END OF SECTION

SECTION 263000

LIGHTING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. All work in this Section shall comply with the provisions of Section 260100.
- B. Provide all lighting fixtures and lamps as specified herein and as shown.
- C. All lamps shall be operating at the time of the final inspection and for a period of six (6) months after the final acceptance of the project by the Owner.
- D. Confirm exact locations of all lighting fixtures by coordination with the Architects Reflected Ceiling Plans and mechanical equipment above or on the ceiling.
- E. Confirm all ceiling types before ordering lighting fixtures.
- F. Each lighting fixture shall have been tested and certified for proper operation by the fixture manufacturer for the type mounting and ceiling on/in, which it is installed.

PART 2 - PRODUCTS

2.1 LIGHTING FIXTURES

- A. Each lighting fixture shall be as specified in the Lighting Fixture Schedule corresponding with its fixture type indication (letter).
- B. Most lighting outlets are lettered or groups of outlets are indicated by a letter.
- C. Each lighting fixture shall have a manufacturer's label affixed and shall comply with the requirements of all authorities having jurisdiction.
- D. The lighting fixtures that are indicated by the letters shall be as indicated on the Lighting Fixture Schedule.
- E. Emergency fixtures shall have a permanent solid red circle affixed to the frame.

2.2 LAMPS

- A. All LED fixtures shall be equipped with LEDs integral to fixture.

2.3 LED LIGHTING FIXTURES

- A. LED lamps for interior use shall be 3500K, CRI 80 (min.), unless noted otherwise by lighting designer. Color temperature chromaticity over the lifetime of the product shall be within 0.007 on the CIE 1976 (u',v') diagram.
- B. System shall be rated at a minimum for 50,000 hours (min.) at 70% lumen maintenance (L80).
- C. System shall comply with the following:
 - 1. ENERGY STAR® SSL Requirements for Luminaires
 - 2. IESNA LM-16

3. IESNA LM-58-94
4. IESNA LM-79
5. IESNA LM-80
6. ANSI C82.2-2002
7. ANSI C82.77-2002
8. ANSI C78.377-2008
9. CIE 13.3-1995
10. CIE 15-2002
11. ANSI/UL 153
12. UL 1598

- D. LED boards and drivers shall be provided with plug-in connections for tool-less replacement of components.
- E. Compatibility of dimming switches for control of dimmable LED drivers shall be confirmed with LED fixture manufacturer.

2.4 LED DRIVERS

- A. Drivers shall be replaceable with removal of the fixture, and shall be rated for 50,000 hours minimum.
- B. Drivers shall have a minimum power factor of 0.90.
- C. Drivers shall have less than 20% Total Harmonic Distortion.
- D. Drivers shall have Class "A" sound rating.
- E. Drivers shall come standard with 0-10V dimming.

2.5 LIGHT FIXTURE TRIM

- A. Each recessed lighting fixture shall have a trim to match the type of ceiling (plaster, exposed grid, concealed spline, exposed panel, etc.) in which it is being installed, regardless of catalog number given. Coordinate with the Architect's reflected ceiling plan to provide the right trim for the type of ceiling the fixture is to be installed in.
- B. Each lighting fixture recessed in a plastered ceiling of any type shall have a plaster frame.

PART 3 - EXECUTION

3.1 SUPPORT OF LIGHTING FIXTURES

- A. All lighting shall be supported from the building structure. The fixtures shall be supported in a manner that will insure the fixture weight being equally distributed from each support and the fixture remaining in a level position.
- B. Light fixtures installed recessed in a suspended ceiling system shall be supported from the building structure with two (2) 12 gauge wires on diagonal corners of the fixture. In addition, the fixture shall be clipped to members of the ceiling suspension system.
- C. Light fixtures installed in or on any ceiling other than a suspended ceiling system specifically mentioned above shall be supported with concealed steel rods. Rods shall be 1/4" diameter minimum and shall be located where recommended by the fixture manufacturer. Provide a minimum of two (2) supports for each 4' or 8' fixture chassis. Supports shall be maximum of 48" centers.

- D. Pendant mounted fixtures shall be stem supported by a fixture stud mounted in the outlet box. Suspended fixtures shall have mounting stems located as per the manufacturer's recommendations, but in no case shall have less than two (2) stems per chassis.

3.2 AIMING OF ADJUSTABLE LIGHT FIXTURES

- A. All fixtures with lamp position, tilt, shutters, rotation, or other types of adjustments during the final inspection. Fixtures serving areas where day lighting is predominant will be adjusted after sunset.

3.3 LIGHTING FIXTURES IN MILLWORK

- A. Special attention shall be given to lighting fixtures indicated to be mounted within, under, on or otherwise incorporated into millwork or cabinetry.
- B. Refer to the Architectural drawings and details for specific dimensions. This coordination shall occur prior to ordering fixtures to assure fixtures will fit the space limitations of the millwork.
- C. This requirement is intended to preclude incurring additions to the Contract due to fixtures being too small or too large for the space.

3.4 FINAL PREPARATION

- A. All plastic covers shall be removed from all fixtures.
- B. Clean all lens and reflectors from debris, fingerprints, dust, etc.

END OF SECTION 263000

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SECTION 28 72 10

LIFE SAFETY SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, and coordinated system.
- B. The fire alarm system shall comply with requirements of the NFPA Standard 72 for Protected Premises Signaling Systems and all local codes and regulations. The system shall be electrically supervised and monitor the integrity of all conductors. The manufacturer shall confirm all codes have been met and all necessary devices provided prior to submitting price.
- C. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded onto the Signaling Line Circuits.
- D. The system shall be an active/interrogative type system where each transponder is repetitively scanned, causing a signal to be transmitted to the local fire alarm control panel/node indicating that the transponder and its associated initiating device and notification appliance circuit wiring is functional. Loss of this signal at the local FACP shall result in a trouble indication on both the FACP display and at the network display, as specified hereinafter for the particular input.
- E. The system shall be arranged such that not less than 20 percent additional transponders may be inserted into any network communication loop.
- F. The FACP and peripheral devices shall be manufactured by **Notifier, Edwards, or Siemens.**
- G. The installing company shall employ **NICET (minimum Level II Fire Alarm Technology)** technicians on site. To guide the final checkout and to ensure the systems integrity, the submitting company shall employ **NICET Level IV** minimum managers and engineers. Proof of NICET level training shall be included as part of submittal package and kept on site with personnel.

- H. The installing company shall be **UL** listed for fire alarm installations. **UL** certificate shall accompany submittal package. The certification listing category shall be UUUJ and shall be indicated in the project submittal.
- I. The Contractor shall make arrangements and pay all fees in connection with the testing of the Life Safety System. All system devices shall be tested for their correct operation, except non-restorable type heat detectors which shall be sample tested. All tests carried out shall meet the requirements of the local authority having jurisdiction.
- J. The system shall have proper listing and/or approval from the following nationally recognized agencies:
 - 1. Factory Mutual Systems
 - 2. Underwriters Laboratories

1.2 SCOPE

- A. A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance to the project specifications and drawings.
- B. Basic Performance
 - 1. Each SLC loop shall be wired NFPA 72 Class B, Survivability Level 1.
 - 2. Initiation Device Circuits (IDC) shall be wired NFPA Class B, Survivability Level 1 as part of an addressable device connected by the SLC circuit.
 - 3. Notification Appliance Circuits (NAC) shall be wired NFPA Class B, Survivability Level 1 as part of an addressable device connected by the SLC circuit or a panel circuit.
 - 4. NAC speaker circuits shall be arranged such that there is a minimum of one speaker circuit per floor of the building or smoke zone, which ever is greater.
 - 5. NAC speaker circuits and control equipment shall be arranged such that loss of any one (1) speaker circuit will not cause the loss of any other speaker circuit in the system.

C. Basic System Functional Operation

1. As part of the fire alarm; when a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:
 - a. FACP will sound and display the alarm condition showing the device address, location, zone information, time/date, and device type.
 - b. The remote annunciator will sound and display the same information as shown on the FACP display unit.
 - c. Via system programming, the horn/bell outputs for all zones will activate and sound in temporal 3-3 pattern in synchronized fashion until silenced from FACP panel.
 - d. All strobes on floors with activated horn/bell outputs shall flash in a synchronized pattern per floor until silenced from the FACP panel.
 - e. Automatic functions including, but not limited to: elevator(s) recall, smoke evacuation, smoke door release and supply/return fan shutdown shall be activated via system programming as directed by codes and/or drawings.
 - f. Release all magnetically held smoke doors.
 - g. Provide signals to the mechanical controls including smoke dampers to shut down or reroute air-handling systems to prevent the recirculation of smoke.
 - h. Provide a DACT (Digital Alarm Communicator Transmitter) and a signal via DACT for connection to a central station or local municipal fire department (connection and leased line, if required, shall be provided by building owner).
 - i. Initiate a preprogrammed timing sequence.
 - j. Additionally, actuation of a lobby elevator smoke detector shall cause immediate non-stop return of all automatic elevators served by that lobby to the primary discharge level; except that,

when the alarm has been initiated on the primary discharge level, the elevators, shall be returned to the designated alternate discharge level per the requirements of ANSI ASME A17.1.

- k. Additionally, actuation of any elevator equipment room or shaft smoke detector shall cause immediate non-stop return of all automatic elevators served by that equipment room or shaft, to the primary discharge level per the requirements of ANSI ASME A17.1. Provide all required signals from FACP to elevator controls for smoke detector in elevator machine room per the requirements of ANSI ASME A17.1
- l. Additionally, actuation of any smoke detector located in the air handling units and/or equipment rooms shall activate signals to the mechanical controls indicating the floor of occurrence.
- m. It shall be possible to silence the alarm signals by operating the signal silence switch. However, the activation of another zone shall repeat the entire alarm process, thus causing the signals to resound.
- n. Silencing the alarm shall cause all speakers to silence. Firelights will continue to flash.
- o. Fire pump (if applicable) normal power availability, fire pump phase reversal and fire pump run status shall be monitored. Loss of normal power, phase reversal shall annunciate as supervisory alarms and pump running shall annunciate as an alarm.
- p. Provide a signal to activate the elevator shunt trip breaker upon activation of the heat detector(s) in the elevator shaft or elevator machine rooms.

2. General Operation

- a. Power failures, opens, grounds or any disarrangement of the system wiring or components shall be indicated by a visual and audible trouble signal. The audible trouble signal may be silenced, however, the trouble LED shall remain lit until the system has been returned to normal operating condition.

1.3 SUBMITTALS

A. General

1. Copies of all submittals shall be submitted to the Architect/Engineer for review prior to acceptance of system.
2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality.
3. The authority having jurisdiction shall be notified prior to installation of equipment and wiring. Complete information regarding the system including specifications, wiring diagrams, battery and power supply calculations, floor plans and graphics shall be submitted for approval.
4. If submittals, upon review by the Owner and/or the Owners Representative, are found not to conform with the performance, type and quality of products as well as all other requirements of these specifications; the Contractor shall be required to resubmit. The Contractor shall be responsible for the Owner's extra expenses for subsequent review(s) of rejected submittals. Such extra fees shall be deducted from payments by the Owner to the Contractor. Approval of the submittals by the Owner shall, in no case, relieve the Contractor of the responsibility to meet the requirements of this specification.

B. Shop Drawings

1. Drawings shall include the following minimum requirements for submittal:
 - a. Point-to-point wiring/conduit layout for all devices on 1/8" scale plans.
 - b. Device placement showing all addresses and device ID.
 - c. All panel and equipment terminations.
 - d. All circuit voltage drop and current calculations spread sheets.
 - e. All battery calculation spreadsheets.
 - f. Legend reflecting device description, manufacturer, model number, and back-box requirement.

- g. Wiring legend reflecting wire function, type, and recommended manufacturer's part number.
- h. Full sequence of operations.
- i. Power supply and amplifier calculations.

- 2. Specification data sheets on each individual system component.

C. Data Sheets

- 1. Submit simultaneously with the shop drawings, complete manufacturer's technical data sheets showing product description, listings, and specs.
- 2. Copies of **NICET II** and **IV** certifications.
- 3. Copy of company **UL** listing certificate.

1.4 APPLICABLE STANDARDS AND SPECIFICATIONS:

- A. The specifications and standards listed below form a part of this specification. The system shall comply with the latest standards.

- 1. National Fire Protection Association (NFPA), 2000 Edition - USA:

- No. 13 Sprinkler Systems
- No. 13A Halon 1301 Extinguishing Systems
- No. 17 Dry Chemical Extinguishing Systems
- No. 17A Wet Chemical Extinguishing Systems
- Clean Agent Extinguishing Systems
- No. 70 National Electrical Code
- Specifically Article 760
- No. 72 National Fire Alarm Code
- No. 101 Life Safety Code

- 2. International Building Code
- 3. American National Standard A17.1-1980
- 4. Underwriter's Laboratories Fire Resistance Directory

5. Local and State Building Codes
6. ADA Public Law 101-336
7. All requirements of the Authority Having Jurisdiction (AHJ)

1.5 APPROVALS

- A. The system shall have proper listing, approval and labeling from the following nationally recognized agencies:

FM	Factory Mutual Systems
UL	Underwriters Laboratories

1.6 SYSTEM FEATURES

- A. The system shall include the following features as a minimum:
1. During an alarm condition, the LCD annunciator shall display the activated alarm until acknowledged. This shall allow determination of where the last alarm has taken place.
 2. Ground fault detection in wiring on either plus or minus side.
 3. Separate alarm and trouble shall be displayed on the LCD annunciator.
 4. Resound feature.
 5. Dead Front" design control panel with all LED alarm trouble and power on indicators and all switches located behind a locked tempered glass door.
 6. Solid state construction.
 7. All alarm initiating circuit wiring, signal circuit wiring, speaker circuit wiring shall be supervised.
 8. Automatic transfer to standby batteries upon power failure.
 9. Lightning and surge protection.

PART 2 - PRODUCTS

2.1 CONDUIT AND WIRE

- A. All fire alarm wiring shall be installed in conduit. Conduit shall be installed as required by specification Section 26 10 00.
- B. Wiring shall be in accordance with local, state and National codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system.
- C. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
- D. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes from the 120 volt normal power source or from a generator powered source if available.
- E. All junction boxes and conduit utilized for fire alarm system cabling shall be painted red.
- F. All circuit breakers serving the fire alarm system shall include red marking and a listed locking mechanism per NFPA 72.

2.2 MAIN FIRE ALARM CONTROL PANEL:

- A. The FACP shall be completely microprocessor based.
- B. System Capacity and General Operation:
 - 1. Configure size of panel to operate number of SLC circuits in a fashion so that each circuit handles no greater than 70% load of capacity or a maximum of 5 floors per circuit.
 - 2. The fire alarm control panel shall include a full-featured operator interface and backlit 80-character Liquid Crystal Display (LCD).
 - 3. The system shall be fully field programmable from the display panel. Panels requiring the use of external keyboards for programming and changes are not acceptable.
 - 4. The FACP shall provide the **minimum** following features:
 - a. Drift compensation to extend detector accuracy over life.

- b. Detector sensitivity test, per NFPA 72, Chapter 7.
 - c. Maintenance alert, to warn of excessive smoke detector dirt or dust accumulation.
 - d. Multiple sensitivity levels for alarm, selected by detector.
 - e. System status reports to display and printer. Provide printer.
 - f. Alarm verification, with verification counters.
 - g. Cross zoning with the capability of counting two detectors in alarm.
 - h. Walk test.
 - i. UL-1076 security monitor points.
 - j. Control-by-time with holiday schedules.
 - k. Day/night automatic adjustment of detector sensitivity.
 - l. Device blink control for sleeping areas.
 - m. Releasing capability.
 - n. Pre-Alarm.
 - o. Selectable sensitivity levels, three minimum.
 - p. History Storage, with a minimum of 400 events.
 - q. Point Enable/Disable.
 - r. Point Read (status and level of obscuration).
 - s. Output point for connection to any building EMS.
- C. Signaling Line Circuits (SLC)

1. Each SLC interface shall provide power to communicate with 99 intelligent detectors (ionization, photoelectric or thermal) and 99 intelligent modules (monitor or control).
2. Each SLC circuit shall not exceed 70%, load capacity or cover more than 5 floors.

D. Serial Interface

1. The system shall include two serial EIA-232 interfaces. Each interface shall be a means of connecting UL Listed Electronic Data Processing (EDP) peripherals.
 - a. One serial port shall support a serial printer.
 - b. One serial port shall support a CRT/NRT device.
 - c. The system shall include an EIA-485 port for the serial connection of annunciators and remote LCD displays.

E. Field Charging Power Supply (**FCPS**): The FCPS is a device designed for use as either a remote 24-volt power supply or used to power Notification Appliances.

1. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24-volt power. It shall include an integral charger designed to charge 7.0 amp hour batteries. Provide batteries to support 60-hour standby with ten minutes of alarm indication at the end of this period. Battery charger shall be capable of recharging all batteries to seventy percent capacity in twelve hours.
2. The Field Charging Power Supply shall have four outputs (Survivability Level 1) and shall be available for connection to the Notification devices.
3. Provide 20-watt spare capacity in each electrical room on each floor for tenant audible circuits. Locate in a junction box clearly labeled "tenant fire alarm audible circuits".
4. Provide 1ea. Field Charging Power Supply (DC) per floor to allow for tenant build-out expansion of NAC devices. At no time shall there

exceed 70% load capacity of any FCPS on any of the common levels.
Provide power capacity as follows:

<u>Floor Size</u>	<u>Capacity</u>
<25,000 gross sq. ft.	6 amps DC
25,001 to 35,000 gross sq. ft.	10 amps DC
35,001 gross sq. ft. and greater	consult engineer

5. Locate audible (where required) and visual power supplies adjacent to one another and in a location within each room approved by the engineer.
6. Provide battery capacity and amplifier capacity in the main fire control panel for addition of tenant devices described above.

- F. Provide and install ceiling mounted smoke detector within 5 horizontal feet of FACP.

2.3 SYSTEM COMPONENTS

A. Horns/Bells

1. All Horns/Bells shall be installed as shown on drawings and in accordance with NFPA 72 and local codes.
2. Horns in corridors and all public spaces shall produce a nominal sound output of 15 dBA above average ambient noise levels with a minimum sound output of 15 dBA.
3. Horns shall be UL-464 listed for fire evacuation and operate on 12 or 24 voltage in a temporal 3-3 pattern.
4. The back of each speaker shall be sealed to protect the speaker cone from damage and dust.
5. Speakers shall be bone white in color.
6. Provide a unit cost to add 2 speakers per 25,000 sq.ft. This unit cost shall be applied to additional speakers that may be required at the request of the Fire Marshal during field inspections.

B. Strobe Lights

1. All strobe lights shall meet the requirements of the ADA, UL Standard 1971.
2. Strobe intensity and flash rate shall meet the requirements of UL 1971, ADA and NFPA 72.
3. Combination horn/strobe devices shall meet all above requirements as well as horn/bell requirements listed herein.
4. Strobe unit shall mount to a four inch square electrical outlet box. The strobe light shall have a white lens with red "FIRE" imprinted on it. When the unit is combination speaker/strobe, the speaker portion shall comply with the requirements stated in A. above.
5. All strobes shall have selectable output intensities from 15 to 110 cd. The intensity selected shall meet NFPA 72 requirements for the layout shown on the drawings.
6. Strobe spacing shall be as follows:
 - a. Strobes shall be spaced a maximum of 100' apart in corridors and within 15' of the end of every corridor to comply with the requirements of NFPA 72.
 - b. Strobes in open areas shall be provided to comply with NFPA 72.
 - c. Provide strobes in public spaces such as restrooms, kitchens, breakrooms, cafeterias, conference rooms, training rooms and any other space where six or more people are likely to gather.
7. Provide a unit cost to add 5 strobes including required signal circuits per 25,000 sq.ft. This unit cost shall be applied to additional strobes that may be required at the request of the fire marshal during field inspections.

C. Manual Fire Alarm Stations

1. Manual fire alarm stations shall be dual-action, non-coded, non-break glass type, equipped with key lock so that they may be tested without operating the handle.
2. Stations must be designed such that after an actual activation, they cannot be restored to normal except by key reset. Units shall be master keyed with control equipment.
3. An operated station shall automatically condition itself so as to be visually detected, as operated, at a minimum distance of 100 feet (30.5 m) front or side. This shall be achieved with the pull lever remaining at a right angle to the station body until reset.
4. The station body shall be constructed so that chips and scratches will not expose metal.
5. Manual fire alarm stations shall be located as required by NFPA 101 and the International Building Code.

D. Smoke Dampers

1. Smoke dampers shall be provided by Division 23.
2. Provide a smoke detector at each smoke damper location to meet the requirements of NFPA 72. Confirm quantities and locations of smoke detectors required for smoke dampers with Division 23. Provide 120 volt power as required for operation of smoke dampers.

E. LCD Alphanumeric Display Remote Annunciator

1. The alphanumeric display annunciator shall be a supervised, backlit LCD display containing a minimum of eighty, (80) characters for alarm annunciation in clear English text. Annunciator shall be located as shown on the drawings or at the location selected by the local fire department.
2. The LCD annunciator shall display all alarm, supervisory, and trouble conditions from the FACP via the serial card.

2.4 SYSTEM COMPONENTS - ADDRESSABLE DEVICES

E. Addressable Devices - General

1. Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel signaling line circuits.
2. Addressable photoelectric smoke and thermal detectors shall provide alarm and power/polling LEDs. LED(s) shall flash under normal conditions and LED(s) shall be placed into steady illumination by the control panel, indicating an alarm condition.
3. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system.
4. Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, **not the detector**, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.
5. All field wiring is to be terminated on the detector base, **not on the sensor head**. Addressing of detectors shall be via integral decade switches built into sensor. Devices requiring separate addressing means will not be accepted.
6. Any additional equipment required to program devices are not acceptable.

F. Intelligent Photoelectric Smoke Detector

1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
2. Provide photoelectric smoke detector heads with bases as required. Detectors shall be of the solid state photoelectric type utilizing a stable LED light source and a silicone photo diode as the receiving element to form a highly accurate means of smoke detection. Internal detector circuits shall be shielded against electrical interference and resistant to transients, noise and, RF interference. Detector shall be low profile, the complete unit including base shall not exceed 1.875 inches in depth.

Detector shall have a dual purpose red LED that flashes continuously to show that the device is operating and, that comes on steady to show that the device is in alarm.

3. Nominal detector sensitivity shall be 1.4% per foot obscuration with a range of 1% to 1.84%. Regardless of sensitivity settings, the detector's stability shall be unaffected by high air velocity. No radioactive materials shall be used.
4. Provide smoke detectors in elevator lobbies, at stairwell doors, in telephone rooms, electrical rooms, mechanical rooms, elevator pits, the top of the elevator shaft, adjacent to the fire alarm control panel, fire pump room, computer rooms as defined by NFPA 90, chiller plants, pump rooms, UPS rooms and elevator machine rooms.

C. Linear Beam Smoke Detector

1. Each beam shall be comprised of a solid state infrared (IR) transmitter, photodiode receiver and microprocessor based control module. Should IR output be attenuated below the desired alarm obscuration level as a result of smoke interference an alarm will be annunciated. Total obscuration of the beam is annunciated as a beam blockage trouble signal. All wiring from the control module to the transmitter and receiver heads is supervised.
2. The projected beam smoke detector system shall have an operating range of 10M. (33 ft.) to 100M. (330 ft.) and be listed for spacing the beam 30 ft. from a wall and 60 ft. on center. The transmitter and receiver optical elements shall be adjustable +/- 90 degrees horizontally and +/- 30 degrees vertically. The sensitivity shall be field selectable from 7% to 50% obscuration.

D. Intelligent Thermal Detectors

1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.

G. Duct Smoke Detectors

1. Duct smoke detectors shall be addressable type with visual alarm and power indicators. Provide remote LED/test stations where duct detectors are mounted in non-visible areas such as above ceiling.
2. Each detector shall be installed upon the composite supply/return air ducts(s), with properly sized air sampling tubes where required. Provide smoke detectors in each return air path of any mechanical equipment that moves air in excess of 2000 CFM to meet the requirements of NFPA 72 and 90A. Provide smoke detectors in each supply and return air path of any mechanical equipment that moves air in excess of 15,000 CFM to meet the requirements of NFPA 72 and 90A. Confirm quantities of smoke detectors required for mechanical equipment with Division 23. Room detectors may be used to accomplish smoke detection in the supply/return air paths if the application permits.
3. Each duct detector shall be installed along with addressable control module as needed for fan shutdown and/or smoke control. Detectors zoned with other devices shall be capable of operating its control module even if all other devices on their circuit have gone into alarm.
4. Duct detectors shall be provided by this division, installed by the mechanical contractor and electrically connected to the fire alarm system by the electrical contractor.

E. Addressable Dry Contact Monitor Module

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device such as flow, tamper, release systems, etc.) to one of the fire alarm control panel SLCs.
3. The IDC zone shall be suitable for Survivability Level 1 operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
4. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include an LED.

5. Monitor module shall be provided for all sprinkler flow and tamper switches. Switches are furnished and installed by others and electrically connected to the fire alarm system by the electrical contractor. Verify quantities and locations and coordinate installation of devices required with fire protection shop drawings. Provide connections to devices per fire protection shop drawings.

F. Addressable Control Module:

1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contact relay. Each relay shall have a red LED mounted on its cover to indicate if that relay has been activated.
2. The control module NAC may be wired for Class (A/B) Survivability Level 1 with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation, or as a dry contact (Form-C) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to ensure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.

G. Door Holders

1. Provide door holders for wall mounting and for floor mounting. Door holders shall operate on 24 volt dc power and each holder shall not draw more than 70 milliamps of power.
2. Coordinate quantities of door holders required with architect's door schedule.

2.5 BATTERIES

- A. The batteries shall be sealed, 12 volt nominal (two required).
- B. The battery shall have sufficient capacity to power the fire alarm system for the time required in NFPA 72. This time shall be based on the type of system installed. At the end of this period the system shall be capable of operating all alarm notification appliances used for evacuation or to direct aid to the location of an emergency for 5 minutes upon a normal AC power failure.

2.6 ELEVATOR VISUAL SIGNAL (NC & FLA)

- A. Provide 1/8" diameter minimum red LED mounted in a single gang polished stainless steel coverplate. Engrave nameplate "DO NOT USE ELEVATOR" with 1/8" high black filled letters. Coordinate installation of this device with the architect prior to rough-in to assure this component is integrated into the architecture of all elevator lobbies.
- B. Provide gasketed coverplate for elevator lobbies in parking decks and similar damp locations.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide all equipment, wiring, conduit and outlet boxes required for the erection of a complete and operating system in accordance with applicable local, state and national codes, the manufacturer's recommendations, these plans and specifications. Color code shall be used throughout.

3.2 TEST

- A. The manufacturer's authorized representative shall provide supervision of final system panel connections, perform a complete functional test of the system and submit a written report to the contractor attesting to the proper operation of the system.

3.3 FINAL INSPECTION

- A. Upon completion of the installation, the electrical contractor shall provide to the architect, with a copy to the manufacturer's representative, a signed written statement attesting that all system equipment was installed in accordance with these specifications and in accordance with wiring diagrams, instructions and directions provided to the contractor by the manufacturer.

3.4 INSTRUCTION

- A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components shall be provided and shall include one session for a period of 8 hours. Additional time that may be required for end-user training will be at added cost to owner.

3.5 GUARANTEE

- A. All equipment and wiring shall be guaranteed against defects in materials and workmanship for a two year period from the start up and beneficial use of the system. Warranty service for the equipment shall be provided by the manufacturer's factory trained representative during normal working hours, Monday through Friday excluding holidays. Emergency service provided at times other than as stipulated above shall be available from the same source at additional cost to the owner.

3.6 INSPECTIONS

- A. Upon satisfactory completion of the system test, the manufacturer's representative shall present for the owner's consideration, a proposal to provide semi-annual inspection and tests of the system.

END OF SECTION

SECTION 31 00 01

SITE PREPARATION AND GENERAL SITE WORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Site work layout and construction survey.
 - 2. Protecting existing vegetation to remain.
 - 3. Protecting existing site improvements to remain.
 - 4. Utility locates.
 - 5. Disposition of utilities.
 - 6. Maintain existing utility services.
 - 7. Temporary Traffic Control
 - 8. Spill prevention.
 - 9. Recycling and waste management for site materials.
 - 10. Final Cleanup
- B. Related Sections:
 - 1. 31 00 02 "SITE DEMOLITION" for removal of site improvements including utilities.

1.2 REFERENCE SPECIFICATIONS AND DOCUMENTS

- A. Manual for Erosion and Sediment Control in Georgia, 2016 Edition, by the Georgia Soil and Water Conservation Commission, "Best Management Practices". Apply to all land disturbing activities for all phases of Work.
- B. American Society of Civil Engineers (ASCE)
 - 1. ASCE CI 38-2: Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data.

1.3 SUBMITTALS

- A. Record Drawings: Record active, inactive, relocated, and abandoned utilities encountered.
 - 1. Survey the horizontal and vertical positions, and depths to ground surface, for utilities capped, utilities uncovered during project operations and for utilities relocated. Survey shall be from established project control.

1.4 QUALITY ASSURANCE

- A. Qualifications: The person in responsible charge of construction survey and survey of as-built/record drawing items shall be a registered professional or person familiar with construction layout work.

1.5 SITE CONDITIONS

- A. Subsurface Conditions: Copies of the following subsurface investigation report(s) of the site are provided for information only:
 - 1. Geotechnical Engineering Report Conley Hills Elementary School, April 15, 2022, prepared by ECS Southeast, LLP
 - 2. Refer to Specification SECTION 02 3000 – SUBSURFACE INVESTIGATION
 - 3. Report data is not intended as a representation or warranty of conditions or continuity of conditions. Owner is not responsible for interpretation or conclusions drawn by the Contractor. The data is made available for convenience and is not guaranteed to represent conditions that may be encountered.
 - 4. Contractor shall examine the site and may make its own explorations at its own expense. Notify Owner prior to making any subsurface explorations.
- B. Safety: Provide all safety fence barricades guards, lights and other installations required to protect persons and property during the work. This is in addition to such protection required elsewhere in the Contract documents. At a minimum, secure all work areas and staging/storage areas with temporary construction safety fencing. Maintain such safety fencing to assure a complete boundary throughout construction.
- C. Locate storage sheds, temporary office, and stockpiled material to best advance the progress of work, as approved by the Design Professional or in areas otherwise designated for Contractor's use.
- D. Existing conditions are shown on the drawings. Contractor shall visit the site, familiarize himself/herself with existing conditions in the field.
- E. Contractor shall strictly adhere to the "Land Disturbance Construction Activity Sequence" As defined in the Phase I Erosion and Sedimentation Control Plan only upon completion of applicable items in the sequence, shall the contractor expand clearing and grubbing operations to the entire site.
- F. Items of historic or archaeological value discovered during construction operations shall remain the property of the Owner. Notify Design Professional immediately of any such type finding for instructions.

1.6 RECYCLING AND REFUSE COLLECTION CENTERS (WASTE MATERIALS)

- A. The contractor shall provide appropriate refuse collection centers, which allow for glass, paper, and plastic separation. Said refuse collection centers shall be maintained on a weekly basis and transferred to an Owner-approved recycling and refuse center. The contractor shall also provide appropriate refuse containers for construction debris. Construction debris shall be recycled as possible and practical, especially in demolition and renovation situations (i.e., copper pipe, steel, concrete, glass, etc.). Illegal disposal of said materials (including littering) is subject to fines and penalties. The Contractor shall establish construction site policy and educate all construction personnel.
- B. All waste materials shall be collected and stored in a securely lidded, metal dumpster. The dumpster shall be rented from and emptied by a Georgia licensed solid waste management company. The dumpster shall meet all County and State Solid Waste Management regulations and ordinances. The dumpster shall be emptied as necessary, and the material shall be hauled to a State licensed landfill. No construction debris shall be buried on the construction site. All personnel shall be

informed and instructed regarding the correct procedure for waste disposal. Notices stating these procedures shall be posted in the construction office and the construction superintendent shall be responsible for ensuring that these procedures shall be followed.

1.7 HAZARDOUS WASTE

- A. All hazardous waste materials shall be disposed of in a manner specified by Georgia State Solid Management regulations. All personnel shall be informed and instructed regarding the correct procedure for waste disposal. Notices stating these procedures shall be posted in the construction office and the construction superintendent shall be responsible for ensuring that these procedures shall be followed.

1.8 SANITARY WASTE

- A. All sanitary waste shall be collected from the portable units, as necessary, by a Georgia State licensed sanitary waste management contractor, or as required by local regulations.

1.9 TEMPORARY FUELING TANK AREA

- A. Temporary fueling tanks shall have a Georgia E.P.D. approved secondary containment (liner system) basin to prevent and/or minimize site contamination. Temporary fueling tank locations shall be located remotely from drainage ways, drainage systems, and state waters (streams, springheads, etc.).

1.10 EQUIPMENT MAINTENANCE AREA

- A. Equipment maintenance areas shall be clearly identified with signage. Said signage shall read as follows:

<p style="text-align: center;">Equipment Maintenance Area</p> <p style="text-align: center;">Discharge of new or used oil, fuel, lubricants, etc. is prohibited. Utilize containment/capture systems. Recycle used oils, contaminated fuels and lubricants. Illegal discharges are subject to fines and penalties.</p>

- B. Sign shall be weatherproof and have a minimum size of 36" X 36".
- C. Equipment Maintenance Area(s) shall be located remotely from drainage ways, drainage systems, and state waters (streams, springheads, etc.).

PART 2 - PRODUCTS

2.1 CONSTRUCTION SURVEY AND LAYOUT EQUIPMENT

- A. Surveyor's transit and measuring devices properly calibrated to accurately layout the work shall be used.
- B. Provide stakes and batter boards of size and quality commensurate with function. Use wire or non-stretching cord to establish reference lines for site clearing and grading.

2.2 PROTECTION MATERIALS

- A. Materials for protection of existing work remaining shall be of the size, strength, and extent to provide adequate protection of existing work remaining.

2.3 REPAIR MATERIALS

- A. Repair materials shall be of the same or better quality and performance as materials that are to be restored. Where possible, reuse existing materials that are removed.

PART 3 - EXECUTION

3.1 SITE WORK LAYOUT AND CONSTRUCTION SURVEY

- A. Bench Marks and Monuments: Before commencing work verify bench marks and all reference points. If found at variance with the drawings, notify the Design Professional immediately and prior to continuing with construction activities in that area.
- B. Plainly mark all bench marks, and property corners and property lines as follows:
 - 1. Mark all project bench marks and mark all property corners within 100 feet of construction limits by driving a 4 foot lath with appropriate offset (not to exceed 5 feet) from property pin or monument. Paint at least the upper 8" of the lath a bright yellow and clearly label the lath with the bench mark number and elevation, or label "property corner" as applicable.
 - 2. Install 2' lath, label "property line", and tie a red ribbon to the lath every 50' along property lines when project work coincides within 50 feet of property boundaries.
- C. Carefully maintain all benchmarks, monuments and other reference points. If disturbed or destroyed, replace as directed, at no additional cost to the owner. Establish and maintain stakes as required for drives, parking, walks, underground vaults and structures, and other site improvements.
- D. Flag or stake limits of construction and tree protection areas and install tree protection fencing to protect existing trees to remain.
- E. As work progresses provide construction staking for grading (including subgrade, gravel courses, finish grade), points of curvature, points of tangency, grade changes, and for structures and miscellaneous site elements. If discrepancies between actual lines, grades, and elevations exist, notify Design professional before proceeding with layout of structure.

3.2 PROTECTING EXISTING VEGETATION TO REMAIN

- A. All trees and vegetation marked to be saved or relocated shall be protected by temporary barricades, be watered and maintained where necessary, and replaced if damaged by construction. Root systems cut or damaged within work area during construction shall be pruned and protected from additional damage and covered with soil as soon as possible.
- B. Under no circumstance, do not remove vegetation shown on the drawings to be saved, or marked by the Design Professional or Owner to be saved.

3.3 PROTECTING EXISTING SITE IMPROVEMENTS TO REMAIN.

- A. Protect all existing curbs, sidewalks, buildings, utilities, and paving to remain.
- B. If existing site improvements are damaged in performance of this work, restore such improvements without extra cost to the Owner.

3.4 UTILITY LOCATES

- A. Utilities Protection Law (Dig Law): Comply with Georgia Utilities Protection Law. Notice must be given to the Georgia Utilities Protection Center; by dialing 8-1-1 or 800-282-7411 at least 48 hours but no more than 10 days preceding the day mechanized digging is to begin. This notice shall contain County (where project is located), Town (or closest City or Town), location (street address), type of work to be done, name of Contractor, company name and address, telephone number, which company/individual the work is being done for, date and time the Contractor is planning to dig. Locates are valid for 30 days. Renew or call for re-mark as necessary.
- B. Secure the services of a private utility locator service in addition to contacting the Utilities Protection Center of Georgia. Perform Subsurface Utility Engineering (SUE) services in accordance with ASCE CI 38-02 Quality Level B: Utility Designation. Such utility designations shall be as necessary to ascertain any wet sewer lines, water supply lines, live electrical conduits, live phone lines, live gas lines and all other utilities, and shall make sure these utilities can be broken or changed without danger or disruption to any necessary service.

3.5 DISPOSITION OF UTILITIES

- A. Follow rules and regulations of authorities having jurisdiction for the respective utilities in executing work under this section.
- B. Carefully locate existing underground utilities by hand excavation, potholing, vacuum excavation, or other methods. If utilities are to remain in place, provide protection from damage during construction operations.
- C. Active Utilities Shown on Drawings or that are Visible Onsite: Protect from damage and remove or relocate as indicated or specified. All utilities (including but not limited to: existing utility poles, guy wires, hydrants, meters, valve boxes) within the construction area that are evident from a visual inspection of the site shall be protected or relocated as necessary.
- D. Active Utilities Not Shown on Drawings or Evident from Visual Inspection: Protect or relocate in accordance with written instructions of the Design Professional.
- E. Inactive and Abandoned Utilities:
 - 1. Fully remove inactive and abandoned utilities only as shown.
 - 2. Plug, cap, abandon in place utilities as shown. In absence of specific requirements, plug or cap such utility lines at least 4 feet outside of existing building walls, excavation limits, or as required by local regulations.
- F. Repair damaged utilities to satisfaction of utility owner.
- G. Accurately record locations of active and inactive utilities encountered during construction operations on record drawings.

3.6 MAINTAIN EXISTING UTILITY SERVICES

- A. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Do not interrupt existing utility service facilities occupied and used by Owner or others, unless written permission is given by the Design Professional and then only after temporary utility services have been provided. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities.
- B. Provide not less than 72 hours' notice to Owner if shutdown of service is required during a changeover.
 - 1. Arrange to shut off indicated utilities with utility companies.
 - 2. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections to maintain continuity of service to other parts of the building before proceeding with selective demolition.
 - 3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit after bypassing.

3.7 TEMPORARY TRAFFIC CONTROL

- A. Schedule and conduct work in a manner, which will minimize inconvenience to vehicular and pedestrian traffic. Provide flaggers, barricades, warning signs, warning lights, and other warning means as appropriate, the minimum measures shown on the plans, and those measures required by local jurisdictions. Maintain traffic on all roads and streets, which must be crossed by utility lines. All traffic controls during construction must conform to Part VI of the Manual on Uniform Traffic Control Devices, ANSI D 6.1e.

3.8 DUST CONTROL

- A. Keep airborne dust to a minimum by using water sprinkling or tossing and/or other suitable means to limit dust and dirt from rising and scattering in the air. Water all disturbed earth no later than 5 days from last rain or last watering.

3.9 POLLUTION AND SPILL PREVENTION

- A. Control both air and water pollution. No tires, oils, asphalt, paint or coated metals are permitted in combustible waste piles. Pollutants such as fuels, lubricants, bitumens, raw sewage and other harmful materials will not be discharged into or near rivers, streams or man-made channels. Equipment maintenance shall be performed with containment and capture of used oil. Do not pour or drain used lubricants or other necessary mechanical fluids onto the ground. Remove from site and deliver to a recycling center. Utilize a concrete washout area and remove washed out concrete from the site.
- B. Material Management Practices
 - 1. The following material management practices shall be used to reduce the risk of spills or other accidental exposure of materials and substances to storm water runoff. Follow good housekeeping practices onsite during the construction project.
 - a. An effort shall be made to store only enough product required to do the job.

- b. All materials stored onsite shall be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
 - c. Products shall be kept in their original containers with the original manufacturer's label.
 - d. Substances shall not be mixed with one another unless recommended by the manufacturer.
 - e. Whenever possible, all of a product shall be used up before disposing of the container.
 - f. Manufacturer's recommendations for proper use and disposal shall be followed.
 - g. The site superintendent shall inspect daily to ensure proper use and disposal of materials onsite.
- C. Hazardous Products
 - 1. The Contractor shall use the following practices to reduce the risks associated with hazardous materials:
 - a. Products shall be kept in original containers unless they are not resealable.
 - b. Original labels and material safety data shall be retained with the product by the General Contractor. They contain important product information.
 - c. Surplus products shall be disposed of following and in conformance with local and State recommended methods, NPDES permit requirements, and Federal Environmental Regulations.
- D. Product Specific Practices
 - 1. The following product specific practices shall be followed for products stored on-site:
 - a. Petroleum Products:

All on-site vehicles shall be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage. Petroleum products shall be stored in tightly sealed containers that shall be clearly labeled and stored in a clearly identified area. Any asphalt substances used on-site shall be applied according to the manufacturer's recommendations.
 - b. Fertilizers:

Fertilizers used shall be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer shall be worked into the soil to limit the exposure to storm water. Any fertilizers that are to be stored on-site shall be stored in a protected, securable enclosure. The contents of any partially used bags of fertilizers shall be transferred to a clearly labeled sealable plastic container to avoid spills.
 - c. Paints:

All containers shall be tightly sealed and stored when not required for use. Excess paint shall not be discharged to the storm sewer system but shall be properly disposed of according to local and State regulations.
 - d. Concrete:

Concrete trucks shall be allowed to wash out, discharge, and drum wash only at the identified equipment maintenance area(s). Maintenance areas shall be equipped with a discharge containment area (e.g., earth berms surrounding area). The containment area shall be cleaned up and removed from the site upon completion of concrete installation work.

E. Spill Prevention and Cleanup

1. The following practices shall be followed for spill prevention and cleanup:
 - a. Local, State, NPDES, Federal Environmental, and Manufacturer's recommended methods for spill cleanup shall be clearly posted and site personnel shall be made aware of the procedures and the location of the information and cleanup supplies.
 - b. Materials and equipment necessary for spill cleanup shall be kept in the material storage area on-site. Equipment and materials shall include but not be limited to brooms, dustpans, mops, rags, gloves, goggles, respirators, cat litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.
 - c. All spills shall be cleaned up immediately upon discovery.
 - d. The spill area shall be kept well ventilated and personnel shall wear the appropriate protective clothing to prevent injury from contact with a hazardous substance.
 - e. Spills of toxic or hazardous material shall be reported to the appropriate local and/or State government agency, regardless of size.
 - f. A spill prevention plan shall be implemented or adjusted to include measures to prevent this type of spill from reoccurring and how to clean up the spill if there is another one. A description of the spill, what caused it, and the cleanup measures shall also be included.
 - g. The General Contractor shall be responsible for assigning personnel to be responsible for spill prevention and cleanup coordination. The General Contractor shall designate, at a minimum, three site personnel to receive spill prevention and cleanup training. These individuals shall each become responsible for a particular phase of prevention and cleanup. The names of responsible spill personnel shall be posted in the material storage area and in the on-site construction office.

3.10 WASTE MANAGEMENT

- A. Clean and remove trash and debris on entire site, including trash and debris deposited from previous operations.
- B. During construction, maintain a clean and orderly worksite. Do not dump or store debris on any part of the property unless authorized in writing by the Owner and Design Professional. Debris may include but is not limited to trash, construction material, cleared vegetative matter, and boulders.

3.11 FINAL CLEAN UP

- A. Remove Contractors office trailer, storage shelters, stockpiled materials, and equipment from the site.
- B. Remove all remaining debris, or any other extraneous material deposited during construction from the site including all graded areas, and other undisturbed areas. All debris is the property of the Contractor and shall be hauled away from the site and disposed of lawfully.
- C. Clean, sweep and wash the entire site, including areas outside of the "limits of disturbance" for final inspection. Provide required lawn maintenance to provide complete and finished appearance. Leave the site in a neat and orderly fashion for use by the Owner.

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31 00 01-9
SITE PREPARATION AND GENERAL SITE WORK
MAY 22, 2026

END OF SECTION

SECTION 31 00 02

SITE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition of buildings and below grade foundations.
2. Demolition of existing site elements.
3. Protection of existing site elements to remain.
4. Disposal of demolished materials.

B. Related Sections:

1. 31 00 01 "SITE PREPARATION AND GENERAL SITE WORK" for protection of existing facilities, protection of vegetation, utility locates, and utility protection, and maintenance of active utility service to portions of existing facilities schedule to remain open and in service during construction.

1.2 DEFINITIONS:

- A. Remove:** Remove and legally dispose of items except those indicated to be salvaged, or to remain the Owner's property.
- B. Remove and Salvage:** Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.
- C. Existing to Remain:** Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Design Professional, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in the original locations.

1.3 SUBMITTALS:

- A. Prior to demolition work, submit the following for information only.**
1. Proposed dust control measures.
 2. Proposed noise control measures.
- B. Inventory of all items to be removed and salvaged.**
- C. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damaged caused by demolition operations.**
- D. As applicable, records indicating receipt and acceptance of solid waste and hazardous wastes by legal and licensed facilities to accept such wastes.**

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:**

1. Comply with hauling and disposal regulations of Georgia EPD (Environmental Protection Division) and other authorities having jurisdiction.
2. Comply with applicable demolition requirements of local jurisdictions and the State of Georgia.
3. Comply with the requirements of NFPA 241, 2013 Edition, Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.5 SITE CONDITIONS

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.
- B. Storage or sale of removed items or materials onsite will not be permitted.
- C. All existing curb and gutter, paving, structures, utilities and all other existing items that are located where proposed items are to be built but are not shown specifically for removal, shall be removed, at the contractor's expense, only when approved in writing by the Owner or Design Professional.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform public and private utility locates in accordance with Section 31 00 01 "Site Preparation and General Site Work." Disconnect and de-activate all existing utilities before proceeding with the work, except as specified herein or otherwise shown on plans.
- B. Verify that utilities have been disconnected and capped.
- C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- D. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- E. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Design Professional.
- F. Evaluate the condition of site structures to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.

3.2 SAFETY AND PROTECTION

- A. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities. Do not

close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

- B. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide all barricades, guards, lights and other installations required.
 - 2. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
 - 3. Ensure safe passage of people around demolition area
 - 4. Protect existing site improvements, appurtenances, and landscaping to remain.

3.3 POLLUTION CONTROLS:

- A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt.
 - 1. Do not use water to the extent that may result in damage to existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.
- C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.4 DEMOLITION:

- A. Demolish and remove from site the existing structures, curb & gutter, slabs, walks, paving, steps, and any other item above or below ground that interferes with construction of the project as shown on plans.
- B. Remove existing curbs, gutters, slabs, and concrete walkways at the nearest contraction or expansion joint.
- C. Provide neat and straight sawcutting as shown on the Plans and as required to provide selective or partial demolition.
- D. Where portions of concrete slabs-on-grade are to be removed, first outline the portion with a concrete saw to a depth of at least 1/3 of the thickness.
- E. Completely remove below grade construction, including foundations and footings.
- F. Contractor is to coordinate the subsurface demolition with any phased utility demolition and construction. The demolition of below grade items shall not interrupt any existing or proposed utility services.
- G. Abandoned items (i.e. storm lines, utility lines, utility poles, utility appurtenances, etc.) shall be removed from the site unless specifically noted and/or approved.

3.5 FILLING BELOW-GRADE AREAS AND VOIDS:

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

- B. Use only clean, non-frozen, and approved fill material, stone, gravel, or sand that is free from deleterious materials. Refer to Section 31 22 00 "EARTHWORK" for general fill or structural back fill.
- C. Grade completed surface to drain and to meet adjacent contours.

3.6 DISPOSAL OF DEMOLISHED MATERIALS:

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Send recyclable waste such as asphaltic concrete, Portland cement concrete, plastic, and metals to applicable recycle centers when feasible.
- C. Burning: Do not burn demolished materials.
- D. Burying: Do not bury materials onsite unless approved or otherwise shown.
- E. Disposal of Regulated Materials (in accordance with GDNR, EPD rules):
 - 1. Organic debris such as stumps, limbs, leaves, may be taken to a permitted solid waste landfill or to a permitted inert landfill.
 - 2. Dispose of other non-hazardous trash and debris to a municipal solid waste landfill.
 - 3. Dispose of oils, solvents, fuels, untreated lead paint residue and other solid hazardous wastes in properly licensed hazardous waste disposal facility.
- F. Obtain all necessary permits for disposal. Transport demolished materials off Owner's property and legally dispose of them. Provide copies of disposal certificates to the Design Professional.

3.7 REPAIRS AND PATCHING:

- A. Repair excess demolition.
- B. Employ skilled workmen to perform repair work.
- C. Where installation of similar new work is included, perform repairs in manner specified for installation of new work.
- D. Where similar new work is not included in the project, perform repairs using approved materials that are appropriate to the repair and, where practicable, are identical to the existing materials being repaired.
- E. Restore exposed finished patched areas in a manner, which eliminates evidence of repairs.
 - 1. Continuous surfaces: Extend refinish to nearest intersection, with a neat transition to adjacent surfaces.
 - 2. Assemblies: Refinish entire unit.
 - 3. Painted piping, conduit and duct: Clean and repaint.

3.8 CLEANING:

- A. Remove tools and equipment. Dispose of scrap.
- B. Leave exterior areas free of debris.
- C. Existing structures and site features to remain shall be returned to the condition prior to the commencement of construction.

- D. Sweep remaining hard surfaces on completion of selective or partial demolition operations.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Clearing of vegetative matter and debris.
 - 2. Grubbing.
 - 3. Disposal of cleared and grubbed material.
- B. Related Sections:
 - 1. 31 00 01 "SITE PREPARATION AND GENERAL SITE WORK" for layout, public safety, protection of existing facilities, protection of vegetation, utility locates, and utility protection.

1.2 SITE CONDITIONS

- A. Tree save and protection of existing vegetation: Unless approved in writing by the Design Professional clearing operations and equipment shall be limited to the "Limits Of Work Area", "Limits Of Disturbance", "Limits of Construction", and "Tree Protection Limits" as shown on the drawings.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify that utilities have been disconnected and capped as necessary for clearing activities and that clearing limits and tree protection areas are plainly marked.

3.2 CLEARING:

- A. Strictly adhere to the phased clearing plan as shown on the "Land Disturbance Construction Activity Sequence" Erosion and Sedimentation Control Plan. Only upon completion of initial inspection by the Design Professional shall the contractor expand his clearing and grubbing operations to the entire site.
- B. Clear all areas to be graded of remaining debris and extraneous materials.
- C. Remove from the general construction /grading areas and proper disposal of all trees, brush, stumps, logs, grass, weeds, roots, decayed vegetable matter, refuse dumps, and all other objectionable matter resting on the original ground surface or appearing or being placed on these areas at any time before final acceptance of the work, except as provided for elsewhere.

- D. Remove and properly dispose of any remaining obstructions not to be salvaged or preserved, such as fences and poles, and incidental structures within the construction area.

3.3 GRUBBING:

- A. Grubbing includes the removal and proper disposal of all stumps, roots, and other vegetation or perishable matter that exists below the original ground surface in cleared areas. Grubbing also includes removal of general buried obstructions, trash, and debris not otherwise removed by demolition.
- B. Unless otherwise shown, grub to the following depths:
 - 1. All sound, unsound or decayed stumps shall be completely removed. to a depth of 2 feet below the original ground.
 - 2. Under lawn, planting, or sportsfield areas: Grub to a depth of at least 2 feet below finish grade.
 - 3. Under asphalt, concrete, and gravel pavements: Grub to a depth at least 2 feet below subgrade elevation.
 - 4. Under foundations, slabs, and structures: Grub to a depth of at least 3 feet below the foundation of proposed structures.
 - 5. For other areas: Remove to a depth of at least 1 foot below natural ground surface.

3.4 DISPOSAL OF MATERIALS:

- A. The removal and offsite disposal of all cleared and grubbed materials is the responsibility of the Contractor.
- B. Contractor may utilize a tub grinder for grinding of clearing operation organic debris. Organic mulch produced may be spread and utilized on cut and fill slopes for erosion and sedimentation control purposes, but must be disposed of offsite prior to substantial completion. All other debris from clearing and grubbing operations shall be disposed of offsite, unless approved otherwise by the Owner and Design Professional.
- C. Comply with all local ordinances and obtain any necessary permits if applicable for disposal of trees, stumps, and other debris. Refer to Section 31 00 02 "Site Demolition" for disposal of debris.

END OF SECTION

SECTION 31 22 00

EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Temporary grading or ditching to protect the site and adjoining property from water and silt damage.
2. Topsoil Stripping.
3. Grading, excavating, rock excavating, and filling to prepare subgrades for foundations (buildings and structures), walks, pavements, grass areas, landscape areas, and general areas.
4. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Sections:

1. 31 00 01 "SITE PREPARATION AND GENERAL SITE WORK" for layout, protection of existing facilities, protection of vegetation, utility locates, and utility protection.
2. 32 05 00 "COMMON WORKS FOR EXTERIOR IMPROVEMENTS" for import fill, import backfill, geotextile specifications.

1.2 REFERENCE SPECIFICATIONS AND DOCUMENTS

A. Georgia Department of Transportation (GDOT)

1. Department of Transportation, State of Georgia Standard Specifications, Construction of Roads and Bridges, 2013 Edition. Unless otherwise noted, conform with GDOT Standard Specifications where referenced.
2. GDOT Test Procedures (GDT), where referenced.

B. American Society for Testing Materials (ASTM)

1. ASTM D422 - Particle Size Analysis of Soils.
2. ASTM D423 - Test for Liquid Limit of Soils.
3. ASTM D424 - Test for Plastic Limit and Plasticity Index of Soils.
4. ASTM D1556 - Test for Density of Soil In Place Sand Cone Method.
5. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification).
6. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
7. ASTM D698 - Standard Test Methods For Moisture-Density Relations of Soil Using Standard Effort.
8. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.

1.3 DEFINITIONS

- ###### **A.**
- Backfill is defined as fill immediately behind foundation elements or retaining walls.

- B. Excavation: Removal of material encountered above subgrade elevations, and to lines and dimensions indicated, or as directed. Excavation may be classified as earth excavation, rock excavation, or subexcavation, or it may be *unclassified* as described below.
 - 1. Unclassified Excavation: Excavation of all material, including rock, regardless of its nature or the manner in which it is removed. All excavation shall be unclassified unless explicitly and otherwise shown on the Drawings, or if unit pay items are provided for Rock Excavation, Earth Excavation, or Subexcavation.
 - 2. Earth excavation or simply "Excavation": Excavation of all material except for active utilities and rock.
 - 3. Rock excavation: Excavation of all hard, compacted, or cemented materials that require the use of drilling, blasting or wedging equipment to remove. It shall consist of un-decomposed stone hard enough to ring under a hammer, and the amount of solid stone shall not be less than one (1) cubic yard in volume. If applicable, rock is further defined as follows:
 - a. General Excavation (Mass): Any material occupying an original volume of more than one cubic yard which cannot be excavated with a single-tooth ripper drawn by a crawler tractor having a minimum draw bar pull rated at not less than 80,000 pounds (Caterpillar D-8 or larger).
 - b. Trench Excavation: Any material occupying an original volume of more than one cubic yard which cannot be excavated with a hydraulic excavator having a minimum flywheel power rating of 123 kW (165 hp); such as a Caterpillar 322C L, John Deere 230C LC, or a Komatsu PC 220LC-7; equipped with a short tip radius bucket not wider than 42 inches.
 - 4. Subexcavation: Authorized additional excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Design Professional or Testing Agency in writing.
- C. Fills: Suitable materials placed to raise existing grades.
 - 1. General area fill: all fill in the general grading area covering banks, hollows, drain ditches, etc.
 - 2. Pavement fill zone: The zone occupied by materials supporting asphalt or concrete paving supporting vehicular traffic or parking and extending for a distance of 4 feet on each side paving area measured at the finished grade (including gutter pans), thereafter tapering away at a 45° angle. Pavement fill zone for asphalt or concrete pedestrian areas are 2 feet on each side of paving area measured at finish grade and tapering down at a 45° angle.
 - 3. Structural fill zone: The zone occupied by materials supporting floor slabs, building foundations or other structures and extending for a distance of 10 feet on each side of said structure measured at the finished grade, thereafter tapering away at a 45° angle.
- D. Neat line: The shown, directed or described line or plane defining the limits of work. Work beyond neat line(s) is not subject to payment when included in a unit pay item.
- E. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- F. Trenches:
 - 1. Foundation: The area beneath the bedding.
 - 2. Bedding: The area above the foundation and below the bottom of the pipe.
 - 3. Haunching: The area above the bottom of the barrel of the pipe up to a specified height above the bottom of the barrel of the pipe.

4. Initial backfill: The area above the haunching material and below a plane 18 inches above the top of the pipe.
 5. Final backfill: The area above a plane 18-inches above the top of the barrel of the pipe.
- G. Conserved Topsoil: Excavated soil material, with organics, conserved from grading areas that is suitable for growth of grass, cover crops, or planting areas. Identification and use of all conserved topsoil is subject to approval by the Testing Lab or Design Professional. Refer to 32 05 00 "COMMON WORKS FOR EXTERIOR IMPROVEMENTS" for definition of Furnished Topsoil.
- H. Unsuitable Soils:
1. Existing undisturbed soils which are determined by the Testing Laboratory or Design Professional to be unsuitable for use as fill in a particular application for reasons other than moisture or water content.
 - a. Water saturated soils, regardless of the source of the water (rainfall, storm runoff, ground water or other sources) shall not be considered as unsuitable.
 - b. Dewater or dry out water saturated soils to the extent necessary to satisfy the requirements for fill.
 - c. The Contractor is solely responsible for the scheduling and sequencing of the work. If necessary, to maintain the Contractor's schedule, wet soils shall be removed and replaced with suitable fill to replace water saturated soils. The removal and replacement of water saturated soils shall be performed at the Contractor's expense.
 2. In general, existing undisturbed soils that are highly organic or highly plastic (classified as Class IV Roadway Material per Georgia DOT Standard Specification Section 810) may be classified as unsuitable depending on application.
 3. Fill material placed on site by the Contractor, regardless of whether fill is on-site or off-site borrow, cannot by its nature, be classified as unsuitable soils.
 - a. Materials placed as fill shall not be classified as unsuitable soils regardless of conditions encountered, since only suitable soils shall be used as fill.
 - b. Fill shall be placed, compacted and tested as required by the Contract documents.
 - c. The Contractor shall be responsible for maintaining compacted fill, in condition and at compaction levels required, until improvements (site and/or building) are placed on fill.
 - d. Should compacted soil be disturbed or become water saturated the Contractor shall be responsible for conducting whatever work is necessary to restore to the soils to the specified criteria at no cost to the Owner.
 4. Water Saturated Soils: Should soils become saturated the Contractor shall, at his/her expense and as part of the scope of this Contract, perform activities necessary to mediate and / or replace water saturated soils as required to obtain suitable fill as required by the Testing Agency or Design Professional.

1.4 UNIT PRICES

- A. Rock Excavation: Unit prices for rock excavation include replacement with approved materials. Measurement of rock excavation shall be based on the volume of rock actually removed, measured in its original position, but not to exceed the following (payment neat lines).
1. 2.0 ft outside of concrete forms other than at footings.

2. 1.0 ft outside of concrete forms at footings.
 3. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 4. 6 inches beneath bottom of concrete slabs-on-grade.
 5. 6 inches beneath pipe in trenches, and 2.0 ft wider than pipe but not less than 3.0 ft wide.
- B. Subexcavation: Unit prices for subexcavation shall include replacement of unsuitable material with geotextile for separation and approved backfill material. Volumetric measurement of subexcavation is based on neat line quantities as directed or approved by the Design Professional or Testing Agency.
- C. Import Fill Material: Unit prices for import fill (structural fill, general fill when shown and not including any fill material for rock excavation or subexcavation) shall include disposing of any unsuitable material, procuring fill materials and transporting them to the site.
1. Unless otherwise specified in the General Conditions, when mass measurements are shown on the bid form, measurement of additional import material are based on weight tickets for material delivered to the site and incorporated into the work.
 2. Unless otherwise specified in the General Conditions, when volume measurements are shown on the bid form, measurement shall be based on volumes measured by surveying the installed volume of fill.

1.5 SUBMITTALS

- A. Product data for materials, including but not limited to: geotextiles, utility line markers, import fill material, control density backfill.
- B. Quantities of stripped and stockpiled topsoil. Provide report within 48 hours of stockpiling.
- C. Shoring, bracing and shielding plans and calculations certified by a Registered Professional Engineer registered in the State of Georgia.
- D. Settlement monitoring reports for structural fills.
- E. Backup for unit cost documentation, that may include:
 1. Survey and computed quantities for Rock Excavation.
 2. Delivery tickets (tonnage) for import fill incorporated into the Work.
- F. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, which might be misconstrued as damage caused by earthwork operations including blasting. Submit before earth moving begins.

1.6 QUALITY ASSURANCE

- A. Earthwork Testing and Inspection Services: The Owner will engage a qualified independent Testing/Inspection Agency to perform Earthwork Testing as described in this Section.
- B. Blasting: Comply with applicable requirements in NFPA 495, "Explosive Materials Code," and prepare an informational blasting plan reporting the following:
 1. Types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that

will prevent damage to site improvements and structures on Project site and adjacent properties.

2. Seismographic monitoring during blasting operations.
3. Pre-excavation photos or videotape.

1.7 SITE CONDITIONS

A. Protection:

1. Limit grading and filling operations to within the defined clearing limits, work zones, or limits of disturbance. Do not disturb the existing terrain or trees outside these lines.
2. Fill material placed against drainage structures or back-filled around utility pipes shall be placed and compacted by methods which will not cause any damage. Any damage which does occur shall be repaired or replaced by the Contractor at the Contractor's expense.
3. Graded Areas: Any settlement or washing that occurs prior to acceptance of the work shall be repaired and grades re-established to the required elevations and slopes. Fill to required subgrade levels any areas where settlement occurs.

B. Hazardous Materials:

1. No soil found on site or transported to the site which is contaminated with material containing asbestos, PCB's, radon, gasoline, fuel oil, or other fossil fuels, shall be used for fill, backfill or landscape topsoil.
2. Notify Design Professional of any contaminated soil found on site. Any contaminated soil found on site shall be removed and disposed of in a lawful manner.

1.8 COORIDINATION AND SCHEDULING

- A. Notify the Design Professional a minimum of 48 hours prior to the beginning of any excavation, filling, or grading.
- B. The Contractor is solely responsible for the scheduling and sequencing of the work. If necessary, to maintain the contractor's schedule, removed wet soils dewater and dry out sufficiently for its application, or remove and replace with suitable fill. The dewatering or removal and replacement of water saturated soils shall be performed at the contractor's expense.

PART 2 - PRODUCTS

2.1 FILL OR BACKFILL MATERIALS

- A. The soil used for fill or backfill material shall be free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- B. Fill or backfill for paving areas or supporting buildings shall have a maximum dry density exceeding 90 pounds per cubic foot (pcf).
- C. Where specified use Graded Aggregate Base (GAB) as backfill or structural fill: Refer to 32 05 00 "Common Works for Exterior Improvements" for material properties.

- D. Structural Fill: Soil Classification Groups SM, ML, CL; SW, SP, SC, SP-SM, SP-SC (ASTM D 2487). Additionally Class I or Class II (but excluding Class IIB4) Roadway Materials (GDOT Section 810.01) are also acceptable for Structural Fill.
1. Structural fill material exhibiting a wide variation in consistency and or moisture content shall be blended and/or aerated to stabilize and upgrade the material.
- E. Permeable Backfill: Unless shown otherwise, provide a minimum of 2 horizontal feet of permeable backfill material behind retaining structures consisting of gravel, crushed rock, natural sands, manufactured sands, or combinations of these materials conforming to the following gradation:

Sieve Size	Percent Passing
3/4 inch	100
3/8 inch	0-100
No. 100	0-8
No. 200	0 -3

Those portions of fill material passing a No. 4 sieve shall provide a sand equivalent of at least 60.

- F. General Fill: Includes soils suitable for structural fill as well as other onsite non organic and non expansive soils that are approved by the Design Professional or Testing Agency that will form a stable and dense mass with or without confinement.

2.2 UTILITY EARTHWORK MATERIALS

- A. Foundation Material: Unless otherwise specified, Crushed stone meeting GDOT Standard Specification 800.01, Group 1 (limestone, marble, or dolomite), or Group II (quartzite, granite, or gneiss). Stone size is between No. 57 and No. 4, inclusive.
- B. Utility bedding and backfill: Unless otherwise shown bed pipes from trench bottom to one foot above pipe.
1. Unless otherwise shown pipe bedding and backfill shall consist of: sand, gravel, crushed aggregate, or native free draining granular material providing a sand equivalent of at least 30 or a coefficient of permeability greater than 1.4 inches per hour.
 2. Cement sand slurry shall be provided with 1 sack of concrete per cubic yard of mixture.
 3. Imported Fill Material: Imported fill material shall be a granular material with sufficient binder to form a firm and stable unyielding subgrade and shall not have more than 60 percent of fines passing a 200 mesh sieve. Material shall provide a coefficient of expansion of not more than 2 percent from air dry to optimum moisture content and not more than 6 percent from air dry to saturation. Imported materials shall be clean and free of rubbish, debris, and toxic or hazardous contaminants. Adobe or clay soils are not permitted.

2.3 LINE MARKERS

- A. 2" width minimum, 5 mil tape thickness with non-ferrous detectable aluminum backing and shall be printed with the description that the relevant utility is "buried below". Line marker colors according to APWA corresponding to the utility type as follows:
 - 1. Gas lines- yellow
 - 2. Power – red
 - 3. Communications - orange
 - 4. Sanitary – green
 - 5. Water - blue

2.4 GEOSYTHETICS

- A. Refer to 32 05 00 "Common Works for Exterior Improvements" for material properties of geotextiles for separation and stabilization.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Construction Survey: Refer to 31 00 01 "Site Preparation and General Site Work" for layout and survey requirements. Provide construction staking as required for drives, parking, walks and other site improvements. Protect benchmarks, monuments and other reference points.
- B. Clear and grub the area of vegetation and obstructions.

3.2 EROSION CONTROL AND SEDIMENT CONTAINMENT SYSTEMS:

- A. Adhere to the "Land Disturbance Construction Activity Sequence" as defined in the Erosion and Sediment Control Plans.
- B. Temporary Grading and Drainage: Provide effective drainage for the entire site at all times. Divert watersheds by ditching or embankments to prevent encroachment of surface water in excavations. No impoundment of water will be permitted except as provided. The Contractor is fully responsible for all water damage to the site and to the installed work.
- C. Refer to 31 25 00 "EROSION AND SEDIMENT CONTROLS" for additional grading operation requirements and storm drainage system installation requirements.

3.3 CONSERVED TOPSOIL

- A. After all demolition, clearing and disposal is completed, strip from the top of the existing ground all topsoil from all areas to be graded.
- B. Prior to stockpiling of topsoil, screen topsoil via a mobile mechanical screening machine with a 1/2inch size sieve.
- C. Stockpile topsoil in designated or approved locations with proper drainage and where it will not interfere with the work. After topsoil has been stockpiled, quantify the stockpiled volumes. Report quantities to the Owner, Architect, and Site Design Professional within 2 days of completing stockpiles.

3.4 GENERAL GRADING REQUIREMENTS

- A. Perform exterior grading to provide smooth transitions to and between the proposed contours and spot elevations shown on Drawings.
- B. In all cases, grade to a sufficient pitch to drain water.
- C. Perform earthwork as required to establish finished grades as indicated on drawings. Grades not otherwise indicated shall be uniform levels of slopes between points where elevations are given or between such points and existing finished grades.
- D. Excess Cut Material: If quantity of grading material is in excess of quantities necessary to provide finish grade elevations indicated on drawings or if excavated material is deemed unsatisfactory for use as compacted fill, excess material shall be spread onsite as indicated on the Plans or as directed by the Owner and/or Design Professional. Excess material that cannot be spread on site shall be hauled off site and disposed of legally. Hauling and disposal of excess cut material is performed at the Contractor's expense.
- E. Insufficient Fill Material: If quantity of grading material is insufficient to achieve subgrade elevations, Contractor shall obtain additional fill material of specified quality from an off-site source. Obtaining and hauling of additional fill material is performed at the Contractor's expense.
- F. Import Fill Material for Areas Determined to be Unsuitable: If the Testing Agency or the Design Professional determines that onsite excavated or grading materials are unsuitable for use as compacted fill for a given application, then import fill material shall be obtained from an off-site source. Import fill material shall conform to specifications for the given application. Disposing of unsuitable material, and providing, hauling of import fill material shall be performed by change order based on the unit prices included within the contract.
- G. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory value. All moisture conditioning necessary to permit compaction to the specified density is performed at the Contractors expense.
- H. Slope subgrade to provide positive drainage within all underdrain systems. Unless shown otherwise on the Drawings, subgrade minimum slope to underdrain collection systems is 0.5%.
- I. Subgrade Elevation Tolerance: Cut, place, compact fill and rough grade entire project area to within 0.10 feet above or below design subgrade elevations.

3.5 EXCAVATION AND EMBANKMENT SAFETY

- A. Comply with all Federal, State, and Local safety laws and regulations pertaining to trenching, excavation, bracing and shoring that includes but is not limited to:
 - 1. OSHA Excavation Standards, 29 Code of Federal Regulations (CFR) Part 1926, Subpart P- Excavations.

- B. If conflict exists between safety laws, regulations, and contract requirements including these specifications, apply the most stringent requirements or standards.
- C. Protect all excavations and embankments against collapse. Where possible, excavations over 4 feet high shall be made at a slope not steeper than 1.5H:1V or where the soil is very sandy or wet the slope should be no steeper than 2H:1V.
- D. Barricade trenches, ditches, pits, sumps and similar Work outside the barricaded working area with chain link fence and in accordance with OSHA standards and requirements.
- E. Where it is not possible to provide a safe slope, temporarily support all banks and excavations and maintain secure until permanent support has been provided.
- F. Where ditches or trenches that are over 4 feet deep, provide cross bracing and shoring to prevent collapse.
- G. Provide bracing, shoring, or shielding systems designed by a Georgia Registered Professional Engineer experienced in such designs. The design drawings shall show the work and sequence in its entirety and be submitted to the Design Professional prior to commencing the work.
- H. Remove shoring upon completion of Work, or when no longer need, unless otherwise required by authorities having jurisdiction over the Work.

3.6 DEWATERING

- A. Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.
- B. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rainwater and water removed from excavations to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.
- C. Maintain groundwater a minimum of 3 feet below the bottom of any excavation associated with a foundation. Maintain all excavations free of standing water at all times.
- D. Remove all mud caused by standing water from any excavation before the placing of permanent material.
- E. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations.
- F. No untreated sediment laden water from dewatering operations shall be allowed to enter surface water or a storm drainage system or a permanent stormwater pond.

3.7 TRENCH EARTHWORK

- A. General:
 - 1. Conform with the most stringent requirements of these specifications, the Plans, of Utility providers, and of local agency permitting authorities. Requirements may include, but are not limited to: depth of cover, minimum

trench width, bedding material, pipe zone backfill, and compaction requirements.

2. Detection wire: Bury continuous and unbroken wire directly above non-metallic piping at a distance not to exceed 12 inches above top of pipe. Terminate wire in junctions (manholes, vaults, boxes) with a minimum of 3 feet of wire coiled, remaining accessible in each manhole.
3. Line Markers: During back filling of utility lines, furnish and install continuous underground-type plastic line marker, located directly over buried utility lines at 12" below finished grade. Under pavements and slabs, bury tape 6" below top of subgrade.
4. Do not exceed 100 feet of open trench in advance of pipe laying, unless approved otherwise by the Design Professional.

B. General Trench Excavation:

1. Saw cut concrete or bituminous paving for trench excavation.
2. Where indicated and/or required to excavate in lawn areas, protect adjoining lawn areas outside of the Work area. Replace or install removed sod upon completion of backfill by installing sod level with adjacent lawns. If installation of removed sod fails, furnish sod and install to match existing lawns
3. Excavate trenches to the required depth or elevation allowing for placement of the pipe and bedding to the dimensions shown on the Drawings.
4. Grade bottom of trenches, no larger than necessary, to accommodate bell holes and other joints and junctions to provide uniform bearing along the pipe.
5. At the direction of the Testing Agency or Design Professional, remove unstable or unsuitable material shall be removed from the bottom of the trench and backfilled in accordance with Article – "SUBEXCAVATION".
6. When rock is encountered, excavate to allow a minimum of 6 inches of clearance between rock and any part of the pipe barrel or structure (manhole, vault) and backfill with granular bedding material.
7. Do not excavate trenches parallel to footings closer than 18 inches from the face of the footing or below a plane having a downward slope of 2 horizontal to one vertical, from a line 9 inches above bottom of footings.
8. Unless otherwise indicated on Drawings, depth of excavations outside the buildings shall allow for a minimum coverage above top of pipe, tank, or conduit measured from the lowest adjoining finished grade, as follows:

Pipe material / use	Cover depth (below finish grade)
Steel Pipe	24 inches
Copper Water Tube	18 inches
Cast-Iron Pressure Pipe	36 inches
Plastic Pipe (other than waste)	30 inches
Tanks or other structures	36 inches
Soil, Sewer & Storm Drain	18 inches (min.) and as required for proper pitch and traffic load. Plastic pipe shall have a min. 18" cover.
Irrigation Pipe	12 inches (Non-pressure) 18 inches (Pressure)

C. Utility Trenches (except sanitary and storm sewer):

1. Excavate to a width as necessary for sheeting and bracing and proper performance of the Work.

2. Unless indicated otherwise, excavate trenches to the required depths for utilities, such as pipes, conduit and tanks, with minimum allowances of 6 inches at the bottom and 6 inches at the sides for bedding of unprotected piping or as required for concrete encasement of conduits as indicated on Drawings. Grade bottom of trenches to a uniform smooth surface. Remove loose soil from the excavation before installing sand bedding or concrete encasement.
 3. Provide a minimum clear dimension of 2 inches from sides of wall excavation to outer surfaces of buried pipes or conduits installed in the same trench or outside surfaces of containers and/or tanks.
 4. Do not install backfill until required inspections and testing is completed.
 5. Bed and provide initial backfill in accordance with the Drawings, and authorities having jurisdiction.
 6. Install and compact sand bedding to provide a uniform full length bearing under piping and conduits.
- D. Sanitary and Storm Sewer Trenches:
1. The maximum trench width below a plane 6 inches above the top of pipe is:
 - a. 24 inches for pipe diameters of 12 inches or less.
 - b. Equal to the sum of the outside diameter of the pipe plus 2 feet for pipe diameters greater than 12 inches.
 2. Excavate the trench width to allow for the proper compaction of haunching and initial backfill material.
 3. Excavate the width of trench above a plane 6 inches above the top of pipe as necessary for proper performance of the work including any sheeting, bracing, or shielding.
 4. Bed bottom of pipe on suitable undisturbed soil or as otherwise shown on the Plans.
 5. In haunch areas of plastic pipe, install granular fill bedding material up to the springline of the pipe.
 6. Install initial backfill in lifts not to exceed 6 inches loose, compacted to 98% of modified proctor and to a minimum depth of 12 inches above the top of pipe. Unless otherwise specified or required by authorities having jurisdiction, immediate backfill material is as follows:
 - a. Class 1- Granular fill.
 - b. Class 2- Suitable existing earth material (default).
- E. Final Fill
1. Once outside of the initial backfill area, continue backfilling to reach subgrade elevation as follows:
 - a. For utility trenches in paving and building areas: Provide structural backfill in 6 to 8" loose lifts, compacted to 98% of standard proctor (ASTM D 698), and within +- 3% of optimum moisture. Except that for structural backfill within 12 inches of subgrade, provide in 4" loose lifts and compact to 98% standard Proctor (ASTM D 698).
 - b. Where required, backfill trenches with a cement-sand slurry mix. Install backfill to an elevation of the existing undisturbed grade plus one inch.
 - c. For utility trenches in general fill areas or grading areas: Provide general fill in 6"-8" loose lifts, compacted to 98% of standard proctor (ASTM D 698) and within +-3 % of optimum moisture to reach subgrade elevation.
 2. Where portions of existing structures, walks, paving, or other improvements are removed or cut for piping or conduit installation, replace the material with equal quality, finished to match adjoining existing improvements. Repair pavement as specified in Division 32 "FLEXIBLE AND RIGID PAVING REPAIR".

3.8 EXCAVATION

- A. Excavate to lines, elevations, dimensions, and depth as indicated on the drawings.
- B. Form sides of footings, pads, grade beams, and slab foundations, unless otherwise indicated. Provide excavations of sufficient size to permit installation and removal of forms and other Work as required. Excavation bottoms shall be level and free from loose material.
- C. Machine drill excavation for round footings to size and depth indicated. Provide a collar, casing, or other adequate protection to exclude dirt and debris. Protect excavations with plank covers until concrete is placed.
- D. Excess Excavation: If excavations for foundations or footings of any kind are carried by the Contractor, without proper authorization, below the indicated or specified levels they shall be backfilled at the expense of the Contractor as follows:
 - 1. In the areas of excess excavation in rock or under structure footings, the excess excavation shall be back filled, at the Contractor's expense, with material as determined by the Testing Agency.
 - 2. In the areas of excess excavation in other areas, backfill with approved structural or fill material and constructed in accordance with the fill articles in this Specification.
- E. Earth Excavation:
 - 1. **Surface Preparation in excavated areas for foundations:** scarify and uniformly recompact the upper 24 inches of soils intended to support building foundations and floor slabs to 98% of Standard Proctor (ASTM D 698). In confined areas such as utility trenches, utilize portable compaction equipment and lifts of 3 to 4 inches to achieve the required compaction.
 - 2. **Surface Preparation in excavated areas for paving areas:** scarify and uniformly recompact the upper 12 inches of soils to 98% of Standard Proctor (ASTM D 698). In confined areas such as utility trenches, utilize portable compaction equipment and lifts of 3 to 4 inches to achieve the required compaction.
 - 3. **Surface Preparation in infiltration areas, planting bed areas:** unless otherwise shown, scarify and uniformly recompact the upper 12 inches of soils intended for planting areas or infiltration to 75-80% of Standard Proctor (ASTM D 698) to prevent settlement but still allow for infiltration and plant growth.
 - 4. Do not excavate to full depth when freezing temperature may be expected. Protect excavation bottom from frost if placing of concrete or gravel is delayed. All footing excavations shall be free of pin roots.
- F. Rock Excavation:
 - 1. When potential rock is encountered, remove overburden soils and notify the Testing Lab or Design Professional prior to **any** rock excavation. The Testing Lab or Design Professional shall approve and classify all rock excavation. Once classified, survey grading sections of existing rock surface. When rock is completely removed, survey new grading sections to determine the quantity of rock removed within neat line limits.
 - 2. Perform all blasting in accordance with local ordinances, and obtain necessary permits where required.
 - 3. Rock that is excavated is the property of the Contractor and shall be removed from the site. Except that, as allowed by the Contract Documents or as approved in writing by the Testing Agency or Design Professional, rock may be

incorporated into the Work if it is processed appropriately or meets material specifications.

4. Decomposed rock and similar material removable by tractor drawn ripper or power machinery smaller than defined for rock excavation is classified as earth excavation.

3.9 PROOFROLLING

- A. Proof roll surfaces when specified to check for pockets of soft material in areas associated with buildings and pavements.
- B. Proof rolling subgrades within $\pm 3\%$ of optimum moisture or as approved by the Design Professional. In all cases, proof roll subgrades free of surface water which may promote degradation of an otherwise acceptable subgrade.
- C. Proof roll with a loaded 20-ton dump truck, or other pneumatic-tired vehicle of similar size and weight, operated at 2 to 3 mph. For large areas such as parking lots, proof roll with 2 complete coverages in each of two perpendicular directions.
- D. Perform proof rolling under the observation of the Testing Agency or Design Professional. Provide notification 48 hours in advance of all proof rolling operations. Undercut (or subexcavate) Any areas which "pump" or permanently rut under the wheels of the loaded truck and undercut (subexcavate) to a depth and extent directed or confirmed by the Design Professional or Testing Agency.

3.10 SUBEXCAVATION

- A. Perform subexcavation below existing ground elevations or subgrade elevations, as and when directed by the Testing Agency, to correct areas with unsuitable bearing capacity or materials.
 1. Remove and dispose of unsuitable soils to the extents and depth as directed by the Testing Agency.
 2. Level and clear the bottom of the sub excavation of loose material.
 3. Place separation geotextile with all seams overlapped at least 2 feet or as directed by the Testing Agency.
 4. In paving and foundation areas, backfill with GAB (Graded Aggregate Base) in 6 to 8 inch loose layers and compact to at least 98% of Modified Proctor.

3.11 FILLING AND BACKFILLING

- A. STRUCTURAL FILL –BUILDING AND RETAINING WALLS
 1. Construct structural fills in areas supporting buildings and retaining walls to establish design subgrades.
 2. Provide fill materials as specified in Part 2- Products. If excavated materials from the project site are not of required quality or sufficient quantity, import additional materials as necessary.
 3. Schedule construction of structural fill as early as possible in order to allow settlements of underlying soils to occur before building and retaining wall construction commences.
 4. Surface Preparation for fill: Bench areas to receive fill to a minimum of 12 ft width, remove all loose material, and proof roll prior to beginning fill operations.
 5. Place structural fill material in 6 to 8 inch loose lifts at a moisture content at the time of compaction within 3% of the optimum moisture content. Unless

otherwise shown, compact to a minimum of 98% of Standard Proctor (ASTM D 698). Compact the upper 24 inches to 100 percent of Standard Proctor.

B. STRUCTURAL –BACKFILLING

1. After concrete has been placed, forms removed and concrete work inspected, backfill excavations to indicated or required grades. Backfill simultaneously on each side of walls or grade beams. Remove rubbish debris or other waste material from excavations prior to backfill placement.
2. Before placing any backfill, adequately cure concrete and provide bracing to stabilize structures. Protect waterproofing or damp proofing against damage during backfilling operations with required protection board. Remove bracing as backfill operations progress.
3. Install each layer of material not to exceed thickness of 6 inches, unless otherwise required.
4. Rigidly control the amount of water to be installed to provide optimum moisture content for type of fill material furnished.
5. Carefully backfill walls. Do not utilize heavy equipment within 10 feet of any retaining wall. Use hand tampers to compact within the 10 foot backfill zone.
6. Install wall backfill before installing railings and fences on walls.
7. Install weep hole drainage at the backside of walls so the backing completely covers the weep holes, is horizontally centered and extends at least 12 inches above the bottom of the weep hole opening. Provide an 8 inch square section of galvanized or aluminum screen with a minimum wire diameter of 0.03 inch and install at the backside of each weep hole before installing the backfill material.
8. If a reviewed, approved drainage matting system is provided in lieu of permeable backfill for retaining structures, install in accordance with the manufacturer recommendations.

C. STRUCTURAL FILL – PAVED DRIVE, WALKS, AND PARKING AREAS

1. Load, haul, place, grade, and compact all necessary structural fill to establish design grades as shown.
2. Surface Preparation for fill: Bench to a minimum of 12 ft widths, all loose material removed, and proof roll prior to beginning fill operations.
3. Place structural fill material in 6 to 8 inch loose measure lifts with moisture content at the time of compaction within 3% of optimum. Compact to a minimum of 95% of Standard Proctor (ASTM D 698). Compact the upper 12 inches to at least 98% of Standard Proctor.
4. Proof roll completed subgrade when within 0.1 feet of final subgrade elevation.

D. GENERAL AREA FILL

1. Load, haul, place, grade, and compact all necessary general area fill in general grading area, covering banks, hollows, drain ditches, etc.
2. Place fill material in 6 to 8 inch loose lifts, compacted to a minimum of 90% of Standard Proctor (ASTM D 698) and within +- 3% of optimum moisture. Except that in landscaping, planting bed areas, and infiltration areas unless otherwise specified or shown, compact the upper 12 inches of soil to 75 to 80% of standard proctor.

3.12 STRUCTURAL FILL SETTLEMENT MONITORING

- A. Perform settlement monitoring in areas supporting buildings and drive/parking areas that are supported on structural fill with depths that exceed 10 feet. Owner's Geotechnical Engineer shall define areas to receive settlement monitoring
- B. Perform settlement monitoring using settlement pins installed as determined in the field by the Owner's Geotechnical Engineer. Utilize a surveyor registered in the State of Georgia to establish elevations at each marker a minimum of 2 times per week until the Owner's Geotechnical Engineer determines that settlement has reached negligible levels. Contractor shall anticipate that settlement monitoring will continue for a minimum of 30-45 days after fill has been placed and compacted.
- C. Refer to the Subsurface Geotechnical Engineering Report for Settlement Pin Detail
- D. Remove all settlement markers at the conclusion of the monitoring period and at the direction of the Owner's Geotechnical Engineer.

3.13 TESTING

- A. All failing tests or retests are the responsibility of the Contractor.
- B. Minimal testing requirements for Owners Quality Assurance are summarized below. Contractor may elect to collect additional samples and perform additional tests or prepare additional specimens for testing at its sole discretion in accordance with their own quality control program.
 - 1. Observe fill and subgrades during proof-rolling to evaluate suitability of surface material to receive fill or base course. Verify soil bearing capacity assumptions. Provide recommendations to the Design Professional regarding suitability or unsuitability of areas where proof-rolling was observed. Where unsuitable results are observed, witness excavation of unsuitable material and recommend to Design Professional extent of removal and replacement of unsuitable materials and observe proof-rolling of replaced areas until satisfactory results are obtained.
 - 2. Provide characterization and classification, testing of all general fill, and subgrade materials as follows:
 - a. Classification: 1 per material type/source
 - b. Atterberg Limits: 1 per material type/source
 - c. Grain size distribution
 - d. Moisture – Density (ASTM D698 Standard Proctor for fine grained material, ASTM D1557 Modified for coarse grained): 1 per material type/Source (except structural fill).
 - 3. Characterization and classification of import structural, import pavement area fill, and import trench backfill shall be sampled and tested at their designated sources a rate of 1 test per 250 CY of import if total quantity is greater than 1000 CY. If less than 1000 CY, sample and test a rate of 1 test per 100 CY. Perform field density and moisture tests (ASTM D6938, GDT 21 ,59). Other test methods based on material type may be proposed and are subject to approval by the Design Professional. Perform and report field density tests at the minimum frequencies listed below.
 - a. Building Slab: 1 test for each type of soil type on excavated surfaces. 1 test per compacted fill layer each 2500 sq.ft. of area.
 - b. Footings- Foundation: 1 test for each layer or type of soil present. In compacted fill layers, perform one test per 100 feet of footing length.

- c. Paving Area Fill: 1 test per layer for every 2 feet of fill each 5,000 sq.ft. of area.
- d. General Area Fill: 1 test per every 2 feet of fill for each 10,000 sq.ft. of area.
- e. Utility trench spread footing or retaining wall: 1 test per 2 feet of fill per 50 linear feet of trench.
- 4. For import and export of materials, submit bills of lading or equivalent documentation to the Design Professional on a daily basis.

3.14 MAINTENANCE AND PROTECTION

- A. Maintain subgrade, in condition and at compaction levels required, until improvements (site and/or building) are completed.
 - 1. Should subgrade or fill materials be disturbed or become water saturated, restore to the specified criteria as verified by the Design Professional.
- B. Provide additional fill material, remove excess material, or redistribute material, should grades be changed from erosion or construction activities.

3.15 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 31 25 00

EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Compliance with NPDES Phase II Construction General Permit No. GAR 100001 for land disturbing activities over 1 acre in extent.
2. Temporary erosion, sedimentation, and pollution controls (air, water, soil) from site preparation through final site stabilization that include, but are not limited to:
 - a. Silt dams, traps, barriers and
 - b. Slope stabilization,
 - c. Temporary grading to manage stormwater and dewatering activities.
 - d. Polyacrylamide (PAM) applications.

B. Related Sections:

1. 31 00 01 "SITE PREPARATION AND GENERAL SITE WORK" for protection of existing vegetation, waste management, and spill prevention.
2. 31 22 00 "EARTHWORK" for dewatering requirements and additional requirements for Temporary Grading and Drainage.
3. 31 25 00 "COMMON WORKS FOR EXTERIOR IMPROVEMENTS" for riprap, and geotextile.
4. 32 92 00 "TURF & GRASSES" for temporary vegetation and mulching and for permanent grassing.

1.2 REFERENCE SPECIFICATIONS AND DOCUMENTS

- A. The Manual for Erosion and Sediment Control in Georgia, 2016 Edition, by the Georgia Soil and Water Conservation Commission, "Best Management Practices". Apply to all land disturbing activities.
- B. The State of Georgia Department of Natural Resources Environmental Protection Division "National Pollution Discharge Elimination System" General Permit No. GAR 100001. This permit applies to all land disturbing activities for this project.

1.3 SUBMITTALS:

- A. Schedule of operations: Submit schedule of proposed operations conforming with the "Land Disturbance Activities Sequence" as delineated on the Erosion, Sedimentation & Pollution Control Plan(s), including program for erosion control measures, logs, documentation, identified superintendent with required continuing education certification, maintenance of control facilities and vegetative practices. Show anticipated starting and completion dates for land-disturbing activities including excavation, filling and rough grading, finished grading, construction of temporary and permanent control measures, and disposition of temporary sediment control measures.

- B. Product Data: For each type of the following manufactured products required provide manufactures data to the Owner for review and comment prior to bringing products onsite and incorporating into the work. Product submittals include, but are not limited to:
 - 1. Silt fence.
 - 2. Rolled erosion control blankets.
 - 3. Anionic polyacrylamide (PAM).
- C. Samples: Submit samples of the following items or products prior to incorporating into the work.
 - 1. All Class A and Class B Erosion Control Blanket products proposed for the work.
 - 2. PAM gel bars or logs.

1.4 QUALITY ASSURANCE

- A. Comply with "Manual for Erosion and Sediment Control in Georgia" and "Best Management Practices" for practices, procedures, and operations.
- B. Obtain NPDES Phase II permit coverage and conform to all provisions under the State of Georgia and Federal Clean Water Act (permit no. GAR 100001). Refer to <http://epd.georgia.gov/npdes-construction-storm-water-general-permits>. Responsibilities of the Contractor include, but are not limited to:
 - 1. Filing a NOI (Notice of Intent) with State's Environmental Protection Division (EPD) 14 days prior to land disturbance activities with both the Owner's signature and the General Contractor's signature.
 - 2. Maintain a logbook log book on site documenting the inspections of erosion control devices (minimum once/week and within 24 hrs of any storm event) and noting any corrections or modifications. Document all rainfall events. As necessary, coordinate and assist with required stormwater monitoring requirement and maintain monitoring reports prepared by the Testing Agency (with the log book).
 - 3. Filing a NOT (Notice of Termination) with the EPD when the site is fully stabilized, and all stormwater discharge associated with the construction activity has ceased.
- C. Erosion, Sediment and Pollution Control Superintendent:
 - 1. Provide a designated representative to remain on site during land disturbance activities with the following qualifications:
 - a. Minimum 5 years of experience in erosion, sediment and pollution control.
 - b. Certification Level 1A (minimum) "blue card" from Georgia Soil & Water Conservation Commission.
 - 2. Duties include:
 - a. Oversight of land disturbance operations.
 - b. Ensure strict adherence to the land disturbance construction activities sequence, strict adherence to all "Best Management Practices" as defined in the "Manual for Erosion and Sediment Control in Georgia"
 - c. Monitor proper grading (terracing, berm construction, etc.) to properly divert water, and maximize storm water travel lengths and minimize path slopes.
 - d. Monitor and provide for temporary or permanent site stabilization as soon as possible and within the required time limits.

1.5 SITE CONDITIONS

- A. Furnish and install erosion control measures prior to or concurrent with any land disturbance activity. Conform with the "Land Disturbance Activities Sequence" (if applicable).
- B. The Contractor is solely responsible for ensuring that no silt or debris leaves the immediate construction site. Return any silted or eroded area to its natural state.
- C. Install and maintain erosion and sediment control "Best Management Practices" prior to land disturbing activities, and continuously through construction until final site stabilization measures (paving, planting, etc.) are effective at controlling erosion from the site.
- D. Schedule grading operations to allow permanent erosion control to take place in the same construction season. Avoid or minimize exposure of soils to winter weather. Maintain all controls until vegetative cover has been established.
- E. The Contractor is responsible for all quantities of soil erosion control measures regardless if shown on the drawings. The extent of soil erosion control measures shown on the drawings is considered minimum. Install additional erosion and sedimentation control measures when deemed necessary by the Contractor, or onsite inspections from the Owner, Design Professional, Testing Agency or by authorities having jurisdiction.

1.6 PROTECTION OF ADJACENT PROPERTY AND STATE WATER BUFFERS

- A. Protection existing State Water Buffers and adjacent property from sediment trespass is of the essence. Flag and fence buffers, tree save areas and property lines prior to any construction activities. Flag stream (State Water) buffers as shown on the approved "Erosion, Sedimentation, and Pollution Control Plan". Unless otherwise shown, install 11"x17" weatherproof signs along State Water buffer(s) at 40 ft intervals, that read:

"STATE WATER BUFFER – DO NOT DISTURB"
- B. Protect adjacent property including, but not limited to landscape areas, stormwater facilities, sidewalks, curbing, roadways and all utilities therein.

PART 2 - PRODUCTS

2.1 TEMPORARY GRASSING MATERIALS

- A. Use quick growing temporary grass species suitable to the area and season.
- B. Refer to 32 05 00 "Common Works for Exterior Improvements" for soil additives and mulches, refer to 32 92 00 "Turf Grasses" for temporary seed mixes.

2.2 HYDRAULICALLY APPLIED MULCH

- A. Wood cellulose fiber containing no germination inhibiting or growth inhibiting agents with characteristics (including acceptance tolerances) as follows:
 - 1. Percent moisture content: 9.0% (+ 3, 0%).
 - 2. Percent organic matter: 99.2% (+ 0.8%).

3. Percent ash content: 0.8% (+ 0.2%).
4. pH: 4.8 (+ 0.5).
5. Min. water holding capacity: 150 grams water / 100 grams fiber.

2.3 BONDED FIBER MATRIX MULCH

- A. Bonded Fiber matrix (BFM) manufactured to be hydraulically applied, and upon drying, adheres to the soil in the form of a continuous, 100% coverage, biodegradable, erosion control blanket. Acceptable BFM producers include:
 1. Soil Guard as manufactured by Mat, Inc., phone (888) 477-3028
 2. Ecoaegis as manufactured by Canfor Panel & Fibre Market, LTD, phone (800) 363-8873
 3. Conwed 3000 Profile Products, phone (800) 508-8681
- B. The BFM shall be comprised of a long strand, thermally produced wood fibers passing a freeness test at a 760 cc (MLS) level or below (>88% of total volume by weight) held together by organic tackifiers (10%) and mineral bonding agents (>2%) which upon drying become insoluble and non-dispersible.
- C. The matrix which forms shall be designed, tested and proven to perform in a manner equal or superior to biodegradable erosion control blankets (ECB's). Documentation of testing at an independent university laboratory shall be provided which demonstrates superior performance as measured by reduced water runoff, reduced soil loss, and faster plant germination, as compared to ECB's. The formed matrix shall meet the following requirements:
 1. Pass a free liquid quality control test (liquids separate from fibrous solids no greater than one inch in one minute's time as measured on a standard test board).
 2. Does not dissolve or disperse upon rewetting.
 3. Does not have holes > 1mm in size and no gaps between product and the soil.

2.4 SILT FENCE (TYPE C)

- A. Geotextile: Silt fence fabric shall be woven geotextile for Type C fabric. Type A fabric may be either woven or non-woven. Fabric shall conform with the following properties:

Property *	Type C Fabric	Type A Fabric
Min. Tensile Strength (lbs) (ASTM D-4632)	Warp – 260 Fill – 180	Warp – 120 Fill – 100
Elongation (% Max.) (ASTM D-4632)	40	40
AOS (Apparent Opening Size) (ASTM D-4751)	No. 30	No. 30
Flow Rate (Gal./Min./Sq.Ft.) (GDT-87)	70	25
Ultraviolet Stability (ASTM D-4632 after 300 hours weathering in accordance with ASTM D-4355)	80	80
Bursting Strength (PSI Min.) (ASTM D-3786)	175	175
Minimum Fabric With (Inches)	36	36

* from GDOT Standard Specification 881.2.07

- B. Wood posts:
 - 1. Minimum dimension: 1 ½ inch by 1 ½ inch by 4 feet.
 - 2. Untreated fir, redwood, cedar, or pine cut from sound timber with no loose or unsound knots.
- C. Steel posts:
 - 1. 48 inch minimum length.
 - 2. Cross section shape that can resist failure from lateral loads (T-shaped, U-shaped, or L-shaped) and 0.75 pounds per foot minimum mass.
- D. Silt fence reinforcement (if used):
 - 1. Wire mesh consisting of 14 gauge steel with mesh spacing of 6 inch x 6 inches (maximum), or prefabricated polymeric mesh of equivalent strength.

2.5 FILTER STONE & SURGE STONE

- A. Unless otherwise shown Filter stone, surge stone is in accordance with Appendix C of the Manual for Erosion and Sediment Control in Georgia.

2.6 SLOPE STABILIZATION BLANKET

- A. Class A Blanket:
 - 1. Application: Unless otherwise shown on the Plans, apply on slopes steeper than 3H:1V, up to a maximum of 1H:1V.
 - 2. Double net blanket.
 - 3. Rated for extended survivability with at least a 12 month functional longevity.
 - 4. Biodegradable natural fiber netting for blanket for slopes up to 2H:1V.
 - 5. Slow degrading polypropylene or other manufacturer tested /rated netting for slopes steeper than 2H:1V.
 - 6. Core: Straw and Coir (Coconut) blend fiber or Excelsior (shredded aspen) fiber. Certified weed free straw. Alternative core products may be submitted for approval.

7. Approved Products and Manufacturers:
 - a. "Curlex ® II Blanket" by American Excelsior Company.
 - b. "SK Straw/Coir Blanket" by Bon Terra. Note- Netting option shall be consistent with the slope application.
 - c. "Ero-Mat Excelsior" by Verdyol.
 - B. Class B Blanket:
 1. Application: Unless otherwise shown on the Plans, apply on slopes of 3H:1V or flatter.
 2. Single net blanket.
 3. Net shall be either biodegradable (natural fiber) or photodegradable synthetic mesh.
 4. Rated for short term survivability with up to a 12 month functional longevity.
 5. Straw core material, if used, shall be certified weed free.
 6. Approved Products and Manufacturers:
 - a. "Curlex ® I Blanket" by American Excelsior Company.
 - b. "S Straw Blanket" with jute/cotton threading by Bon Terra.
 - c. "EroNET TM S75" by North America Green.
- 2.7 NON-WOVEN GEOTEXTILE FABRIC
- A. Non-woven geotextile fabric shall be as indicated on Plans. If not otherwise indicated, fabric weight is a minimum of 6 oz. per square yard.
- 2.8 POLYACRYLAMIDE
- A. All polyacrylamide shall be anionic and in emulsion form and gel bars/logs.

PART 3 - EXECUTION

- 3.1 GENERAL
- A. Sedimentation Control: Sediment basins, diversion berms, silt dams, traps, barriers, downlines, check dams, rock filter dams, seep berms, mulching temporary grassing and appurtenances shall be installed and shall be maintained in-place for duration of construction, as shown and detailed on erosion control plan.
 - B. Silt fence:
 1. Construct silt fences as shown in the Plans.
 2. Where shown install multiple rows of silt fence.
 - C. Provide and construct erosion control check dams as shown.
 - D. Maintain erosion and sedimentation controls in a condition which will retain unfiltered water.
 - E. Construct sedimentation ponds and control devices prior to clearing and grubbing the site to insure complete silt control.
 - F. Provide temporary seeding for all exposed soil surfaces that are not to be fine graded or landscaped within 14 calendar days. Multiple temporary seeding applications should be expected.

- G. Provide temporary or permanent grassing (season dependent) and/or mulching for all disturbed areas within 7 calendar days of reaching finished grades. Reduce areas of disturbance daily through use of temporary grassing and mulching.

3.2 GRADING OPERATIONS

- A. Grading Operations: Phased grading operations so that the ground surface will be disturbed for the shortest possible time before permanent construction is installed. Maintained large areas as flat as possible to minimize soil transport through surface flow. Immediately install graded diversion channels, ditches and berms to direct storm runoff to sediment and filtering basins. Grade fill slopes in a manner which prevents surface areas from flowing over newly constructed fill slope areas through shaping and providing required temporary downlines or diversions to permanent storm structures as construction allows.
 - 1. Protect newly graded areas from actions of the elements. Repair settlement or washing that occurs prior to acceptance of work and maintain established grades until the date of substantial completion.
 - 2. Contractor is responsible for any damage occurring to adjacent property resulting from drainage or siltation from the site.
 - 3. Construct all fills at outmost part of fill and slope towards original ground so that all surface storm water drains back away from fill and does not run over the top of fill slope. Construct swales at bottom of proposed fill slopes prior to construction of any fills. Construct and maintain a swale /berm at the outermost part of top fills as fills are constructed.
- B. Storm Drainage System: Install as much of the permanent storm drainage system as practical, provide the required temporary inlet sediment traps immediately and divert surface water into the system. Install temporary inlet sediment traps shall as base of structure is set and adjust up periodically as the grading operation raises the grades around the structure.
 - 1. Maintain temporary sediment barriers at drainage structures until final stabilization occurs.
 - 2. Install storm drainage as grading progresses and makes additional storm drainage installation possible. Direct swales to drainage structure locations as shown on drawings.
- C. Ground Cover:
 - 1. All exposed and unworked soil shall be protected by application of temporary groundcover.
 - 2. Ground cover may consist of any effective erosion preventative treatment such as straw or other mulches, planting, etc.
 - 3. All grassing or planting operations shall include mulching as stabilization until ground cover by planting is effective.

3.3 STABILIZATION PRACTICES

- A. Control soil erosion during all phases of construction to preserve and protect slopes, drainage structures, pavement, and other facilities, and to reduce potential sources of water pollution and damage to adjacent property.
- B. Mulching: Apply dry straw or hay and/or wood chip mulch to disturbed areas at a depth of two to three inches unless otherwise shown. Apply by hand or mechanical equipment. Press Straw or hay mulch shall be pressed into the soil with a disc harrow

with disc set straight or with special "Packer Disc". The edge of the disc should be dull enough not to cut the mulch but to press it into the soil leaving much of it in an erect position. Anchor immediately after application.

- C. Polyacrylamide (PAM): Utilize anionic polyacrylamide as a temporary soil binding agent to reduce soil erosion. PAM is available in emulsions, powders and gel bars or logs. Use PAM in conjunction with other "best management practices". Use PAM in direct soil surface applications where the timely establishment of vegetation is not feasible (including building pad and parking lot areas). Apply PAM in conjunction with temporary seeding efforts or as a separate hydro spray application. The maximum application of PAM, in pure form, shall not exceed 200 pounds/acre/year. Install a PAM gel bar or log in each storm structure (secured with rope) and replace at the manufactures recommended interval. Apply PAM via hydrospreader to all disturbed areas once per 7 calendar days at the rate of 7.5 pounds per acre. Provide written record of each application.
- D. Temporary Stabilization: Stabilize topsoil stockpiles and disturbed areas of the site, where construction activity has ceased for at least 14 calendar days with temporary cover or seeding.
- E. Seed Bed Preparation for Temporary Vegetation: Loosen ground surface by discing, raking or harrowing. If the area has been recently loosened or disturbed, no further roughening shall be required. Remove all large clods, boulders and debris that will interfere with the work.
- F. Unless otherwise shown, plant temporary grass areas at the rates specified in 32 92 00 Turf and Grasses.
- G. Hydroseeding: Protect existing trees and shrubs during hydroseeding. Apply seed, fertilizer, lime, and fiber in one application. Maintain temporary vegetative cover until the permanent turf planting seson, at which time the temporary grass or annual ryegrass shall be mowed down to the ground surface, the lawn area disc harrowed, the soil prepared for planting lawns and the permanent lawn planted or sodded as called for on the plans. Refer to 32 92 00 "TURF AND GRASSES" for permanent turf.
- H. Reseeding – Reseed and provide straw cover for bare areas 1 square foot and larger to establish and maintain vegetative cover and to prevent sheet and rill erosion. Repair erosion damage as required and reseed.
- I. Matting and Mulching – Cover all seeding with matting or mulch. After seeding, cover all slopes that exceed 3H:1V with erosion control matting and/or blankets. Install mats and/or blankets per manufacturer's recommendations using the recommended fastening hardware.
- J. Depending on the season at which slopes that exceed 3H:1V are established, the Contractor shall anticipate multiple applications of erosion matting. If a permanent slope is established and planted with temporary grass due to planting season, contractor shall eradicate temporary grass and install permanent grassing as called shown. Once bare soil is exposed, an additional application of matting will be required. Remaining seeded areas shall be covered with straw or hay spread at the rate of approximately 2 tons/acre or wood cellulose fiber applied at the rate of approximately 1500 lbs/acre.
- K. Stabilize areas of the site that are to be paved through proper compaction of the soil and placement of a graded, stone aggregate base.

- L. Rolling – Roll all seeded areas with roller weighing 60 to 90 pounds per linear foot of roller before applying mulch. On steep slopes cover seeds by dragging spiked chains or similar methods.
- M. Watering – Depending on weather conditions at the time of construction, Contractor shall anticipate watering measures other than natural rainfall. Provide all watering necessary to establish a healthy vegetative cover.
- N. Permanent Stabilization – Stabilize disturbed areas of the site, where finished grade has been achieved, with season dependent permanent seeding within 7 calendar days of achieving grade. Refer to Plans and 32 92 00 "Turf and Grasses" for permanent seed mixes.
 - 1. Hydroseed mixtures shall contain PAM.
 - 2. After seeding provide erosion control matting or blankets where shown and in accordance with manufacturers recommendations.
- O. Complete all permanent erosion control features at the earliest practical time. Use temporary measures until permanent measures are completed.

3.4 STRUCTURAL PRACTICES

- A. Submit any additional structural control measures in the form of shop drawings.
- B. Temporary Construction Entrance – Construct a stabilized, stone aggregate construction entrance shall be constructed, as per the detail set forth in the Manual for Erosion and Sediment Control in Georgia, Latest Edition. The temporary construction entrance shall reduce vehicle tracking of sediments. Out-going trucks shall have the tires washed prior to exiting the site onto any public street or right-of-way. Any mud, dirt, or rock that is tracked onto public streets shall be swept immediately and material placed within the perimeter controls.
- C. Maintain all access to the site to prevent mud from washing or being tracked onto existing pavements. Provide a temporary hose bib system or water truck with a pressure hose for wash down of trucks and equipment entering the public right-of-way as necessary.
- D. Sediment Basins – Construct temporary sediment basins to contain and filter at least 67 cubic yards of sediment per disturbed acre and in accordance with the Manual for Erosion and Sediment Control in Georgia, 2016 Edition. Construct the unit complete as shown including:
 - 1. Principal spillways with riprap outfall protection.
 - 2. Anti-seep collars.
 - 3. Risers and Trash racks.
 - 4. Temporary mulch and grassing of external slopes.
 - 5. Skimmers.
 - 6. Emergency overflow areas.
- E. Silt Barriers – Unless shown otherwise, install a single row of Type "C" Silt fence along the toe of all downstream slopes and a double row of Type "C" Silt Fence adjacent to all state waters buffers.
- F. Temporary Diversion Berms/Dikes – Construct temporary diversion berms/dikes per the approved Erosion, Sedimentation, and Pollution Control Plan. Raise diversions, minimum 4 feet wide, at the end of each day during grading activities. The diversions shall intercept and redirect runoff to the temporary sediment basin(s) and/or

temporary storm drainage structure sediment inlet traps prior to the runoff reaching perimeter sediment controls.

3.5 MAINTENANCE

- A. Inspect slope protection and erosion control elements after each rainfall. Unless otherwise shown, inspect all barriers and sediment traps after each rain event. Clear all debris and accumulated sediment from behind barriers and sediment traps when one third full. Remove accumulated sediment from traps after each rain event and spread on site.
- B. Provide appropriate stabilization (mulch, grass seed) where collected sediment is redistributed onsite.
- C. Control dust from disturbed areas by means of mulching, watering, calcium chloride or other method subject to the Design Professionals approval.

3.6 REMOVAL OF TEMPORARY EROSION CONTROL DEVICES

- A. As soon as permanent vegetative cover is established, remove temporary devices, including sediment barriers, berms, silt traps and similar devices.
- B. Remove any retrofit structure and clean out all accumulated silt and debris in detention ponds to finish grades.
- C. Remove all debris resulting from temporary erosion control from project site.

END OF SECTION

SECTION 31 31 16

TERMITE CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Soil treatment with termiticide.

1.2 SUBMITTALS

- A. Product information
 - 1. Submit toxicant manufacturer's data indicating chemical to be used and installation instructions including copy of container label.

1.3 QUALITY ASSURANCE

- A. Applicator shall be a state licensed pest control operator.
- B. Qualification of toxicant: Toxicant shall bear Federal registration number of the U.S. Environmental Protection Agency and be acceptable to the U.S. Department of Agriculture for use in controlling termite infestation of buildings without being injurious to plant life.

1.4 SITE CONDITIONS

- A. Scheduling:
 - 1. Notify Architect at least 48 hours prior to time termite control material application is to commence.
 - 2. Make application during normal working hours.
 - 3. Do not schedule soil treatment work if rain or freezing conditions are forecasted prior to, during or after application of chemicals.
 - 4. Allow not less than 12 hours for drying after application, before covering treated area.
- B. Post signs in areas of application, warning that poison has been applied. Remove signs before treated areas are covered by other construction.

1.5 WARRANTY

- A. Warrant effectiveness of treatment for period of **five (5) years**, non-prorated from Date of Substantial Completion (not the application date) against infestation and/or termite damage without additional cost to the Owner during warranty period. Warranty shall be in written form of an insurance policy, written in the amount of 10% of the construction cost or One Hundred Thousand and NO/100 Dollars (\$100,000.00), whichever is less, for damages to building and contents. Rating for insurance company shall be A-, IV (4). The warranty shall be submitted along with other documents in accordance with Contract Close-Out section.

- B. Warranty shall state dates of application and chemicals used, including quantities and concentrations.
- C. Warranty shall state that the policy coverage may be renewable on a year-to-year basis at end of the five (5) year period, at the Owner's option, for an equitable fee to be agreed upon between the applicator and Owner at time of renewal.
- D. Warranty shall be secured with a bond by a Georgia licensed surety.
- E. If evidence of termites occurs within the warranty period, areas shall be retreated at no cost to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Toxicant shall bear Federal Registration number of the U.S. Environmental Protection Agency. Toxicant shall be acceptable to U.S. Department of Agriculture for use in controlling termites without being injurious to plant life. Only manufacturer pre-mixes permitted, no job-mixing of chemicals.
- B. Mixtures of chemicals are prohibited, except as pre-mixed from manufacturer.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Remove foreign matter which would decrease effectiveness of treatment on areas to be treated.
- B. Loosen, rake and level soil to be treated, except at previously compacted areas under slabs and foundations.
- C. Toxicants may be applied before placement of compacted fill under slabs, if recommended by toxicant manufacturer.

3.2 APPLICATION

- A. Notify Architect at least 48 hours prior to application.
- B. Apply toxicant under interior concrete slab vapor retarders, around footings and along both sides of foundation walls in accordance with manufacturer's labeled instructions and EPA requirements for subterranean or surface treatment. Treat soil before concrete slabs are placed.
- C. Apply subterranean treatments by means of injection or trenching.
- D. Perform no treatment when soil is frozen, wet or after rains. Avoid flow of toxicant from treated surfaces.
- E. Re-apply soil treatment solution to areas disturbed by subsequent excavation, landscape grading or other construction activities following application.
- F. Post signs in areas of applications, warning that poison has been applied; leave signs in place for minimum 2 weeks following application.

FANNIN COUNTY REC CENTER – PHASE I
ATLANTA, GA
PRAXIS3-24184

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TERMITE CONTROL
MAY 22, 2026

END OF SECTION

SECTION 32 05 00

COMMON WORKS FOR EXTERIOR IMPROVEMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Furnished Topsoil
 - 2. Water
 - 3. Soil Amendments
 - 4. Mulch.
 - 5. Compost
 - 6. Graded Aggregate Base (GAB)
 - 7. Coarse Sand
 - 8. ASTM Aggregates
 - 9. Drain Rock
 - 10. Geotextiles

1.2 REFERENCE SPECIFICATIONS AND DOCUMENTS

- A. Georgia Department of Transportation (GDOT)
 - 1. Department of Transportation, State of Georgia Standard Specifications, Construction of Roads and Bridges, 2013 Edition. Unless otherwise noted, conform with GDOT Standard Specifications for materials.
- B. American Society for Testing Materials (ASTM)
 - 1. ASTM D1557- laboratory compaction characteristics of soil using Modified Effort.

1.3 SUBMITTALS

- A. Product data for material proposed for the work.
- B. Copies of all soil testing results for lawn and landscape planting areas, including but not limited to the following data:
 - 1. Include the recommended ratio and amounts (lbs per 1000 sq-ft) of fertilizing.
 - 2. Amendments of lime, organic matter.

1.4 SITE CONDITIONS

- A. Store materials only in areas designated for Contractor's use.

PART 2 - PRODUCTS

2.1 FURNISHED (IMPORT) TOPSOIL

- A. Furnished Topsoil is adapted to the sustenance of plant life and harvested from fields or development sites. Manufactured topsoil where components such as sand,

organic matter, and chemicals are added to mineral soil are not acceptable. Furnished topsoil shall reasonably achieve the following characteristics:

1. Texture – USDA loam, sandy clay loam, or sandy loam with clay between 15 and 25% and combined clay and silt content no more than 55%.
2. Organic Material – 2.0 to 20% by mass
3. pH - between 5 and 7.
4. Uniform quality and free from foreign material such as hard clods, sod, stiff clay, hard pan, stones larger than 1 inch diameter, lime cement, ashes, slag, concrete, tar residues, tarred paper, boards, chips, sticks, or other undesirable materials. It shall also be reasonably free from weeds and objectionable plant material.

- B. All sources of Furnished (Import) Topsoil shall be approved by the Design Professional prior to delivery to site. Test proposed topsoil and submit test results for approval, along with a minimum 1 gallon labeled soil sample.
- C. Stockpiled existing topsoil at the site meeting the above criteria may be acceptable.
- D. Furnished Topsoil shall be screened.
- E. Imported Topsoil shall be at no additional cost to the Owner.

2.2 WATER

- A. Furnish and pay for water used in this work. Furnish watering trucks, hoses and other temporary watering equipment (sprinklers, stands. etc.) required for work.
- B. When used for plant irrigation, water shall be suitable and free from ingredients harmful to plant life.

2.3 SOIL APPURTENANCES (AMMENDMENTS)

- A. Mulches and Composts: See separate Articles this specification.
- B. Ground Limestone: Lime shall be ground limestone (Dolomite) containing not less than 85 percent of total carbonates and ground to such a fineness that 50 percent will pass through a 200-mesh sieve and 90 percent will pass through a 20-mesh sieve. Coarser material will be acceptable, provided the specified rates of application are increased proportionately on the basis of quantities passing through the 100-mesh sieve.
- C. Sand: Clean, washed sand, free of toxic materials.
- D. Sawdust: Rotted sawdust, free of chips, stones, sticks, soil or toxic substances and with 7.5 lbs nitrogen fertilizer uniformly mixed into each cubic yard of sawdust.
- E. Peat Moss: granulated sphagnum free of woody substances, brown in color, free of stones and mineral matter, air dry condition.
- F. Peat Humus: When shown, provide a domestic product of peat humus consisting of partially decomposed vegetable matter of natural occurrence. It shall be brown, clean, low in content of mineral and woody material, mildly acid, and granulated or shredded.
- G. Commercial Fertilizer: Fertilizer formula complying with State and Federal fertilizer laws. Deliver fertilizer to the site in original, unopened containers bearing the manufacturer's certificate of compliance covering analysis and primary nutrient (N,

P, K) concentrations. **To protect public health and waterways, do not over apply any fertilizer.** Unless otherwise shown on the plans or specified in other Sections, fertilizer application is as follows:

1. Lawns: Provide nutrients in ratios and quantities (lbs per 1000 sq-ft, or lbs per acre) as recommended from soil testing. Provide nitrogen in a form that will be available to lawn during initial growth period (approximately 50% fast release) as well as in slow release organic forms (approximately 50%).
 2. Trees and shrubs (planting beds): Provide in the ratios and quantities (lbs per 1000 sq-ft, or lbs per cubic yard of soil) in accordance with results of soil tests.
- H. Ammonium Nitrate: Use where specified or where a fast release nitrogen fertilizer is required. Commercial product in dry granular form of recent manufacture (within last 6 months) and delivered in the original, unopened containers each bearing the manufacturer's guaranteed statement of analysis, containing not less than 33.0% percent Nitrogen.
- I. Pre-emergent Weed Control: shall be Scotts Pro Grow Ornamental Herbicide 2 (granular) and Pro Turf Southern Weed Grass Control #83204 (or approved equal) as manufactured by Scotts Pro Grow, Marysville, Ohio 43041.

2.4 MULCHES FOR GRASSING AND EROSION

- A. Provide mulches of the types and depths shown, that are clean and free from debris, and reasonably free of weeds. Mulches may include, but are not limited to:
1. Bermuda grass hay.
 2. Threshed wheat rye or oat straw.

2.5 COMPOST

- A. Use compost that meets the following:
1. Composed of decomposed organic material.
 2. Organic material is disinfected through composting (minimum 9 months) or similar technologies.
 3. Stabilized so it is beneficial to plant growth.
 4. Mature, dark brown or black in color and have an earthy odor.
 5. Contain no human pathogens.
 6. pH range of 5 to 8.
 7. Contains not more than 25% by volume wood shavings, sawdust or refuse.
- B. Submit all ingredient in the compost mix, and their relative proportions.

2.6 NUTRIENT GRADE COMPOST

- A. Provide nutrient grade compost manufactured from a composter enrolled in the United State Compost Council Seal of Testing Assurance (STA) Program. When shown, provide EARTH Food™ as distributed by: Exceptional Products, Inc, 402 Line Creek Dr., Peachtree City, GA 30269, (or approved Equal) that meets the following parameters as tested by an STA approved lab:

Plant Nutrient	% dry weight basis	TMECC Method
Nitrogen	>1.2	4.02D
Phosphorus	>.50	Calc.
Potassium	>.50	Calc.
Calcium	>.90	4.05
Magnesium	>.20	4.05
Organic Matter Content	>50%	5.07-A
Soluble Salts dS/m (mmhos/cm)	<4.0	4.08-A
Particle Size % under 9.5 mm	95% or greater	2.02-B
Stability Indicator (respirometry) CO ₂ Evolution mg CO ₂ -C/g OM/day	<2	5.08-F777
Maturity Indicator (bioassay) Percent Emergence	85% or greater	5.05A
Select Pathogens (pass/fail per US EPA Class A standard, 40 CFR 8503.32 (a)) Method 9221E	Pass	Standard

2.7 GRADED AGGREGATE BASE (GAB)

- A. GAB material shall be composed of well graded crushed stone consisting of hard, durable rock fragments free from clay and reasonably free from flat, elongated or soft pieces of organic matter.
- B. GAB shall achieve the following gradation:

Sieve Size	Percent Passing by Weight
2 in	100
1-1/2 in	97-100
3/4 in	60-95
No. 10	25-50
No. 60	10-35
No. 200	7-15

2.8 COARSE SAND

- A. Clean, washed, sand free of toxic materials free of limestone, shale and slate particles, complying with ASTM C-33 fine aggregate for concrete.
- B. Coarse sand shall achieve the following gradation:

Sieve Size	Percent Passing by Weight
3/8 in	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	2-10
No. 200	2-5

2.9 COARSE AGGREGATES

- A. Refer to TABLE 800.1 GDOT Standard Specifications for No's 3, 4, 5, 6, and 57 stone, respectively.

2.10 CONTROLLED LOW STRENGTH FLOWABLE FILL

- A. Flowable fill where required shall meet the requirements of GDOT Std. Spec Section 600.3.03 for Excavateable mix design. The mix design shall produce a consistency that will result in a flowable self-leveling product at time of placement.

Property or Content	Quantity
Cement Type 1	75-100 lbs / yd ³
Air	15-35%
28-Day Compressive Strength	Maximum 100 psi
Unit Weight	90-100 lbs / ft ³

2.11 GEOSYTHETICS

- A. Separation fabric:

Woven polypropylene fabric, high modulus type with good separation capabilities conforming to the following:

Property	Test Method	Requirement
Grab Tensile Strength	ASTM D 4632	200 lbs min.
Grab Tensile Elongation	ASTM D 4632	30% max.
Mullen Burst Strength	ASTM D 3786	400 psi min.
Trapezoid Tear Strength	ASTM D 4533	75 lbs min.
Puncture Strength	ASTM D 3787	75 lbs min.
CBR Puncture	ASTM D 6241	
Apparent Opening Size (AOS)	ASTM D 4751-99a	20 to 50 US Sieve

PART 3 - EXECUTION

3.1 AGGREGATE BASES

- A. Placement
 - 1. Maximum single layer compacted course is 8 inches.
 - 2. If total thickness of base exceeds 8 inches, construct in 2 or more courses of equal thickness.
- B. Compaction
 - 1. Ensure moisture content is uniformly distributed and sufficient to achieve optimum moisture.
 - 2. Uniformly roll the base to line, grade, and section and to the required percentage of maximum dry density.
 - 3. For multiple courses, add water as necessary to achieve optimum moisture content.
 - 4. In areas inaccessible to roller, obtain the required compaction with mechanical tampers approved by the Testing Agency or Design Professional.
- C. Maintenance
 - 1. Maintain the base until it is sufficiently ready for paving courses. Repair defects by additional watering, rolling, and blading as necessary.

END OF SECTION

SECTION 32 12 00

FLEXIBLE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bituminous prime coat, if used.
2. Asphalt paving courses including binder course and surface course.
3. Bituminous tack coat.
4. Paint and thermoplastic pavement markings
5. Tennis court, ball court coating system

B. Related Sections:

1. 31 22 00 "GRADING" for backfill and compaction of trench excavations prior to paving and for general subgrade preparation.
2. 32 05 00 "COMMON WORKS FOR EXTERIOR IMPROVEMENTS" for graded aggregate base (GAB) construction.

1.2 REFERENCE SPECIFICATIONS AND DOCUMENTS

A. Georgia Department of Transportation (GDOT)

1. Department of Transportation, State of Georgia Standard Specifications, Construction of Roads and Bridges, 2013 Edition. Unless otherwise noted, conform with GDOT Standard Specifications for testing, materials, and methods for bases and hot mix asphalt pavement.
2. GDOT *Special Provision* Sect. 828 applies to hot mix asphalt mixtures and is available at http://www.dot.ga.gov/PartnerSmart/Business/Source/special_provisions/sheif/sp828.pdf.
3. GDOT Test Procedures (GDT), where referenced.

B. American Society for Testing Materials (ASTM)

1. ASTM D1557- laboratory compaction characteristics of soil using Modified Effort.
2. ASTM D2726- Bulk specific gravity and density of compacted bituminous mixtures.
3. ASTM D2950- In place density of bituminous concrete by nuclear gage.
4. ASTM D3203- Percent air voids in compacted bituminous paving mixtures.
5. ASTM D3549- Thickness of compacted bituminous paving mixture specimens.
6. ASTM D6938- In place density and water content of soil and aggregate using nuclear gage.

C. MUTCD: US Department of Transportation, Manual of Uniform Traffic Control Devices for Streets and Highways, 2009 Edition with Revisions 1 and 2- dated May 2012. Unless otherwise shown or specified conform with the MUTCD on all asphalt striping and pavement marking.

1.3 SUBMITTALS

- A. Product data for materials, including but not limited to: traffic paint, thermoplastic markings, prime coat, bituminous tack coat.
- B. Job Mix Formula for all asphalt concrete mixtures which includes the following information:
 - 1. Mixture I.D. Number
 - 2. Source and description and proportions of materials to be used.
 - 3. Percentage of combined mineral aggregates passing each specified sieve.
 - 4. Percentage of asphalt by weight of the total mix
 - 5. Single temperature at which to discharge from the plant.
 - 6. Theoretical specific gravity or Theoretical maximum density (Rice) of the mixture at the designated asphalt content
- C. Copy of pavement warranty and maintenance agreement for review by the Design Professional.

1.4 QUALITY ASSURANCE

- A. Testing Services: The Owner will engage a qualified independent testing agency to perform material evaluation tests described in this Section.

1.5 SITE CONDITIONS

- A. Store materials only in areas designated for Contractor's use.
- B. Complete all underground work and raise all necessary structures prior to paving operations.
- C. Verify all grades and elevations for conformance with the Drawings before proceeding with work. The Design Professional reserves the right to make minor modifications by reasonable field adjustments prior to completion of subgrade work.
- D. Weather Limitations:
 - 1. Install base course when subgrade is sufficiently stable, not saturated, and when air temperature is above 30° F and rising.
 - 2. Apply prime and tack coats to dry surfaces when: rain is not imminent, temperature is above 40° F, and temperature has not been below 35° F for 12 hours immediately prior to application.
 - 3. Construct Asphalt paving courses in dry weather when subgrade is sufficiently stable and air temperature is above 40° F and rising.

1.6 PAVEMENT DESIGN

- A. Pavement sections are shown on the Plans and may include, but are not limited to, the following applications:
 - 1. Asphalt Paving within the Right-of-Way.
 - 2. Heavy Duty Asphalt Paving.
 - 3. Medium Duty Asphalt Paving.
 - 4. Tennis court or other recreational surface paving.
- B. All depths shown or specified are measured after compaction.

1.7 WARRANTY

A. Pavement Warranty:

1. (Sub) Contractor shall provide the Owner with a warranty and maintenance agreement on materials and workmanship for all hot mix asphalt paving work. Warranty and maintenance period shall be for a **2 year** period beginning on the established date of substantial completion on all asphalt paving.
2. All maintenance work under the Pavement Warranty shall be performed within 30 days of notice by the Owner and in accordance with GDOT Standard Specifications.

PART 2 - PRODUCTS

2.1 PRIME COAT- CUTBACK ASPHALT

- A. Medium curing cut back asphalts {MC-30, MC-70, MC-250, MC-800, MC-3000} and rapid curing cutback asphalts {RC-30, RC-70, RC-250, RC-800, RC-3000} material properties in accordance with GDOT Standard Specification 821.

2.2 BITUMINOUS TACK COAT

- A. Performance graded asphalt cement: PG 58-22, PG 64-22, or PG 67-22 in accordance with GDOT Standard Specification 820.

2.3 SUPERPAVE ASPHALTIC CONCRETE MIXTURES

- A. Asphaltic concrete shall be hot plant mix material and shall comply with requirements for Hot Mix Asphaltic Concrete Mixtures per GDOT *Special Provision* Sect. 828 available at the following address:
http://www.dot.ga.gov/PartnerSmart/Business/Source/special_provisions/shelf/sp828.pdf.
- B. Asphalt cement: PG 64-22 or PG 67-22, unless otherwise approved by the Design Professional.
- C. Design gradations for pavements typically used as surface (top) courses are:

Sieve Size ¹	4.75 mm Superpave ³	9.5 mm Superpave Type I	9.5 mm Superpave Type II	12.5mm Superpave
	Percent Passing			
1-1/2 in (37.5mm)				100
1-in (25.0 mm) sieve				90-100
¾ in (19.0 mm) sieve		100	100	55-89
½ in (12.5 mm) sieve	100	98- 100	98-100	50-70

3/8 in (9.5 mm) sieve	90-100	90-100	90-100	
No. 4 (4.75 mm) sieve	75-95	65-85	55-75	
No. 8 (2.36 mm) sieve	60-65	48-55	42-47	30-36
No. 50 (300 µm) sieve	20-50			
No. 200 (75 µm) sieve	4-12	5.0-7.0	5.0-7.0	4.5 -7.0
Range for Total AC ²	6.00- 7.50%	5.50 - 7.25%	5.25 - 7.00%	5.00-6.25%

1. Refer to GDOT Special Provision 828 for mixture control tolerances applicable to each sieve and pavement.
2. Range for % AC is Original Optimum AC (OOAC) at 65 gyrations prior to the Corrected Optimum AC calculations detailed in GDOT SOP 2.
3. Application of 4.75 mm superpavement is limited to low volume parking lots unless otherwise shown.
4. 9.5 mm superpavement shall be Type II unless otherwise shown.

D. Design gradations for pavements typically used as asphalt binder (subsurface, intermediate, or base) courses are:

Sieve Size ¹	12.5 mm Superpave	19 mm Superpave	25 mm Superpave
	Percent Passing		
1-1/2 in (37.5mm)			100
1-in (25.0 mm) sieve	100	100	90-100
¾ in (19.0 mm) sieve	98-100	90-100	55-89
½ in (12.5 mm) sieve	90-100	60-89	50-70
3/8 in (9.5 mm) sieve	70-89	55-75	
No. 8 (2.36 mm) sieve	38-46	32-36	30-36

No. 200 (75 µm) sieve	4.5-7.0	4.0-6.0	3.5-6.0
Range for Total AC ²	5.00- 6.25%	4.25-5.50%	4.00-5.25%

1. Refer to GDOT Special Provision 828 for mixture control tolerances applicable to each sieve and pavement.
2. Range for % AC is Original Optimum AC (OOAC) at 65 gyrations prior to the Corrected Optimum AC calculations detailed in GDOT SOP 2.

E. Volumetric mix requirements for superpavements, including work within public rights of ways.

Design Parameter	Mix Type(s)	Limits
% of Max. Specific Gravity (Gmm) at design gyrations, (Ndes)	All	96%
% Gmm at the initial number of gyrations, Ni	All	91.5% Max
% voids filled with asphalt (VFA) at Ndes	9.5 mm Type I	Min 72; Max 80
	9.5 mm Type II, 12.5 mm	Min 72; Max 76
	19 mm	Min 71; Max 76
	25 mm	Min 69; Max 76
Fines to effective asphalt binder ration (F/Pbe)	9.5 mm Type I	0.6 to 1.4
	All other types	0.8 to 1.6
Minimum Film Thickness (microns)	All	>7.00 µm
Minimum % Voids in Mineral Aggregate (VMA)	25 mm	13.0%
	19 mm	14.0%
	12.5 mm	15.0%
	9.5 mm Type I	16.0%
	9.5 mm Type II	16.0%

F. Volumetric mix requirements for parking facilities only.

Design Parameter	Mix Type(s)	Limits
% of Max. Specific Gravity (Gmm) at design gyrations, (Ndes)	All	96%

% Gmm at the initial number of gyrations, Ni	All	91.5% Max
% voids filled with asphalt (VFA) at Ndes	4.75 mm	Min 60; Max 80
	9.5 mm Type I	Min 72; Max 80
	9.5 mm Type II, 12.5 mm	Min 72; Max 78
	19 mm	Min 71; Max 76
	25 mm	Min 71; Max 76
Design optimum air voids	4.75 mm	4.0 - 7.0
Fines to effective asphalt binder ration (F/Pbe)	9.5 mm Type I	0.6 to 1.4
	All other types	0.8 to 1.6
Minimum Film Thickness (microns)	4.75 mm	> 6.00 µm
	All others	> 7.00 µm
Minimum % Voids in Mineral Aggregate (VMA)	25 mm	13.0%
	19 mm	14.0%
	12.5 mm	15.0%
	9.5 mm Type I	16.0%
	9.5 mm Type II	16.0%

2.4 STRIPING AND MARKINGS (PAVEMENT SURFACES, CURBS)

- A. Unless otherwise noted- parking lines, cross walks, bus lane striping, directional arrows, stop bars, center line markings, curb painting/markings and handicap markings shall be painted when Work is outside public road Right of Ways.
- B. All striping and markings within public road Right of Ways, unless otherwise noted, shall be thermoplastic.
- C. Traffic line paint shall be waterborne and conform with material requirements of Georgia DOT Standard Specification 870.2.02. Where specified, glass beads shall be in accordance with GDOT Standard Section 652.
- D. Thermoplastic markings shall be in accordance with Georgia DOT Standard Specification 653.
- E. Unless otherwise shown on the Plans, color applications are as follows:
 1. White: All auto parking spaces, pedestrian crossings and direction arrows.
 2. Yellow: All bus lanes, general no-parking zones (including along curbs), speed breakers, traffic lane direction dividers, and other cautionary areas.
 3. Light Blue: For highlight/background to WHITE in Handicap Areas.
 4. Red: all fire lane areas as indicated on the drawings shall have the curb facing painted red and provide 4" tall "NO PARKING FIRE LANE" curb stenciling along

painted fire lane restricted area once every twenty (20) feet on center.
Secure local Fire Marshall written approval of markings prior to installation.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Ensure that subgrade has been finished to line, grade, and cross section shown.
- B. Prepare subgrade in accordance with Division 31 "EARTHWORK". Any subgrade defects, or unsatisfactory conditions, that may adversely affect proper installation of this work shall be reported to the Design Professional and corrected prior to base course or paving course work.

3.2 AGGREGATE BASE

- A. Place, compact, and maintain aggregate bases in accordance with Division 32 "COMMON WORKS FOR EXTERIOR IMPROVEMENTS".

3.3 PRIME COAT

- A. Provide prime coats to finished, compacted, and slightly damp soil or base surfaces under the following conditions:
 - 1. Prime where noted on the plans.
 - 2. Prime soil or aggregate bases prior to applying bituminous surface treatments (chip seals).
 - 3. Prime all cement or lime stabilized bases prior to asphalt paving.
 - 4. Prime aggregate bases on which less than 5 inches of total thickness of hot mix asphalt will be placed. Except that prime coats are not required in parking lots and driveways bound by curbs or other features, under paved shoulders, or under non-vehicular areas.
- B. Grade of cut back asphalt shall be as shown on the Plans or as determined by the Architect or Testing Agency. If not shown or specified, provide grade of cut back asphalt in accordance with GDOT Standard Specification 412.3.05 given base material texture {tight, average, or open} and Contractor selected curing rate.
- C. Apply prime coat for optimum penetration at a rate between 0.15 and 0.30 gal/sq-yd.

3.4 TACK COAT

- A. Apply tack coat of asphalt cement between all layers of successive pavement, including between the binder course and surface course pavements.
- B. Apply tack coat to milled pavement surfaces prior to paving.
- C. Apply tack coat to vertical surfaces of curbs, gutters, transverse and longitudinal construction joints, dig out patches prior to such surfaces being paved.
- D. Limit the amount of tack coat applied to that which can be covered by paving operations that day.

- E. Sweep and clean application surfaces of all loose debris, and allow to dry prior to applying tack coat.
- F. Apply tack coats of asphalt cement at an application temperature of 350 - 400 °F and rates of 0.02 to 0.014 gal/sq-yd for freshly placed asphalt and at a rate of 0.04 to 0.06 gal/sq-yd on other surfaces.
- G. Do not allow traffic on tack coat material. Allow the tack coat to become sufficiently tacky (break) prior to paving.

3.5 BINDER COURSE

- A. Construct a hot plant mix asphaltic concrete binder course on prepared base to the line, grade, thicknesses, and tolerances indicated on the Plans and in these specifications.
- B. Uniformly spread and compact.
- C. Layer Thicknesses: Conform with minimum and maximum lift thicknesses as follows (reference GDOT Section 400, Table 5):
 - 1. 25 mm Superpave: 3" to 5"
 - 2. 19 mm Superpave: 1-3/4" to 3"
 - 3. 12.5 mm Superpave: 1-3/8" to 2-1/2"

3.6 SURFACE COURSE

- A. Following tack coat break, place hot plant mix asphaltic concrete wearing course by means of a mechanical spreader to the thickness indicated on plans and details and roll evenly in place.
- B. Replace any high, low, or defective areas by saw cut and removal of the affected pavement. Replacement hot plant mix asphaltic concrete shall be immediately compacted to conform to surrounding area and thoroughly bonded thereto.
- C. Uniformly spread and compact.
- D. Layer Thicknesses: Conform with minimum and maximum lift thicknesses as follows:
 - 1. 12.5 mm Superpave: 1-3/8" to 2-1/2"
 - 2. 9.5 mm Superpave Type 2: 1-1/4" to 2"
 - 3. 9.5 mm Superpave Type 1: 7/8" to 1-1/2"
 - 4. 4.75 mm Superpave: 7/8" to 1-1/8"

3.7 PLACING ASPHALTIC CONCRETE PAVING

- A. Hot plant mix asphaltic concrete paving shall be placed on prepared surface, spread, and struck. Unless approved otherwise, spread mixture at minimum temperature of 225°F.
- B. Place each course by pavers equipped with automatic screed control such that it can be finished to required grade, cross-section, width, thickness and is uniform in density and texture. Except that, when approved by the Testing Agency or Design Professional, small areas inaccessible to paving machines may be placed by hand. **Paving machine screed extensions may be used with approval of Design Professional only.** Approved Extensions shall provide for consistent lay down density through use of extended auger systems or other approved mechanisms.

- C. Make longitudinal and transverse joints between old and new pavements, or between successive days work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density, and smoothness as other sections of asphaltic concrete course. Prior to paving, clean joint contact surfaces and apply tack coat.

3.8 ROLLING

- A. Commence rolling when asphaltic concrete mixture will support roller weight without excessive displacement.
- B. Continue rolling until roller marks are no longer visible and asphalt has been uniformly compacted attaining required density and smoothness.
- C. Compact asphaltic concrete mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
- D. Do not roll asphalt if mix temperature is less than 175° F unless a lower temperature is supported by the mix design and is otherwise approved by the Design Professional or Testing Agency.

3.9 TOLERANCES

- A. Elevation tolerance for asphalt paved surfaces are:
1. General areas \pm 1/4 inch at finish grade unless field adjustments are directed or approved by the Design Professional.
 2. Tennis court \pm 0.05 ft.
- B. Cross slope, thickness, and smoothness tolerances per pavement section layer are as follows:

Layer	Cross Slope	Thickness	Smoothness ¹
Base (Aggregate or treated)	\pm 1.0%	-1/4 in, no max.	1/2 inch
HMA Binder Course	\pm 0.75%	-1/4 in, GDOT max ²	3/8 inch
HMA Surface Course	\pm 0.5%	-3/8 in, GDOT max ²	1/4 inch
HMA Tennis Surface Course	\pm 0.3%	-1/8 in, GDOT max ²	1/8 inch

¹ In any direction within a single plane of asphalt, do not exceed the gap below a 10 foot straightedge resting on high spots.

² Refer to Articles on HMA binder and surface courses this section for maximum layer thickness (from GDOT Standard Section 400 Table 5).

3.10 PAVEMENT MARKINGS

- A. Approximately two (2) calendar weeks after surface course has been completed, apply parking lines and other pavement markings as shown on the staking plan. Pavement markings includes lines, arrows, handicap designations and all other required pavement painting as detailed.

- B. Apply paint to produce uniform straight edges to widths shown but not less than 4" wide. Uneven lines will not be accepted. Do not apply paint during windy conditions that prevent application in uniform straight edges.
- C. Apply paint to dry and clean surfaces, in accordance with manufactures recommendations but in no cases when air temperature in the shade is less than 40°F.
- D. Apply paint in two uniform coats, by roller, spray or striping machine at manufactures recommended rates not less than fifteen (15) mils.
- E. All work shall be done in accordance with Georgia DOT Standard Specification Section 652 except that application of glass beads are not required.
- F. Protect newly applied paint with cones, drums or other temporary device. Repair any pavement marking damage that occurs until substantial completion of the project.

3.11 TESTING- QUALITY ACCEPTANCE

- A. Inspections: Prior to commencement of portions of the work, the Testing Agency and/or Design Professional shall be notified 48 days in advance to verify the following items:
 - 1. Subgrade preparation, stiffness (proofrolling).
 - 2. Subgrade profile, cross slope, and elevation.
 - 3. Grades, elevations, compaction, surface smoothness of base aggregate.
 - 4. Grades, elevations, surface smoothness of asphalt binder course
- B. Additional testing (or retesting) after failing tests shall be paid for by the Contractor.
- C. Minimal testing requirements for Owners Quality Assurance are summarized below. Contractor may elect to collect additional samples and perform additional tests, or prepare additional specimens for testing at its sole discretion in accordance with their own quality control program.

Material or Product	Characteristic /Test Method	Minimum Sample Frequency	Acceptance Criteria	Sampling Point
Aggregate base courses	Gradation; max dry density, optimum moisture by modified proctor, <i>ASTM D1557</i>	1 per source	Gradation within limits.	Stockpile at source
	Compaction <i>GDT 21, 59, ASTM D6938</i>	1 per 500 sq yards, per lift	100% of max dry density, $\pm 2\%$ optimum moisture *	In-place, prior to next lift
Hot asphalt concrete mixes	Compaction <i>GDT 39, 59 ASTM D2950, ASTM D1188, ASTM D3203</i>	1 core per 500 sq-yds per lift, not less than 1 test per paving day.	Percent air voids $\leq 8\%^{**}$	Completed surface after rolling

		Continuous nuclear gage testing during paving.		
	Thickness, by coring.	Binder Courses: 1 per 1000 sq-yds. Overall Section Including Surface Course: Measured from Compaction samples.	Average of all measurements for a given course or full section \geq specified thickness ***	Completed surface after rolling

* Unless shown otherwise on the Plans.

** Additionally asphalt mixes shall be applied with uniform density such that within a single day or paving area, the difference between highest and lowest measured air voids does not exceed 4% for new pavement and 5% for resurfacing projects.

*** Additionally, at any location, the thickness of a given lift shall not be less than within 1/4" of the design thickness.

D. Hot Asphalt Concrete Compaction Testing

1. Density tests are not required when HMA is placed at 90 lbs/sq-yd or less or for courses of 4.75 mm mix.
2. Non conforming work: Remove completed asphalt courses that exceed maximum percentage of air voids (or do not attain minimum compaction percentages) and replace at the direction of the Design Professional or Testing Agency. Statistical testing and pay factors specified in GDOT Standard Specifications are not applicable.

E. Asphalt Cores

1. Repair holes resulting from coring to match existing pavement elevations. Repair holes prior to paving any subsequent courses.
2. 4" diameter cores of binder course shall be taken through base and binder course prior to placing surface course.

F. Correction of Asphalt Thickness Deficiencies

1. In areas where there is a deficiency in the thickness of binder course(s), increase the thickness of wearing course to offset the deficiency.
2. The average thickness of the full asphalt paving section, binder courses + surface course, shall be \geq the design asphalt section. If tests show a deficiency of -1/4 inch or more in the average thickness of the specimens, provide mitigation acceptable to the Design Professional, Testing Agency, or Owners representation. If directed, place an additional lift of wearing course at the minimum depth as specified in this Section.

3.12 MAINTENANCE OF ASPHALTIC CONCRETE PAVING

- A. Protect completed asphalt surfaces from damage, siltation, and spills throughout construction.
- B. Remove and replace any asphaltic concrete paving if damaged by construction activities. Do not change or alter grade during corrective work, unless approved by the Design Professional.
- C. Saw cut and remove areas of damaged asphaltic concrete paving in neat and straight lines extending the width of a full lane or at least 10 feet in large areas. Corrections by surface patching will not be accepted.

END OF SECTION

SECTION 32 13 01

RIGID PAVING AND SITE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete curb and gutter.
2. Concrete walkway, flumes, and other miscellaneous cast in place elements.
3. ADA ramps.
4. Concrete paving of driveways, roadways, dumpster pads, loading dock pads, and parking lots.

B. Related Sections:

1. 31 22 00 "GRADING" for backfill and compaction of trench excavations prior to paving and for general subgrade preparation.
2. 32 05 00 "COMMON WORKS FOR EXTERIOR IMPROVEMENTS" for graded aggregate base (GAB) if shown on the Plans.

1.2 REFERENCE SPECIFICATIONS AND DOCUMENTS

A. Georgia Department of Transportation (GDOT)

1. Department of Transportation, State of Georgia Standard Specifications, Construction of Roads and Bridges, 2013 Edition. Unless otherwise noted, conform with GDOT Standard Specifications for testing, materials, and methods for bases and concrete pavements.
2. GDOT Test Procedures (GDT), where referenced.

B. American Concrete Institute (ACI)

1. ACI 301: Specifications for Structural Concrete.
2. ACI 308.1: Standard Specification for Curing concrete
3. ACI CP-1: Technical Workbook for ACI Certification of Concrete Field Testing Technician- Grade 1.

C. American Society for Testing Materials (ASTM)

1. ASTM A615: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Placement
2. ASTM A1064: Standard Specifications for Carbon Steel Wire and Welded Wire Reinforcement.
3. ASTM C31: Standard Practice for Making and Curing Concrete Test Specimens in the Field.
4. ASTM C39: Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
5. ASTM C42: Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
6. ASTM C260: Standard Specification for Air-Entraining Admixtures for Concrete.
7. ASTM C309: Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete.

8. ASTM D698: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
9. ASTM D994: Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
10. ASTM D1751: Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
11. ASTM D2628: Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.
12. ASTM D3406: Standard Specification for Joint Sealant, Hot Applied, Elastomeric Type; for Portland Cement Concrete Pavements.
13. ASTM D5893: Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements.

1.3 SUBMITTALS

- A. Product data for materials, including but not limited to: cementitious material, admixtures (air entraining, etc.), joint filler and sealants, reinforcing material, grout, anchors, curing compounds.
- B. Concrete mix designs or job mix formulas for each proposed concrete mixture, including the following as applicable:
 1. Curbs & sidewalks, minor cast in place structures.
 2. Heavy Duty Concrete paving areas.
- C. Shop drawings for ADA detectible warning strips.

1.4 QUALITY ASSURANCE

- A. Testing Services: The Owner will engage a qualified independent testing agency to perform material evaluation tests described in this Section.
 1. Testing Agency Qualifications: Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- B. Ready-Mix- Concrete Manufacturer Qualifications: Manufacturer must be certified according to the National Ready Mix Concrete Association (NRMCA) Plant Certification Program.
- C. Test sections. Build 10' sample test sections of walkways, curbs, and paving areas (10'x10') to demonstrate aesthetic affects and quality standards for materials and execution. Construct mock ups at approved locations only. Incorporate representative control and joints according to project requirements.
 1. Notify Testing Agency and Design Professional at least 7 days in advance of mock up construction.
 2. Obtain Owner or Design Professional approval of mockup prior to commencement of the work.
 3. Mockup may be incorporated into the work with approval.
 4. Demolish and remove each mockup from the Site when directed.
- D. Comply with ACI 301 – Standard Specifications for Structural Concrete, unless otherwise modified by Contract Documents.

1.5 SITE CONDITIONS

- A. Store materials only in areas designated for Contractor's use.
- B. Complete all underground work and raise all necessary structures prior to paving operations.
- C. Verify all grades and elevations for conformance with the Drawings before proceeding with work. The Design Professional reserves the right to make minor modifications by reasonable field adjustments prior to completion of subgrade work.

1.6 WEATHER LIMITATIONS

- A. Cold weather protection - Whenever the air temperature may be expected to reach the freezing point, spread straw or other blanketing material to sufficient depth to keep concrete from freezing, or provide enclosure and a heating device capable of maintaining concrete temperature of at least forty-five (45) degrees five (5) days and maintain above freezing for the entire specified curing period. The Contractor shall be responsible for removing and replacing any concrete injured by freezing or frost.
- B. Placing During Hot Weather: The temperature of the concrete as placed shall not exceed 85° F, mixing water or aggregates may be cooled as necessary to maintain a satisfactory placement temperature. Do not place concrete when air temperatures exceed 95° F.

1.7 PAVEMENT DESIGN

- A. Pavement sections are shown on the Plans and may include, but are not limited to, the following applications:
 - 1. Concrete Paving within the Right-of-Way.
 - 2. Heavy Duty Concrete Paving.
 - 3. Medium Duty Concrete Paving.
- B. All depths shown or specified are measured after compaction or construction.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Cementitious materials. Type I or Type II Portland cement. Portland cement may be partially replaced with either fly ash or slag cement at the following maximum proportions:
 - 1. Fly ash, 15%
 - 2. Slag cement, 50%
- B. Fine and coarse aggregates for concrete mixes. The ratio of fine to total aggregate shall be such as will produce a dense, homogeneous and workable mixture, which can be placed without segregation of materials and which will attain the design compressive strength. Aggregates shall comply with ASTM C33.

2.2 CONCRETE MIXTURES

- A. Concrete for rigid paving (heavy duty and normal). Proportion such that the following are met:
 - 1. Minimum compressive strength at 28 days ($f'c$) = 4000 p.s.i (heavy duty); 3000 p.s.i. (normal)
 - 2. Air content acceptance 3.5 to 6.0%, design air content 4.0 to 5.5%.
 - 3. Maximum slump = 4 inches.
- B. Unless otherwise shown, proportion concrete for curb, paving, walks, planters, seat walls, flumes and all other miscellaneous site work concrete to meet:
 - 1. Minimum compressive strength at 28 days ($f'c$) = 3000 p.s.i.
 - 2. Air content acceptance = 2.0 to 6.0%, design air content 2.5 to 6.0%.
 - 3. Maximum slump = 4 inches.

2.3 FILLER AND SEALER

- A. Expansion joint material: 1/2 inch performed strips of cellular fiber impregnated with suitable bituminous binder. Filler shall conform to section area and extend through section to within 1/2 inch of top surface and conforms to ASTM D1751 or D1752, unless otherwise indicated.
- B. Contraction Joint Sealer Material: Only apply joint sealant when otherwise shown in the Plans. Cold applied is the default.
 - 1. Cold applied silicone rubber type; ASTM D5893
 - 2. Hot-poured elastomeric type; ASTM D3406
 - 3. Single-Component Elastomeric Type (preformed); ASTM D2628

2.4 STEEL BAR, WELDED WIRE FABRIC

- A. Provide steel bars and welded wire fabric of intermediate grade steel in specified sizes as shown on plans.
- B. Plain-steel welded wire fabric: ASTM 1064, fabricated from steel wire formed into flat sheets.
- C. Reinforcement bars: ASTM A615, Grade 60, deformed unless otherwise indicated. Cut bars true to length with ends square and free of burs.
- D. Dowel bars: ASTM A615, Grade 60, plain steel bars unless otherwise indicated. Dowel bars shall be cut true to length with ends square and free of burs.

2.5 FORMS

- A. Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.
 - 1. Use flexible spring steel forms or laminated boards to form radius bends as required.
 - 2. Coat forms with a non-staining form release agent that will not discolor or deface the surface of the concrete

2.6 EPOXY RESIN GROUT

- A. Epoxy adhesive used for anchors and dowel bars in accordance with Type VIII per GDOT Standard Specification 886 unless otherwise noted.

2.7 DOVETAIL ANCHOR SLOTS

- A. Galvanized steel, 22 gage (0.8 mm) thick, foam filled, release tape sealed slots, anchors for securing to concrete forms.

2.8 DETECTABLE WARNING

- A. Provide tactile warning surface (truncated dome) via pavers or monolithic concrete pour systems at ADA ramps.
 - 1. Provide shop drawings for proposed system.
 - 2. Dome Size: Diameter of 0.9 inch (23 mm), height of 0.2 inch (5 mm) and a center-to-center spacing of 2.35 inches (60 mm).
 - 3. Visual Contrast: Contrast visually with adjoining walking surfaces either light-on-dark or dark-on-light. The material used to provide contrast shall be an integral part of the truncated dome surface.
 - 4. Audible Contrast: Differ from adjoining walking surfaces in resiliency or sound-on-cane contact.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBGRADES

- A. Prepare subgrades as specified in Section 31 22 00 "Grading" to bring subgrade to required lines and grade for site improvements.
- B. Maintain all subgrade in satisfactory condition, protected against traffic where necessary, and properly drained until site improvements are placed. Immediately in advance of concrete, check subgrade levels with templates riding the forms, correct irregularities, and re-compact any added fill material.

3.2 STRUCTURE LOCATIONS

- A. Check for correct elevation and position of all manhole covers, valve boxes, and similar structures located within areas to be poured and make any necessary adjustments in such structures.

3.3 AGGREGATE BASES

- A. If shown on the Plans- place, compact, and maintain aggregate bases in accordance with Division 32 "COMMON WORKS FOR EXTERIOR IMPROVEMENTS".

3.4 FORM CONSTRUCTION

- A. Set forms to required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of the work and so forms can remain in place at least 24 hours after concrete placement.

- B. Check completed formwork for grade and alignment to the following tolerances:
 - 1. Top of Forms not more than 1/8" in 10' from indicated elevation.
 - 2. Vertical face on longitudinal axis, not more than 1/4" in 10' from indicated alignment.
- C. Clean forms after each use, and coat with form release agent after each use and as often as required to ensure separation from concrete without damage.

3.5 MIXING AND TRANSPORTING CONCRETE

- A. Ready-Mixed Concrete - Certificates and laboratory strength test data shall be furnished from the mixing plant that concrete has a twenty-eight (28) day compressive strength when tested in accordance with methods described in ASTM Standard C39. No change shall be made in materials or the established mix without prior approval of the Design Professional.
- B. Ready-mixed concrete shall be transported to the site in transit-mix or agitator trucks having watertight drums loaded not in excess of rated capacities. Concrete shall be delivered and discharged within one (1) hour after water is added to the cement. Concrete which, when delivered is not plastic and workable will be rejected.
- C. Retempering of concrete that has partially hardened (remixing with or without additional cement, aggregate or water) will not be permitted.

3.6 PLACING CONCRETE

- A. Subgrade- Place concrete only on a moist compacted subgrade or base, free from loose material. Place no concrete on a muddy or frozen subgrade.
- B. Forms - All forms shall be free from warp, tight enough to prevent leakage of concrete, and substantial enough to maintain their shape and position without springing or settlement when concrete is placed or vibrated. Forms shall be staked, braced, and/or tied together securely. Forms shall be clean and those for surfaces to be exposed shall produce a smooth, even finish without fins or board marks. Set forms for slabs on ground at exact finished grade. Check for line and grade and correct as necessary immediately before concreting. Provide uniform bearing for such forms.
- C. Reinforcement shall be accurately placed, and securely supported and fastened to prevent movement during placement of concrete.
- D. Concrete shall be deposited to require as little rehandling as practical. Placing shall be continuous between transverse joints or in individual sections of the work. Vibrate concrete thoroughly along forms and expansion joints, and work carefully into corners and around reinforcement. Tamp and screed to a dense mass. If the temperature may be expected to fall below forty (40) degrees F within twenty-four (24) hours after concrete is placed, heat water and aggregates to bring the temperature of concrete mix to at least fifty (50) degrees.
- E. Do not remove forms for at least 24 hours after concrete has been placed. After forms are removed, clean ends of joints and point-up any minor honeycombed areas. Remove and replace sections with major defects, as directed by Design Professional.

3.7 JOINTS

- A. General: Construct expansion, control (also may be called weakened-plane or contraction, and construction joints true-to-line with face perpendicular to surface of the concrete, unless otherwise indicated. Construct transverse joints at right angles to the centerline, unless otherwise indicated.
- B. When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.
- C. Control Joints: Provide control (contraction) joints, sectioning concrete into areas not to exceed 25 feet in length. Construct control joints for a depth equal to at least 1/4 of concrete thickness, as follows:
 - 1. Tooled Joints: Form control joints in fresh concrete by grooving top portion of concrete. Finish edges with a jointer. Joints in walks shall be 1/4" x 1" deep and at a spacing equal to walk width.
 - 2. Sawed Joints: Form control joints using powered saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into hardened concrete as soon as surface will not be torn, abraded, or otherwise damaged by cutting action.
- D. Construction Joints: Place construction joints at the end of all pours and at locations where placement operations are stopped for a period of more than 1/2-hour, except where such pours terminate at expansion joints. Construct joints as shown or, if not shown, use standard metal keyway-section forms.
- E. Expansion Joints: Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks, and other fixed objects, unless otherwise indicated.

3.8 CONCRETE CURB AND GUTTER

- A. Furnish and install formed concrete curb and gutter as detailed. Curb and gutter shall be accurately formed to a true, clean, straight, even profile. Unless otherwise shown:
 - 1. Provide expansion joints 40 feet on center. Control (tooled) joints shall be provided at 10 feet on center.
 - 2. Finish of concrete shall be a fine broom finish.
- B. All curves shall be accurately formed to detail.

3.9 CONCRETE WALKS AND FLUMES

- A. Concrete walks shall be four (4) inches thick and of width as shown on the Site Plan. Unless otherwise shown:
 - 1. Provide expansion joints through walks at a maximum of 40 feet on-center and control (tooled) joints at the same intervals as the width of the walk.
 - 2. Slope walks toward curb unless otherwise indicated.
 - 3. Finish shall be a fine broom finish.
 - 4. Finished surfaces shall be smooth and not vary more than 5/16 inch from the testing edge of a 10-foot straightedge. Permissible deficiencies in section thickness is up to 1/4".
 - 5. Minimum slope shall be 1.0% unless specifically noted.

3.10 SAND BLAST FINISH

- A. Provide abrasive blast (sand blast) finish where indicated on the Drawings.
- B. Perform sand blasting 24 to 72 hours after casting when concrete strength is between 1000 and 1500 psi.
- C. Surface Continuity: Perform sand blasting in a continuous manner, utilizing same crew or personnel.
- D. Depth of Cut: Use an abrasive grit of proper tyhpe and gradation to expose aggregate and surrounding matrix surfaces to match the design reference sample or mock up as follows:
 - 1. Brush: Remove cement matrix to eliminate surface sheen and expose face of fine aggregate. No reveal.
 - 2. Light: Expose fine aggregate with occasional exposure of coarse aggregate and uniform color. Maximum reveal 1/16 inch.
 - 3. Medium: Generally expose coarse aggregate with slight reveal. Max reveal ¼”.
 - 4. Heavy: Expose and reveal coarse aggregate to a maximum projection of one-third of its diameter, reveal ¼ to ½ inch.
- E. Sand blasting: Blast corners and edges carefully, using back-up boards, to maintain uniform corner or edge line. Determine type of nozzle, nozzle pressure, and blasting techniques required to match the mockup.
- F. Cleaning: After sand blasting is complete, clean surface with commercial concrete cleaner according to manufacturer instructions and recommendations. Thoroughly neutralize and flush cleaning solution from finished surface with water under pressure.
- G. Protect adjacent surfaces and materials from washing and run-off.

3.11 HANDICAP RAMP

- A. Locate and construct concrete handicap ramps per Plan and details. Provide tactile warning surface (truncates dome) via pavers or monolithic concrete pour systems provide shop drawings for said system. Apply a fine broom finish. Do not exceed eight (8) percent slope at any point.

3.12 HEAVY DUTY CONCRETE PAVING

- A. Place steel reinforcing where indicated prior to placing concrete.
- B. Pour heavy duty concrete mix in forms so that when consolidated struck off, compacted and finished, paving will be to the thickness shown on the Plans. If not shown on the Plans, paving thickness shall be eight (8) inches.
- C. Locate expansion joints at 40' o.c. and control joints at minimum of 10' o.c. for each pavement lane.
- D. Test surface for trueness with a 10' straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.
- E. Compact in such a manner that aggregate is forced down and not less than three eights (3/8) inch of mortar is left on top. Apply heavy broom finish.

3.13 CURING CONCRETE

- A. Protect unhardened concrete from rain and flowing water and protect concrete against loss of moisture and rapid temperature change for at least a 7 day curing period.
- B. Impervious membrane - Where applicable, concrete will be cured through the application of a transparent, impervious membrane of a type approved by the Design Professional. The liquid shall contain a fugitive dye and shall be of such composition as not to react with the concrete nor alter its color. Apply the liquid immediately after free water has disappeared from the finished surface of the concrete; apply in the form of a fine mist and in such manner as to cover the surface with a uniform film, ample to seal the surface thoroughly and without marring the concrete finish in accordance with manufacturer recommendations. Keep workmen, equipment and materials off the membrane during the curing period, except as required for joint sawing operations and surface tests.

3.14 TOLERANCES

- A. Elevation tolerance for finish grade surfaces are:
 - 1. General areas ± 0.04 ft unless field adjustments are directed or approved by the Design Professional.
- B. Cross slope, thickness, and smoothness tolerances are as follows:

Layer	Cross Slope ²	Thickness	Smoothness ¹
Base (Aggregate or treated)	$\pm 1.0\%$	$\pm 1/4$ in	1/2 inch
Finished Concrete Surface (Pedestrian Areas)	$\pm 0.25\%$	$\pm 1/4$ in	5/16 inch
Curb Sections	$\pm 0.5\%$	$\pm 1/4$ in	1/4 inch
Rigid Pavement Sections	$\pm 0.3\%$	$\pm 1/4$ in	1/4 inch

¹ In any direction within a single plane of asphalt, do not exceed the gap below a 10 foot straightedge resting on high spots.

² Cross slope tolerance does not alleviate the requirement to provide positive drainage. Minimum slope shall be 1.0%.

3.15 TESTING- QUALITY ACCEPTANCE

- A. Inspections: Prior to commencement of portions of the work, the Testing Agency shall be notified 3 days in advance to verify the following items:
 - 1. Subgrade preparation, stiffness (proofrolling).
 - 2. Subgrade profile, cross slope, and elevation.
 - 3. Grades, elevations, compaction, surface smoothness of base aggregate if used.

- B. Additional testing (or retesting) after failing tests shall be paid for by the Contractor.
- C. Replace concrete in all areas (between joints) that fail to meet cross slope, thickness, and smoothness tolerances. Also, replace concrete in all areas that does not meet material testing acceptance criteria shown below.
- D. Appearance: Exposed surfaces of finished work shall not exhibit excessive cracking, discoloration, form marks, or tool marks which are inconsistent from the overall appearance. Such deficient surfaces shall be removed and replaced between joints.
- E. Minimal testing requirements Owners Quality Assurance are summarized below. Contractor may elect to collect additional samples and perform additional tests, or prepare additional specimens for testing at its sole discretion in accordance with their own quality control program.

Material or Product	Characteristic /Test Method	Minimum Sample Frequency	Acceptance Criteria	Sampling Point
Concrete Mixture	Compressive Strength <i>ASTM C31, ASTM C39</i>	Min. 1 composite sample per day (2 sets of 2 standard 6"x12" cylinder), per 250 CY placed, per each class. <i>ASTM C172</i>	Average of three consecutive tests exceed specified strength, and no test is deficient by more than 500 psi.	Molded onsite, lab test.
	Air Content <i>ASTM C173, or C231</i>	(min) 2 tests per day, per class placed.	+/- 0.5% of the design air content	On site
	Slump <i>ASTM C143</i>	(min) 2 tests per day, per 250 CY placed, per each class.	Refer to mix composition.	On site
Aggregate base courses	Gradation; max dry density, optimum moisture by modified proctor, <i>ASTM D1557</i>	1 per source	Gradation within limits.	Stockpile at source
	Compaction <i>GDT 21, 59, ASTM D6938</i>	1 per 2000 sq yards of finished concrete surface, per lift	100% of max dry density, $\pm 2\%$ optimum moisture *	In-place, prior to next lift

- F. Deficient work that test reports and inspections indicated does not comply with this specification, shall be fully replaced. Corrective action not involving full replacement may be approved by the Architect in writing, provided such corrective action equals or better the original specification

3.16 MAINTENANCE OF CONCRETE SITE IMPROVEMENTS

- A. Concrete site improvements damaged during construction shall not be spot patched. If a portion of a panel is damaged between control or expansion joints, the entire panel shall be replaced.

END OF SECTION

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Vinyl coated chain link fences, gates and accessories.

1.2 REFERENCE SPECIFICATIONS AND DOCUMENTS

- A. American Society for Testing Materials (ASTM)
 - 1. ASTM C1107 – Cement grout.
 - 2. ASTM F567 – Installation of chain link fence.
 - 3. ASTM F626 – Fence fittings.
 - 4. ASTM F900 – Commercial swing gates.
 - 5. ASTM F934 – Standard colors for polymer-coated chain link fence.
 - 6. ASTM F1043 – Protective coatings on steel fence framework.
 - 7. ASTM F1083 – Galvanizing for fence structures
 - 8. ASTM F1664 – PVC coated steel wire.

1.3 SUBMITTALS

- A. Manufacturer's literature and data: Cut sheets or specifications indicating material compliance and specified options for chain link fencing, gates, privacy slats (where applicable) and all accessories.
- B. Shop drawings: Site plan showing layout of fence location with dimensions, location of gates and opening size, cleared area, elevation of fence and gates, details of attachments and footings.

1.4 QUALITY ASSURANCE

- A. Manufacturer: Company having manufacturing facility/facilities specializing in manufacturing chain link fence products with at least 5 years' experience.
- B. (Sub) Contractor: Demonstrated successful experience installing similar projects and products in accordance with ASTM F567 and have at least 5 years' experience.

1.5 SITE CONDITIONS

- A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures.

PART 2 - PRODUCTS

2.1 CHAIN LINK FABRIC

- A. Fabric height: Fabric height shall be as noted on the Drawings.
- B. Fabric shall be PVC coated galvanized steel wire fabric provided in one-piece heights complying to ASTM F 668, Class 2a.
- C. Mesh size:
 - 1. Fencing mesh size (except tennis): 2 inches.
 - 2. Tennis court fencing mesh size: 1-3/4 inches.
- D. Core wire diameter: 0.148 inches (9 gauge).
- E. PVC coating: 6 gauge finished diameter with a minimum thickness of 0.015 inches applied in accordance with ASTM F 1043.
- F. PVC coating color: Black, per ASTM F 934.
- G. Selvages: Knuckled top selvage and knuckled bottom selvage.

2.2 FENCE FRAMING

- A. Posts and rails: Comply with ASTM F 1043 for framing, ASTM F 1083 for Group IC round pipe, and the following:
 - 1. Group: IA, round steel pipe, Schedule 40.
 - 2. Fence height shall be as noted on the Drawings.
 - 3. Strength requirement: Light industrial according to ASTM F 1043.
 - 4. Post diameter, thickness and weight:
 - a. Fence heights 4 to 6 feet
 - Line post: 2.375 inches (2-3/8" nominal o.d.), 0.154 inches, 3.65 lb/ft.
 - End, corner and pull post: 2.875 inches (2-7/8" nominal o.d.), 0.203 inches, 5.79 lb/ft.
 - b. Fence height 8 to 10 feet:
 - Line post: 2.875 inches (2-7/8" nominal o.d.), 0.203 inches, 5.79 lb/ft.
 - End, corner and pull post: 4.000 inches (4" nominal o.d.), 0.237 inches, 10.80 lb/ft.
 - c. Swing gate post: According to ASTM F 900
 - 5. Top rails, rails and braces diameter and thickness:
 - a. Top Rails: 1.90 inches (1-7/8" nominal o.d.), 0.145 inches, 2.72 lb/ft.
 - b. Rails and braces: 1.66 inches (1-5/8" nominal o.d.), 0.140 inches, 2.27 lbs/ft.
 - 6. Coating for steel framing: PVC coated finish in accordance with ASTM F 1043 applied with a minimum thickness of 10-mils in black color to match the fabric.

2.3 TENSION WIRE

- A. PVC coated 0.177 inch diameter (7 gauge) metallic coated steel core wire complying with ASTM F 1664 Class 2a.

2.4 SWING GATES

- A. General: Comply with ASTM F 900 for swing gate types.
 - 1. Metal pipe and tubing: Galvanized steel gate framing complying with ASTM F 1043 and ASTM F 1083.
 - 2. Coating for steel framing: PVC coated finish in accordance with ASTM F 1043 applied with a minimum thickness of 10-mils in black color to match the fabric.
- B. Frames and bracing: Fabricate members from round, tubing with outside dimension and weight according to ASTM F 900 and the following:
 - 1. Gate Fabric Height: 2 inches less than adjacent fence height.
 - 2. Leaf Width: As indicated.
 - 3. Frame Members Diameter: 1.90 inches.
- C. Frame corner construction: Welded or assembled with corner fittings.
- D. Hardware: Latches permitting operation from both sides of gate, hinges, and keepers for each gate leaf more than 5 feet wide. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.

2.5 FITTINGS

- A. General:
 - 1. Comply with ASTM F 626.
 - 2. Coating for fittings: PVC coated finish applied with a minimum thickness of 10-mils in black color to match the fabric.
- B. Tension and brace bands: PVC coated 12 gauge galvanized pressed steel a minimum width of $\frac{3}{4}$ inch.
- C. Top rail sleeves: PVC coated pressed-steel or round-steel tubing not less than 6 inches long.
- D. Tie wires and hog rings: PVC coated nine 9 gauge galvanized steel or aluminum core wire for attachment of fabric to framing and tension wire.
- E. Truss rods and tightener:
 - 1. PVC coated steel rods with minimum diameter of $\frac{3}{8}$ inch.
 - 2. PVC coated pressed steel tightener.
- F. Terminal post caps, line post loop tops, rail and brace ends, and boulevard clamps: PVC coated galvanized pressed steel.

2.6 GROUT AND ANCHORING CEMENT:

- A. Grout for post footings in concrete, masonry, or bedrock: Non-shrink grout complying with ASTM C 1107.
- B. Concrete for post footings in soil: 28 day compressive strength of 3,000 psi (minimum).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for conditions for compliance with requirements for site clearing, grading, paving, and other conditions affecting performance of the work.
- B. Do not begin installation before final grading and clearing is completed.

3.2 PREPARATION

- A. Mark locations of fence lines, gates, and terminal posts.
- B. Clear, grub, grade, and remove debris for the fence line.

3.3 INSTALLATION

- A. General:
 - 1. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.
 - 2. Install fencing on established boundary lines inside property line.
- B. Excavation:
 - 1. Drill holes for post footings in firm undisturbed or compacted soil.
 - 2. Bedrock excavation: if bedrock is encountered before reaching required depth, excavate to required depth for setting post in soil or 18 inches, whichever is less, and provide a 2 inch larger diameter than the outside diameter of the post.
 - 3. Clear loose material, fine grade area around finished post footings and uniformly spread and stabilize excavated material on site.
- C. Terminal post locations:
 - 1. Install terminal line posts at each fence termination and change in horizontal or vertical direction of 30° or more.
- D. Line post spacing:
 - 1. For fence heights of 4 to 8 feet, space line posts uniformly 10 feet on center
 - 2. For fence heights of 10 feet, space line posts 8 feet on center
- E. Setting Posts:
 - 1. Set post in soil: Set posts in concrete footing.
 - a. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - b. Footing depths.
 - Fence heights of 4 to 6 feet, footing depth shall be 36".
 - Other fence heights footing depth shall be a minimum of 24" plus an additional 3 inches for each 1 foot increase in the fence height over 4 ft., unless otherwise noted.
 - c. Footing diameters based on diameter of fence post.
 - 3 inch fence post- footing diameter is 12 inches.
 - 4 inch fence post- footing diameter is 16 inches.
 - Other fence heights footing diameter is a minimum of 4 times greater than O.D. of post, unless otherwise noted.

- d. Set post 3 inches above bottom of footing excavation.
Install "Fence Foot" as distributed by Fence Foot | 830 Crossfire Ridge | Marietta, GA 30064 | www.thefencefoot.com to the bottom of the post **<OR>**
Install 3" of #57 stone in bottom of footing.
 - e. Thoroughly consolidate concrete into the hole to remove voids.
 - f. Finish top of concrete sloping away from post for positive drainage.
 2. Set post in bedrock: Set posts in non-shrink grout.
 - a. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with non-shrink grout or mechanical devices.
 - b. Footing depth shall be per bedrock excavation requirements listed above.
 - c. Footing diameter is a minimum of 2 inches greater than O.D. of post, unless otherwise noted.
 - d. Set posts 3 inches above bottom of footing excavation.
Install "Fence Foot" as distributed by Fence Foot | 830 Crossfire Ridge | Marietta, GA 30064 | www.thefencefoot.com to the bottom of the post **<OR>**
Install 3" of #57 stone in bottom of footing.
 - e. Thoroughly consolidate non-shrink grout into the hole to remove voids.
 - f. Finish top of grout sloping away from post for positive drainage.
 3. Set posts in structures:
 - a. Set posts in steel sleeves with non-shrink grout.
 - b. Install post in concrete retaining walls, curbs, slabs, or similar construction in galvanized pipe sleeves set into the concrete or built into the masonry as shown on the drawings.
 - c. Sleeve depth and diameter shall be as noted on drawings.
 - d. Set sleeves plumb and one-half inch above the finished structure.
 - e. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - f. Thoroughly compact non-shrinking grout between sleeve and post.
 - g. Finish top of grout to divert stormwater away from the post.
 4. Gate Posts:
 - a. Gate posts require larger footings than listed above.
 - b. Gate post footing dimensions to comply with ASTM F 567.
 - F. Post Bracing and Intermediate Rails:
 1. Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts.
 2. Locate horizontal braces at mid height of fabric 6 feet or higher, on fences with top rail and at 2/3 fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
 3. For fence height of 10 feet, install an intermediate rail at a height of 5'-0".
 - G. Tension Wire:
 1. Install according to ASTM F 567, maintaining plumb position and alignment of fencing.
 2. Install tension wire 4 inches up from the bottom of the fabric.
 3. Pull wire taut, without sags.
 4. Secure tension wire to terminal post using a brace band.
 5. Install tension wire in locations indicated before stretching fabric.

- H. Top Rail:
 - 1. Install according to ASTM F 567, maintain a plumb position and alignment of fencing.
 - 2. Install twenty one 21 foot lengths of rail continuously through line post caps, bending to radius for curved runs and terminating into terminal post by a brace band and rail end.
 - 3. Splice rail using top rail sleeves.
- I. Bottom Rails:
 - 1. Install and secure to posts with fittings, in locations indicated on the drawings.
- J. Chain-Link Fabric:
 - 1. Apply fabric to outside of the framework.
 - 2. Leave approximately 1 inch, without exceeding 2 inches, between finish grade or surface and bottom selvage, unless otherwise noted.
 - 3. Pull fabric taut and anchor to framework so fabric remains under tension after pulling force is released.
 - 4. Attach to terminal post by threading the tension bar through the fabric; secure the tension bar to the terminal post with tension bands and 5/16 in. carriage bolts spaced no greater than 12 inches on center
 - 5. Secure fabric to the line post with tie wires spaced no greater than 12 inches on center.
 - 6. Secure fabric to rail with tie wires spaced no greater than 18 inches on center.
 - 7. Secure fabric to the tension wire with hog rings spaced no greater than 24 inches on center.
- K. Tension or Stretcher Bars:
 - 1. Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches on center
- L. Tie Wires:
 - 1. Use wire of proper length to firmly secure fabric to line posts and rails.
 - 2. Attach wire at 1 end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626.
 - 3. Bend ends of wire to minimize hazard to individuals and clothing.
- M. Fasteners:
 - 1. Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side.
 - 2. Peen ends of bolts or score threads to prevent removal of nuts.
- N. Swing Gates:
 - 1. Install swing gates and gateposts per ASTM F567.
 - 2. Direction of swing shall be as indicated on the drawing.
 - 3. Install gates shall be plumb in the closed position having a bottom clearance of 3 inches grade permitting.
 - 4. Hinge and latch offset opening space from the gate frame to the post shall be no greater than 3 inches in the closed position.
 - 5. Double gate drop bar receivers shall be set in a concrete footing minimum 6 inches diameter and 24 inches deep.
 - 6. Gate leaf holdbacks shall be installed for all double gates.

3.4 CLEAN UP

- A. Clean up the area of the fence line shall be left neat and free of any debris caused by the installation of the fence.

END OF SECTION

SECTION 33 4000
STORM DRAINAGE UTILITIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Storm sewers, storm structures, appurtenances.
- B. Related Sections:
 - 1. 31 00 01 "SITE PREPARATION AND GENERAL SITE WORK" for layout and construction staking.
 - 2. 31 22 00 "EARTHWORK" for trench excavation; trench safety; pipe bedding, backfill and compaction.

1.02 REFERENCE SPECIFICATIONS AND DOCUMENTS

- A. Georgia Department of Transportation (GDOT)
 - 1. Department of Transportation, State of Georgia Standard Specifications, Construction of Roads and Bridges, 2013 Edition. Unless otherwise noted, conform with GDOT Standard Specifications for work and materials for storm drain utilities. In the event of conflict apply the more stringent requirement.
- B. American Association of State Highway and Transportation Officials (ASHTO)
 - 1. AASHTO M36 – Standard specification for Corrugated Steel Pipe, Metallic-Coated, for Sewer and Drains.
 - 2. AASHTO M190 – Standard Specification for Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches.
 - 3. AASHTO M170 – Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- C. American Society of Testing Materials (ASTM)
 - 1. ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and other Gravity – Flow Applications.

1.03 SUBMITTALS

- A. Product information including manufacturer instructions: pipe, fittings. Submit for approval prior to delivery of any material.
- B. Shop Drawings:
 - 1. Structures. Submit for approval prior to delivery of any material.
 - 2. CMP Underground systems, as applicable. Indicate all materials to be furnished, material standards, and design assumptions for structural analysis. Note all proposed deviations or alternatives from the site layout plans, include the compliance of applicable ASTM or AASHTO specifications for all deviations.
- C. Record Drawings: At project closeout, submit record drawings of installed site drainage piping (including lengths and slopes), underground systems as applicable, layout, inverts, top elevations, and products. As-built record drawings shall be prepared by a land surveyor licensed in the State of Georgia. Revisions or necessary approved field changes shall be flagged.

1.04 SITE CONDITIONS

- A. Keep a hard copy of GDOT Standard Specifications for reference at the job site at all times during construction.
- B. Comply with all applicable codes and ordinances of local authority.
- C. Clean all existing drainage systems which are tied into the work.
- D. Where applicable, engineering design and manufacturer of underground detention systems shall be by an established company with demonstrated experience in successful completion of a minimum of 5 similar underground systems and has been regularly performing such work for a minimum of 5 years.
- E. Maintain in operating condition all existing surface or subsurface utilities storm drainage systems in accordance with 31 00 01 "SITE PREPARATION AND GENERAL SITE WORK". Repair any damage done to existing utilities during the course of the work, due to construction.

PART 2 PRODUCTS

2.01 PIPE MATERIALS

- A. Concrete Pipe: Unless otherwise shown, concrete pipe shall be reinforced Class IV (ASTM C76, AASHTO M170) with bell and spigot joints with rubber gasket per ASTM C433.
- B. Corrugated Metal Pipe (CMP or AST2): Unless otherwise shown, CMP / AST2 is as follows:
 1. Material / Coating: Aluminized Steel Type 2 (AST2) per AASHTO M274 or ASTM A929.
 2. Corrugation Type: Corrugations per AASHTO M36, Type 1 (circular). Corrugations are either ½" deep or 1" deep depending on diameter in the tables below.
 3. 2-2/3" x 1/2" corrugations: minimum pipe gauges by pipe diameter.
- C.

14 Gauge Pipe Diameters	12 Gauge Pipe Diameters
15"	42"
18"	48"
24"	54"
30"	60"
36"	

1. 3" x 1" corrugations: minimum pipe gauges by pipe diameter.

12 Gauge Pipe Diameters	10 Gauge Pipe Diameters
60"-96"	78"-144"

- D. Spiral Rib Corrugated Metal Pipe: Unless otherwise shown, spiral rib CMP or spiral rib AST2 pipe is as follows.
 1. Material / Coating: Aluminized steel Type 2 (AST2) per AASHTO M274 or ASTM A929. [

2. Corrugation Type: Spiral rib corrugated per AASHTO M36, Type 1R (circular-spiral rib), $\frac{3}{4}$ " corrugations. The spiral rib pipe shall have a documented design manning's n of 0.012 from pipe manufacturer.
3. Minimum pipe gauges by pipe diameter:

14 Gauge Pipe Diameters	12 Gauge Pipe Diameters	10 Gauge Pipe Diameters
18"	54"	90"
24"	60"	96"
30"	72"	102"
36"	84"	108"
42"		

- E. Unless otherwise shown, downspout and roof rain leader pipe shall be schedule 40 polyvinylchloride pipe with matching solvent welded fittings.
- F. High Density Polyethylene (HDPE) corrugated pipe and fittings: Unless otherwise shown, conform with the following:
 1. For 4 to 10 inch diameters, smooth interior and annular exterior corrugated HDPE Pipe per AASHTO M252, Type S.
 2. For 12 to 48 inch diameters, smooth interior and annular exterior corrugated HDPE Pipe per AASHTO M294, Type S.
 3. For 54 to 60 inch diameters, smooth interior and annular exterior corrugated HDPE Pipe per AASHTO MP7-97, Type S.
- G. Pipe and fittings shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects. Joints shall meet or exceed the "soil tight" joint performance criteria of AASHTO Standard Specifications for Highway Bridges, Division II.

2.02 CMP UNDERGROUND DETENTION SYSTEM

- A. Unless otherwise shown, CMP pipe shall be aluminized steel type II per AASHTO M274 or ASTM C929. Corrugations and pipe type are in accordance with AASHTO M36.
- B. Pipe size, gauge and corrugations are shown on plans. Barrel spacing, number of barrels, stone base thickness are shown on the plans.
- C. Manhole access, minimum 24" diameter shall be provided to allow access to system.
- D. Pipe joints:
 1. Minimum joint spacing is 10 ft.
 2. Performance requirements = soil tight, gravity flow joints per AASHTO M36 and ASTM A760.
 3. Do not overlap pipes and utilize banding consistent with the pipe of type being joined.
- E. Integral End Sections:
 1. Each barrel of the CMP system shall be connected to a fitting composing a manifold for hydraulic distribution or have an integrated bulkhead to resist loading at the end / start of the barrel. End cap sections are not permitted.
 2. Unless otherwise approved by the design professional, bulkheads/end sections and fittings shall be fabricated prior to delivery on site.

2.03 CLEANOUTS

- A. Unless otherwise provided on the plans, cleanouts where shown shall meet the following:
 - 1. Cast iron cleanout flush with finish grade with a countersunk brass plug.
 - 2. Center the cleanout in a 4 inch depth concrete pad. Minimum size of concrete pad shall be sufficient to provide 6" of clearance from the edge of cleanout to the edge of concrete, but shall not be less than 18" x 18". Construct the concrete pad with a 1/4" to 3/8" radius rounded edge.

2.04 APPURTENANCES MATERIAL

- A. Concrete shall have a minimum compressive strength of 3,000 psi.
- B. Mortar for masonry work in storm sewer structures shall be 1:2 cement sand mix. Cement shall be High Early Strength American Portland cement. Sand shall be clean and sharp, free from all deleterious substances and shall contain not more than 5% by volume of material passing No. 100 sieve.
- C. Brick shall be clay or shale Hard No. 1 building brick.
- D. Castings: All castings shall be gray iron per Georgia DOT Specifications. Casting, grates, frames and other storm drainage appurtenances shall be on site prior to storm drainage installation. Maintain a snug fit between grates, lids, etc., and frame. All castings shall be heavy-duty, bicycle safe type.
- E. Other materials required to completely install storm sewers in accordance with these specifications shall conform to all applicable articles and paragraphs of Georgia DOT Specifications.

PART 3 EXECUTION

3.01 PREPARATION

- A. Verify lines, grades, and construction stakes before commencing any excavation for storm drainage pipes or structures.

3.02 EXCAVATION

- A. Perform trench and structure excavation in accordance with 31 25 00 "Grading" and in accordance with all OSHA Excavation Standards.

3.03 PIPE BEDDING

- A. Unless otherwise shown on the Drawings, construct all bedding in accordance with 31 25 00 "Grading". Where incompressible soils or rock are encountered, excavate in accordance with 31 25 00 "GRADING".

3.04 CONCRETE PIPE INSTALL

- A. Concrete pipe: lay section in a prepared trench with socket ends pointing upstream. Join sections, including rubber gaskets in accordance with manufacturer recommendations.
 - 1. Install concrete anti-seep collars at all pipe joints for reinforced concrete pipe within the limits of the stormwater management facility dike. Concrete anti-seep collars shall meet the following:
 - a. Extend 12 inches, minimum, beyond the outer dimension of the pipe in each direction.
 - b. Minimum 12 inches in thickness measured parallel to the concrete pipe.
 - c. Reinforced with No. 3 bars at perimeter of concrete anti-seep collar. Maintain 2 inches clearance from outer dimension of anti-seep collar.

3.05 CORRUGATED METAL PIPE AND PIPE ARCH INSTALLATION.

- A. CMP and pipe arches: lay sections in prepared trench, with outside laps of circumferential joints pointing upstream and longitudinal joints at the sides. Join the sections with coupling bands, fastened by 2 or more bolts. Before backfilling repair any damaged coating or exposed base metal.

3.06 HDPE AND PVC PIPE INSTALLATION

- A. Install in accordance with ASTM D 2321.

3.07 CMP UNDERGROUND DETENTION SYSTEM

- A. For perforated underground systems, prepare subgrades as specified in Section 31 22 00 "Grading", to bring subgrade to $\pm \frac{3}{4}$ inch of the specified elevation shown on the Plans, except that:
1. The subgrade shall be uniformly compacted to a relative density of 90% (ASTM D698).
 2. Excavation and grading of the pervious pavement area shall be accomplished using low impact (wide tracked) earth moving equipment.
 3. Scarify the surface of the subgrade to a depth of $\frac{1}{4}$ to $\frac{1}{2}$ ".
 4. Do not over-compact the subgrade. Do not store materials or equipment on completed subgrade.
 5. Immediately in advance of placing base rock or geotextile fabric check subgrade and regrade, recompact, and rescarify as necessary.
- B. Install CMP in accordance with manufacturer's recommendations and ASTM A798.
- C. For operation of temporary construction vehicles over the CMP system provide temporary cover of compacted gravel over the top of pipe as follows:

Minimum Cover (ft) Requirements

Pipe Span (inches)	Axle Loads (kips)			
	18 - 50	50 - 75	75 - 110	110 - 150
12 - 42	2.0	2.5	3.0	3.0
48 - 72	3.0	3.0	3.5	4.0
78 - 120	3.0	3.5	4.0	4.0
126 - 144	3.5	4.0	4.5	4.5

- D. Unless otherwise specified, place backfill material in 8 inch loose lift and compact to 90% of maximum density (per standard proctor).

3.08 APPURTENANCES

- A. Headwalls and aprons shall conform with the Plans.
- B. Curb Inlets, Weir Inlet, Drop Inlets, and Manholes: Refer to plans for location and type.
- C. Connect all downspout and rain leader lines to storm drainage system as shown.
- D. Line Tracers: Wrap all non-metallic pipes with metallic tracer tape prior to backfill.
- E. Line Markers: During back filling of site drainage systems, install continuous underground-type plastic line marker, located directly over buried line at 6" to 8" below finished grade.
- F. All joints between pre-cast base, risers, and round-2-square adapters shall be keyed. All joints shall be grouted inside and out.
- G. Stormwater Quality Control Devices (when applicable) shall be installed as recommended by the manufacturer.

- H. Leave 2" diameter PVC temporary opening at subgrade in drainage structures for surface drainage. Opening shall be grouted up after finish grading and paving is completed. Contractor shall provide for temporary surface drainage removal to allow timely construction.

3.09 BACKFILLING

- A. Check vertical and horizontal alignment of the pipe, culvert, or storm drain by sighting along the crown, invert, and sides of pipe. Check for sagging, faulting, and invert heaving. Repair any issues before backfilling pipe.
- B. Backfill in accordance with 31 22 00 "EARTHWORK".

3.010 VIDEO INSPECTION

- A. Video surveillance may be conducted by the Owner on storm drain installations after completion of all activities that may damage the pipe but prior to the placement of the base and paving when applicable. If video surveillance indicates problems such as pipe deformation, cracking, or joint separation, the Contractor shall be responsible for repairing or replacing these pipes at no cost to the Owner.

3.011 TESTING- QUALITY ACCEPTANCE

- A. Perform compaction testing in accordance with 31 22 00 "EARTHWORK".
- B. A minimum of 25% of the installed length of smooth lined corrugated polyethylene (PE), High Density Polyethylene (HDPE) or PVC pipe, selected by the Design Professional, shall be tested for deformation by the Contractor using a nine point mandrel.
 - 1. The mandrel shall have an effective diameter equal to 95% of the base inside diameter.
 - 2. Provide the Design Professional with a proving-ring to verify mandrel size.
 - 3. Smooth lined corrugated polyethylene or PVC profile wall drain pipe installations shall have a maximum of 5% deflection when checked after completion of all construction activities that may damage the pipe but prior to placement of the base and paving when applicable.
 - 4. If mandrel testing indicates that problems exist, the Design Professional may determine that up to 100% of the storm drain installation be checked for deformation.
 - 5. Pipe with over 5% deflection shall be removed and replaced at no cost to the Owner.

3.012 MAINTENANCE AND PROTECTION

- A. Before any traffic over a culvert is allowed, provide an adequate depth and width of compacted backfill to protect the structure from damage or displacement. Any damage or displacement that may occur after installing and backfilling shall be repaired or corrected at the Contractor's expense.
- B. Remove any debris or silt that constricts the flow through a pipe as often as necessary to maintain drainage throughout the life of the Contract.

3.013 CLEANUP

- A. Upon completion of work, all forms, equipment, protective covering, and rubbish resulting therefrom shall be removed from the premises.
- B. Carefully clean all pipes, culverts, structures, and appurtenances of dirt, rubbish, and surplus mortar before the work is accepted.

END OF SECTION 33 4000