THE PLATFORM

FAÇADE UPGRADES
7300 WOODWARD AVENUE
DETROIT, MICHIGAN

Project Manual

IDS Project No. 20174-1000

June 3, 2021
Bids

Project Manual

the Platform
Façade Upgrades
7300 Woodward Avenue
Detroit, Michigan

INTEGRATED design SOLUTIONS
architecture engineering interiors & technology

1441 w long lake road, suite 200
troy, michigan 48098

5211 cascade road se, suite 300
grand rapids, michigan 49546

248.823.2100, fax 248.823.2200
www.ids-michigan.com

IDS Project No. 20174-1000

SECTION 00 0110 - TABLE OF CONTENTS

END OF TABLE OF CONTENTS

SECTION 01 3300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

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

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

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

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

1.4 SUBMITTAL SCHEDULE

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

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
3. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal Category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's final release or approval.

1.5 SUBMITTAL FORMATS

A. Submittals shall be electronic, unless otherwise indicated.

1. Prepare submittals as a single PDF package, incorporating complete information into PDF file.

a. Name PDF file with submittal number.

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

1. Project name.
2. Date.
3. Name of Architect.
4. Name of Construction Manager.
5. Name of Contractor.
6. Name of firm or entity that prepared submittal.
7. Names of subcontractor, manufacturer, and supplier.
8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
9. Category and type of submittal.
10. Submittal purpose and description.
11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
12. Drawing number and detail references, as appropriate.
13. Indication of full or partial submittal.
14. Location(s) where product is to be installed, as appropriate.
15. Other necessary identification.
16. Remarks.
17. Signature of transmitter.

C. Options: Identify options requiring selection by Architect.

D. 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. Email: Prepare each submittal as a single PDF package and transmit to Architect, through Construction Manager, by sending via email.

a. Send submittals to the following email address:

1) shop_drawings@ids-michigan.com

b. Subject Line: The Subject line of email should indicate the IDS project number, the project name, and specification section number (In this order).
c. IDS submittal form must be completed and included at the beginning of, and in the same PDF, as the submittal.
d. Submit only one specification section in each e-mail.
e. Architect, through Construction Manager, will return review comments in a PDF file.

2. Web-Based Project Management Software: When used for a Project, prepare submittals in PDF form, and upload to web-based Project management software website instead of using email.

    a. Enter required data in web-based software site to fully identify submittal.
    b. IDS submittal form must be completed and included at the beginning of, and in the same PDF, as the submittal.
    c. Submit only one specification section in each e-mail.

B. Submittal Form:

1. Refer to copy of form at the end of this Section.

    a. Additionally, at construction kick-off meeting the Architect will transmit the Submittal Form to the Contractor in both Word and PDF format.

2. Complete and fill out the following information on the submittal form.

    a. Item (1) – Project Title/Location: Refer to Title Page of specifications. Include Bid Package number, if applicable.
    b. Item (2) – From/Return to: Contractor's/Construction Manager's name and address to whom submittal is to be returned
    c. Item (3) - IDS Project No.: Integrated Design Solutions' project number.
    d. Item (4) - Submittal Date:
    e. Item (5) - Submittal Number: Use 1, 2, 3, etc. for easy reference of each separate submittal.
    f. Item (6) - If this is a Partial Submittal of this item, check the box and use "1.1", "1.2", etc. in the submittal number space. If this is a complete submittal, do not check box.
    g. Item (7) - If this is a resubmittal (revision to a previous submittal), check the box and use the original submittal number and number the submittal "1A", "1B", etc in the submittal number space. If this is a new submittal, do not check box.
    h. Item (8) – Project Manual Section No.: Indicate the Project Manual Specification Section number relating to the submittal
    i. Item (9) – Product Manufacturer: Insert name of product manufacturer.
    j. Item (10) - Item Description (specific information, not just "drawings", i.e. Curtainwall Shop Drawings.
    k. Item (11) – Number of copies. Indicate the number of copies, product data, samples, etc. of each item being submitted.
    l. Item (12) – Contractor's/Construction Manager's Remarks & Deviations (if any): Indicate appropriate remarks and note any deviations from the requirements of the Contract Documents, as required, and sign the certification that all submittals have been reviewed.
    m. Item (13) – Addendum or Bulletin (if any): Indicate if submittal information is based on an addendum or bulletin. Indicate number of issue.
    n. Item (14) – Substitution (if any): Indicate whether the submittal was approved under a separate Substitution

C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

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

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect, through Construction Manager, will advise Contractor when a submittal being processed must be delayed for coordination.
2. Resubmittal Review: Allow 15 days for review of each resubmittal.
3. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is required, allow 21 days for initial review of each submittal.

E. Resubmittals: Make resubmittals in same format as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

F. 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.

G. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.7 SUBMITTAL REQUIREMENTS

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

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams 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 concurrently with Samples.

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

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

a. Identification of products.
b. 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.

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

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

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

3. Email or Web-Based Transmittal: Provide PDF transmittal. Include digital image illustrating Sample characteristics and identification information for record.

a. In addition to electronic submittal, submit actual physical samples.

4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

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

a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, through Construction Manager, will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

    a. Number of Samples: Submit three sets of Samples. Architect and Construction Manager will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.

        1) 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.

D. 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.

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

F. 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.

G. Certificates:

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.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

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 substrate preparation and primers required.
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.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.
    d. Product and manufacturers' names.
    e. Description of product.
    f. Test procedures and results.
    g. Limitations of use.

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 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.
2. When requested by Architect, provide three paper copies of certificate, signed and sealed by the responsible design professional

1.9 ARCHITECT'S REVIEW

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

1. Email or Web-Based Submittals: Architect will indicate, via markup on each submittal, the appropriate action, as follows:

a. No Exceptions Taken: Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.
b. Exceptions As Noted: Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.
c. Rejected: Do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary, to obtain different action mark.

1) Do not use, or allow others to use, submittals marked "Rejected" at the Project Site or elsewhere where Work is in progress.

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 and Construction Manager.

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

SUBMITTAL FORM

Project Title (1):	
IDS Project No. (3):	
Submittal Date (4):	

From/Return To (2):

Submittal No.(5):		☐ Partial (6)	☐ Resubmittal (7)	IDS Submittal No.:

Project Manual Section No. (8):	
Manufacturer(s) (9):	

Item Description (10)	Print (11)	Product Data	Sample	Other	☐ A	☐ M	☐ E	☐ EN	☐ S	☐ C	☐ DN	☐ FS	☐ IN	☐ TE

Contractor's/Construction Manager's Remarks and Deviations (12):

Addendum or Bulletin: (13)

Substitution: (14)

The undersigned certifies that the above submitted items have been reviewed in detail, including materials, quantities, dimensions, specified performance criteria, installation requirements, catalog numbers and field conditions and are correct and in strict compliance with the Contract Documents, except as the undersigned has noted otherwise. Approval of items does not relieve the Contractor/Construction Manager from complying with all requirements of the Contract Documents. IDS review does not relieve the contractor from responsibility for errors or omissions in this submittal.

Contractor/Construction Manager: _____

Signature _____

IDS Remarks:

IDS Construction Administration Approval:

_____

Date: _____

ACTION CODES:

1. NO EXCEPTIONS TAKEN
2. EXCEPTIONS AS NOTED
3. REJECTED
4. ACTION NOT REQUIRED

IDS Received Stamp

5211 cascade road se, ste. 300
grand rapids, mi 49546

1441 w. long lake road, ste. 200
troy, mi 48098

248-823-2100 www.ids-michigan.com

INTEGRATED design SOLUTIONS
architecture engineering interiors & technology

INSTRUCTIONS

A. Use this form for all submittals. Integrated Design Solutions, will furnish the Contractor/Construction Manager with forms.

B. Organize submittals by Specification Section. Use a separate form for submittals of each Specification Section. **DO NOT SUBMIT ITEMS SPECIFIED IN DIFFERENT SPECIFICATION SECTIONS ON ONE SUBMITTAL FORM**.

C. Fill in submittal form as follows:

(1) Project Title and Location. (Refer to Title Page of specifications. Include Bid Package number, if applicable.)

(2) Contractor's/Construction Manager's name and address to whom submittal is to be returned.

(3) Integrated Design Solutions' project number.

(4) Submittal Date.

(5) Submittal Number: Use 1, 2, 3, etc. for easy reference of each separate submittal.

(6) If this is a Partial Submittal of this item, check the box and use "1.1", "1.2", etc. in the submittal number space. If this is a complete submittal, do not check box.

(7) If this is a resubmittal (revision to a previous submittal), check the box and use the original submittal number and number the submittal "1A", "1B", etc in the submittal number space. If this is a new submittal, do not check box.

(8) Indicate the Project Manual Specification Section number relating to the submittal.

(9) Manufacturer: Insert name of product manufacturer, (e.g., Liebert).

(10) Item Description: Insert a brief statement describing the submitted item in generic terms (e.g. Ceramic Mosaic Tile, etc.) with a list of all drawings or identifying numbers.

(11) No. of Copies: Indicate the number of copies, product data, samples, etc. of each item being submitted (e.g. prints-2, reproducible-1, etc.).

(12) Indicate appropriate remarks and note any deviations from the requirements of the Contract Documents, as required, and sign the certification that all submittals have been reviewed.

(13) Indicate if submittal information is based on an addendum or bulletin. Indicate number of issue.

(14) Indicate whether the submittal was approved under a separate Substitution Request.

D. The balance of this form will be filled in by Integrated Design Solutions, and returned to the Contractor along with the submittal.

SECTION 01 4000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

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

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

1.3 DEFINITIONS

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

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

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

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

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

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

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

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

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

F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) 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.

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

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

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

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

1.4 DELEGATED DESIGN SERVICES

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

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

B. Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.5 CONFLICTING REQUIREMENTS

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

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

1.6 ACTION SUBMITTALS

A. Mockup Shop Drawings:

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

1.7 INFORMATIONAL SUBMITTALS

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

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

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

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

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

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

1.8 REPORTS AND DOCUMENTS

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

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

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

1. Name, address, telephone number, and email address of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement of whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

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

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

1.9 QUALITY ASSURANCE

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

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

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

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

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

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

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, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following Contractor's responsibilities, including the following:

1. Provide test specimens representative of proposed products and construction.
2. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
3. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
4. Build site-assembled test assemblies and mockups, using installers who will perform same tasks for Project.
5. When testing is complete, remove test specimens and test assemblies, and mockups; do not reuse products on Project.
6. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, through Construction Manager, with copy to Contractor. Interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.

J. Mockups: 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 or Construction Manager.
3. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.
4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
5. Demonstrate the proposed range of aesthetic effects and workmanship.
6. Obtain Architect's approval of mockups before starting corresponding Work, fabrication, or construction.

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

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

1.10 QUALITY CONTROL

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

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

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

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

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

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

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

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

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

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 3300 "Submittal Procedures."

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

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

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.

6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspection equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

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

1.11 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will coordinate with Construction Manager to engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

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

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, Commissioning Authority's, Construction Manager's and authorities' having jurisdiction 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 7329 – Cutting and Patching.

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

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

END OF SECTION 01 4000

SECTION 01 4200 - REFERENCES

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 DEFINITIONS

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

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

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

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

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

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

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

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

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

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

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

1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

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

B. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

1. EPA - Environmental Protection Agency; www.epa.gov.
2. OSHA - Occupational Safety & Health Administration; www.osha.gov.
3. USDA - Department of Agriculture; www.usda.gov.

1.5 CODES AND REGULATORY REQUIREMENTS

A. Regulatory requirements applicable to this project: Refer to Drawings.

B. Where Drawings and specification sections reference more current standards or codes, comply with the more restrictive requirements.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 4200

SECTION 01 6000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Section includes administrative and procedural requirements for substitutions.

1.3 DEFINITIONS

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

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

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

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

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

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

1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.

2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.

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

F. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.

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 to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 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. Substitution Request Form:

a. Use CSI Form 1.5C during bidding phase.
b. Use CSI Form 13.1A after bidding phase.

2. 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 applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

    a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
    b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY 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.

B. 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.

C. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:

    a. Name of product and manufacturer.
    b. Model and serial number.
    c. Capacity.
    d. Speed.
    e. Ratings.

3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.6 COORDINATION

A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

B. Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.7 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 that products are undamaged and properly protected.

C. Storage:

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

1.8 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 standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to 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 in the Project Manual, prepare a written document, using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

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

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. 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.

    a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Architect, whose determination is final.

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 that 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."
    b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.

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 that 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."
    b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.

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 may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

    a. For approval of products by unnamed manufacturers, comply with requirements in Section 01 2500 "Substitution Procedures" for substitutions for convenience.

C. Visual Matching Specification: Where Specifications require the phrase "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.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a 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.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:

1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 01 3300 "Submittal Procedures."

1. Form of Approval of Submittal: As specified in Section 01 3300 "Submittal Procedures."
2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

2.3 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

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

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 6000

SECTION 01 7329 - CUTTING AND PATCHING

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. Cutting and patching.

1.3 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.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

1.5 CLOSEOUT SUBMITTALS

A. Certified statements from existing manufacturers stating that existing warranties have not been affected by Work performed under this Section.

1.6 QUALITY ASSURANCE

A. Professional Engineer Qualifications: Refer to Section 014000 "Quality Requirements."

B. 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, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include but are not limited to the following:

a. Primary operational systems and equipment.
b. Fire separation assemblies.
c. Air or smoke barriers.
d. Fire-suppression systems.

e. Plumbing piping systems.
f. Mechanical systems piping and ducts.
g. Control systems.
h. Communication systems.
i. Fire-detection and -alarm systems.
j. Conveying systems.
k. Electrical wiring systems.
l. Operating systems of special construction.

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. Other construction elements include but are not limited to the following:

a. Water, moisture, or vapor barriers.
b. Membranes and flashings.
c. Exterior curtain-wall construction.
d. Sprayed fire-resistive material.
e. Equipment supports.
f. Piping, ductwork, vessels, and equipment.
g. Noise- and vibration-control elements and systems.

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.

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

1.7 WARRANTY

A. 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.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with requirements specified in other Sections.

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

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

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

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

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

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

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize or prevent interruption to occupied areas.

3.3 CUTTING AND PATCHING

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

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

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

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

D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Division 01.

E. 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.

F. 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.

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

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

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

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

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

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

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

END OF SECTION 01 7329

SECTION 02 4119 – SELECTIVE DEMOLITION

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. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Abandonment and removal of existing utilities and utility structures.
4. Salvage of existing items to be reused or recycled.
5. Removed and reinstalled items.

B. Related Requirements:

1. Section 04 2000 - Unit Masonry: For salvaging existing granite.

1.3 DEFINITIONS

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

B. Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

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

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For demolition firm.

B. Qualification Data: For refrigerant recovery technician.

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

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

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

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

1.7 CLOSEOUT SUBMITTALS

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

1.8 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.

1. Minimum of 5 years of documented experience.

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

1.9 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1. Before selective demolition, Owner may remove items:

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

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

1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.10 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.

1. Coordinate with Owner for list of existing warranties still in effect.

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.11 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Review Project Record Documents of existing construction or other existing conditions.

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

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

C. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs or video.

1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

3.2 PREPARATION

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

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off utilities with utility companies and Owner.
2. Refer to Divisions 20, 21, 22, 23, 26, 27, and 28 for additional requirements.
3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

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

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

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

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least 8 hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials promptly. Comply with requirements of Division 01.]

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

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

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Refer to Section 04 2000 - Unit Masonry, for salvaging granite.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Division 01.

B. Burning: Do not burn demolished materials.

3.8 CLEANING

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

END OF SECTION 02 4119

SECTION 03 3000 - CAST-IN-PLACE CONCRETE

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. Cast-in-place concrete, including concrete materials, mixture design, and finishes.
2. Steel reinforcement bars and welded-wire reinforcement.
3. Concrete formwork.

1.3 DEFINITIONS

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

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

C. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting.

D. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product and material.

B. Design Mixtures: For each concrete mixture.

1. Include indication where each mix design will be used.
2. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:

1. Construction Joint Layout:

a. Indicate proposed construction joints required to construct the structure.

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

2. Concrete Reinforcement:

a. Include placing drawings that detail fabrication, bending, and placement.
b. 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.

D. Samples: Submit 3 samples for each of the following:

1. Vapor Retarder: 4 by 4 inch sample.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Ready-mixed concrete manufacturer.
3. Testing and inspection agency: Include copies of applicable ACI certificates.

B. Welding certificates.

1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M

C. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Steel reinforcement and accessories
4. Form materials and form-release agents.
5. Floor and slab treatments.
6. Bonding agents.
7. Vapor retarders.
8. Joint-filler strips.
9. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Aggregates.
4. Admixtures.
5. Steel Reinforcement:

E. Research Reports:

1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
2. For sheet vapor retarder, showing compliance with ICC AC380.

F. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94 requirements for production facilities and equipment; with not less than 5 years of documented experience.

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

B. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician.

1. Supervisors shall have not less than 5 years of documented experience

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

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

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

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

E. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94 and ACI 301.

B. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage .

1. Store reinforcement to avoid contact with earth.

1.8 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Concrete:

1. Comply with ACI 301 unless modified by requirements in the Contract Documents.

a. Provide construction and movement joints required to construct the structure in accordance with ACI 301.

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

2. Concrete Reinforcement shall comply with ACI SP-066.

B. Concrete Formwork:

1. Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

2.2 FORM-FACING MATERIALS

A. Exposed Surface Form-Facing Material: Smooth 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 and as follows:

a. Plywood, metal, or other approved panel materials.

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.

2.3 RELATED FORMWORK MATERIALS

A. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

B. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
2. Form release agent for form liners shall be acceptable to form liner manufacturer.

2.4 CONCRETE MATERIALS

A. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C150, Type I, gray or white.
2. Fly Ash: ASTM C618, Class C or F.

C. Normal-Weight Aggregates: ASTM C33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Provide Class 4S at exterior flatwork and wet interior flatwork areas.
2. Maximum Coarse-Aggregate Size: 1-1/2 inch nominal, unless otherwise indicated.
3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C260.

B. Other Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C494, Type A.
2. Retarding Admixture: ASTM C494, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017, Type II

C. Water and Water Used to Make Ice: ASTM C94, potable

2.6 STEEL REINFORCEMENT

A. Fabricating Reinforcement

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

B. Reinforcing Bars: ASTM A615, Grade 60, deformed.

C. Steel Bar Mats: ASTM A184, fabricated from ASTM A615, Grade 60, deformed bars, assembled with clips.

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

2.7 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A615, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

C. Steel Tie Wire: ASTM A1064, annealed steel, not less than 0.0508 inch in diameter.

1. Finish: Plain.

2.8 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E1745, Class A; not less than 15 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

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

a. Fortifiber Building Systems Group, a Henry Company: Moistop Ultra 15 www.henry.com.
b. Inteplast Group; Barrier-Bac, VB-350: www.barrierbac.com.
c. ISI Building Products; Viper VaporCheck II 15-mil (Class A): www.isibp.com.
d. Poly-America; Husky Yellow Guard 15-mil Vapor Barrier: www.yellowguard.com.
e. Raven Industries, Inc.; VaporBlock Series (VB15): www.ravenfd.com.
f. Stego Industries, LLC; Stego Wrap Vapor Barrier (15 mil): www.stegoindustries.com.
g. W. R. Meadows, Inc; Perminator 15 mil: www.wrmeadows.com.

2.9 LIQUID FLOOR TREATMENTS

A. Concrete Hardener/Densifier (Sealer): Penetrating liquid floor treatment. Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

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

a. Dayton Superior; Densifier J13: www.daytonsuperior.com.
b. The Euclid Chemical Company; Euco Diamond Hard: www.euclidchemical.com.
c. Kaufman Products, Inc; SureHard: www.kaufmanproducts.net.
d. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; Seal Hard: www.lmcc.com.
e. PROSOCO, Inc; Consolideck LS: www.prosoco.com.
f. W.R. Meadows, Inc; Liqui-Hard: www.wrmeadows.com.

2.10 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

1. Color:

a. Ambient Temperature Below 50 deg F: Black.
b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
c. Ambient Temperature Above 85 deg F: White.

C. Water: Potable or complying with ASTM C1602/C1602M.

2.11 RELATED MATERIALS

A. Bonding Agents: Provide one or more of the following:

1. Latex Bonding Agent: ASTM C1059, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

2. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:

    a. Types I and II, nonload bearing and Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

B. Expansion- and Isolation-Joint-Filler Strips:

1. Size and Configuration: Unless otherwise indicated, 1/2 inch thick by height equal to slab thickness, optionally with removable top section that will form 1/2 inch deep sealant pocket after removal.
2. Materials: Provide products manufactured from one or more of the following:

    a. Cellulose fiber, ASTM D1751.
    b. PVC (Type IV), ASTM D1752.
    c. Semi-rigid, closed-cell polypropylene foam ASTM D8139.

3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

    a. Oscoda Plastics, Inc; Proflex Vinyl Expansion Joints: www.oscodaplastics.com.
    b. W. R. Meadows, Inc; Fiber Expansion Joint Filler with Snap-Cap: www.wrmeadows.com.
    c. W. R. Meadows, Inc; Deck-O-Foam Joint Filler with pre-scored top strip: www.wrmeadows.com.

2.12 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash or Other Pozzolans: 25 percent by mass.
2. Total Fly Ash and Pozzolan: 25 percent by mass.

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

1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, and concrete with a w/cm below 0.50.

2.13 CONCRETE MIXTURES

A. Class A: Normal-weight concrete used for exterior slabs-on-ground.

1. Exposure Class: ACI 318 F3, C2.
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Maximum w/cm: 0.40.
4. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch nominal maximum aggregate size.

B. Class B: Normal-weight concrete used for interior slabs-on-ground.

1. Exposure Class: ACI 318 F0.
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Maximum w/cm: 0.45.
4. Minimum Cementitious Materials Content: 520 lb/cu. yd.
5. Air Content: Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.

2.14 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94 , and furnish batch ticket information.

PART 3 - EXECUTION

3.1 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

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

3.2 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 for as-cast finishes.

C. Limit concrete surface irregularities as follows:

1. For concealed concrete:

a. Surface Finish-1.0: ACI 117 Class D, 1 inch.

2. For exposed concrete, concrete surfaces to receive a rubbed finish, or concrete to be covered with a coating or covering material applied directly to concrete:

a. Surface Finish-3.0: ACI 117 Class A, 1/8 inch.

3.3 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.

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

3.4 INSTALLATION OF VAPOR RETARDER

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.

1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
2. Face laps away from exposed direction of concrete pour.
3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
4. Lap joints 6 inches and seal with manufacturer's recommended tape.
5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
7. Protect vapor retarder during placement of reinforcement and concrete.

    a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

3.5 INSTALLATION OF STEEL REINFORCEMENT

A. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

B. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

C. Accurately position, support, and secure reinforcement against displacement.

1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
2. Do not tack weld crossing reinforcing bars.

D. 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.

E. Provide concrete coverage in accordance with ACI 318.

F. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

G. Splices: Lap splices as indicated on Drawings.

1. Bars indicated to be continuous, and all vertical bars shall be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
2. Stagger splices in accordance with ACI 318.

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

1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."

    a. For reinforcement less than W4.0 or D4.0, continuous support spacing shall not exceed 12 inches.

2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
4. Lace overlaps with wire.

3.6 JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
2. Place joints perpendicular to main reinforcement.

    a. Continue reinforcement across construction joints unless otherwise indicated.
    b. Do not continue reinforcement through sides of strip placements of floors and slabs.

3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
6. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. At Contractor’s option one or more of the following methods may be used:

    a. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
    b. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 07 9200 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints:

1. Install dowel bars and support assemblies at joints where indicated on Drawings.
2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

1. Do not proceed until unsatisfactory conditions have been corrected.
2. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
3. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.

    a. Do not use vibrators to transport concrete inside forms.
    b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
    c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
    d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Do not place concrete floors and slabs in a checkerboard sequence.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

3.8 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. At concrete surfaces not exposed to view:

a. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.

1) Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
2) Remove projections larger than 1 inch.
3) Tie holes do not require patching.
4) Surface Tolerance: ACI 117 Class D.

2. At concrete surfaces exposed to view, concrete surfaces to receive a rubbed finish, concrete to be covered with a coating or covering material applied directly to concrete:

a. ACI 301 Surface Finish SF-3.0:

1) Patch voids larger than 3/4 inch wide or 1/2 inch deep.
2) Remove projections larger than 1/8 inch.
3) Patch tie holes.
4) Surface Tolerance: ACI 117 Class A.

B. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel or broom finish.

C. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to all interior slab surfaces, unless otherwise indicated.

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

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

3.10 TOLERANCES

A. Conform to ACI 117.

3.11 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ACI 117 and ASTM E1155, within 48 hours after slab installation; report both composite overall values and local values for each measured section.

1. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.
2. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

B. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values: F(L) applies to on-grade slabs only.

1. Exposed to View (without a finish flooring material) and Foot Traffic: F(F) of 25; F(L) of 20.
2. At Floors Receiving Finish Flooring Material (except as otherwise indicated in this list): F(F) of 35; F(L) of 25.

3.12 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305.1, before and during finishing operations.

B. Curing Formed Surfaces:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. If forms remain during curing period, moist cure after loosening forms.
3. If removing forms before end of curing period, continue curing for remainder of curing period.

C. Curing Unformed Surfaces:

1. Begin curing immediately after finishing concrete.

a. Interior Concrete Floors: Cure for not less than seven days.

D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing:

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.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

a. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

3.13 APPLICATION OF LIQUID FLOOR TREATMENTS

A. Concrete Hardener/Densifier: Prepare, apply, and finish penetrating liquid floor treatment in accordance with manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs prior to applying liquid floor treatment.
2. Locations:

a. Unless otherwise indicated, provide at unfinished exposed concrete floors, equipment pads, ramps, steps, and stairs.

3.14 JOINT FILLING

A. Refer to Section 07 9200 - Sealants.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by Architect.
2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.16 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31.
2. Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

a. Test reports shall include reporting requirements of ASTM C31, ASTM C39, and ACI 301,

C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

D. Inspections:

1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.
2. Steel-reinforcement placement.
3. Steel-reinforcement welding.
4. Headed bolts and studs.
5. Verification of use of required design mixture.
6. Concrete placement, including conveying and depositing.
7. Curing procedures and maintenance of curing temperature.
8. Verification of concrete strength before removal of shores and forms from beams and slabs.

E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172M shall be performed in accordance with the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day
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. 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.

4. Concrete Temperature: ASTM C1064:

    a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C31:

    a. Cast and laboratory cure two sets of two 6-inch by 12-inch or 4-inch by 8-inch cylinder specimens for each composite sample.
    b. Cast, initial cure, and field cure two sets of two standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C39.

    a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days.
    b. Test one set of two field-cured specimens at seven days and one set of two specimens at 28 days.
    c. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 10 percent of specified compressive strength.
8. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.17 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 03 3000

SECTION 04 2000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Concrete masonry units (CMU).
2. Granite - salvaged.
3. Mortar and grout.
4. Steel reinforcing bars.
5. Masonry-joint reinforcement.
6. Ties and anchors.
7. Miscellaneous masonry accessories.

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Salvaged Granite: Show sizes, profiles, and locations of each stone unit required.
3. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturers, installers, and testing agency.

B. Material Certificates: For each type and size of the following:

1. Masonry units.

    a. Include data on material properties material test reports substantiating compliance with requirements.

2. Cementitious materials. Include name of manufacturer, brand name, and type.
3. Mortar admixtures.
4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
5. Grout mixes. Include description of type and proportions of ingredients.
6. Reinforcing bars.
7. Joint reinforcement.
8. Anchors, ties, and metal accessories.

C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109 for compressive strength, ASTM C1506 for water retention, and ASTM C91 for air content.
2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.

D. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum 5 years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least 5 years of documented experience.

C. Testing Agency Qualifications: Qualified according to ASTM C1093 for testing indicated.

D. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockups for each type of exterior wall unit masonry construction in sizes approximately 60 inches long by 60 inches high by full thickness, including face and backup wythes and accessories.

a. Include a sealant-filled joint at least 16 inches long.
b. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches (400 mm) high.
c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
d. Include metal studs, sheathing, water-resistive barrier, veneer anchors, flashing, cavity drainage material, and weep inserts in exterior masonry-veneer wall mockup.

2. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
4. Protect accepted mockups from the elements with weather-resistant membrane.
5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.

a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

6. Demolish and remove mockups when directed by Architect
7. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe, and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 402/602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 402/602.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

A. Masonry Standard: Comply with TMS 402/602 - Building Code Requirements and Specification for Masonry Structures, except as modified by requirements in the Contract Documents.

B. Reinforcing Steel: Comply with ACI 315 - Guide to Presenting Reinforcing Steel Design Details.

C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

2.3 UNIT MASONRY, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

2.4 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide bullnose units for outside corners unless otherwise indicated.

    a. Field-ground radiused corners are not permitted.

B. CMUs: ASTM C90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
2. Density Classification: Normal weight.
3. Size (Width): Manufactured to dimensions 3/8 inch (10 mm) less than nominal dimensions.
4. Manufacturer: Subject to compliance with requirements, provide products from one of the following:

    a. Best Block Company: www.bestblock.net.
    b. Consumers Concrete Corp.: www.consumersconcrete.com.
    c. Echelon by Oldcastle: www.echelonmasonry.com.
    d. Fendt Builder’s Supply, Inc.: www.fendtproducts.com.
    e. Grand Blanc Cement Products: www.grandblanccementproducts.com.
    f. Michigan Certified Concrete: www.micertconcrete.com.
    g. National Block Company: www.nationalblock.com.

2.5 GRANITE

A. General: Provide shapes indicated.

B. Granite: Reuse salvaged granite.

2.6 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150, Type I or II. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C91.

E. Mortar Cement: ASTM C1329.

F. Aggregate for Mortar: ASTM C144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.

G. Aggregate for Grout: ASTM C404.

H. Water: Potable.

I. Packaged Dry Material for Mortar for Unit Masonry.

1. At Contractor's option, prepackaged dry material for mortar may be used subject to compliance with mortar requirements of this section including, but not limited to, the following:

a. Mortar Types: As indicated.
b. Color(s): As selected by Architect from manufacturer's full range.
c. Use only water repellent admixture for mortar from the same manufacturer as water repellent admixture in masonry units.

2. Portland Cement Based: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714 and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.

a. Manufacturer: Subject to compliance with requirements, provide products from one of the following:

1) Amerimix, an Oldcastle brand; www.amerimix.com.
2) The QUIKRETE Companies; wwwquikcrete.com.
3) SPEC MIX, Inc.: www.specmix.com.

3. Masonry Cement Based: Premixed masonry cement and mason's sand; complying with ASTM C1714 and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.

a. Manufacturer: Subject to compliance with requirements, provide products from one of the following:

1) Amerimix, an Oldcastle brand; www.amerimix.com.
2) The QUIKRETE Companies; wwwquikcrete.com.
3) SPEC MIX, Inc.: www.specmix.com.

J. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.

1. At Contractor's option, prepackaged dry material for grout may be used subject to compliance with grout requirements of this section.
2. Manufacturer: Subject to compliance with requirements, provide products from one of the following:

a. Amerimix, an Oldcastle brand; www.amerimix.com.

b. The QUIKRETE Companies; wwwquikcrete.com.
c. SPEC MIX, Inc.: www.specmix.com.

2.7 REINFORCEMENT

A. Manufacturers:

1. Basis-of-Design Product: The design for each item specified is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the following:

a. Fero Corp.; www.ferocorp.com.
b. Heckmann Building Products; www.heckmannbuildingprods.com.
c. Hohmann & Barnard, Inc.; www.h-b.com.
d. Wire-Bond; www.wirebond.com.

B. Uncoated-Steel Reinforcing Bars: ASTM A615 or ASTM A996, Grade 60 (Grade 420).

C. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.156-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

1. Basis-of-Design Product: Hohmann & Barnard, Inc.; www.h-b.com: RB and RB-Twin Rebar Positioners.

D. Reinforcing Bar Lap Joint Ties: ASTM A1064 steel wire, mill galvanized to 16 CFR 1201 Class 3.

1. Basis-of-Design Product: Hohmann & Barnard, Inc.; www.h-b.com: Spyra-Lox Rebar Lap-Joint Tie.

E. Masonry-Joint Reinforcement, General: ASTM A951.

1. Interior Walls: Hot-dip galvanized carbon steel.
2. Exterior Walls: Hot-dip galvanized carbon steel.
3. Wire Size for Side Rods: 0.148-inch diameter.
4. Wire Size for Cross Rods: 0.148-inch diameter.
5. Wire Size for Veneer Ties: 0.187-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

F. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.

1. Basis-of-Design Product: Hohmann & Barnard, Inc.; www.h-b.com: 120 Truss-Mesh or 220 Ladder-Mesh.

G. Masonry-Joint Reinforcement for Multiwythe Masonry: Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum horizontal play of 1/16 inch and maximum vertical adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.

1. Basis-of-Design Product: Hohmann & Barnard, Inc.; www.h-b.com: 170 Truss LOX-ALL Adjustable Eye Wire or 270 Ladder LOX-ALL Adjustable Eye Wire with 2X-HOOK.

2.8 TIES AND ANCHORS

A. Manufacturers:

1. Basis-of-Design Product: The design for each item specified is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the following:

a. Fero Corp.; www.ferocorp.com.
b. Heckmann Building Products; www.heckmannbuildingprods.com.
c. Hohmann & Barnard, Inc.; www.h-b.com.
d. Wire-Bond; www.wirebond.com.

B. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.

C. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82, with ASTM A153, Class B-2 coating.

a. Wire Size: 0.187-inch diameter, unless otherwise indicated.

2. Steel Sheet, Galvanized after Fabrication: ASTM A1008, Commercial Steel, with ASTM A153, Class B coating.
3. Steel Plates, Shapes, and Bars: ASTM A36.

D. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches.

1. Basis-of-Design Product: Hohmann & Barnard, Inc.; www.h-b.com: 344 Rigid Partition Anchor.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

A. Bond-Breaker Material (Felt): Asphalt-saturated felt complying with ASTM D226, Type I (No. 15 asphalt felt).

B. Column Isolator: Closed cell expanded polyvinyl chloride with pressure sensitive temporary position adhesive, 1/2" thick.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Williams Products, Inc.; Everlastic Vinyl Type U 1000 Series with PSA.

C. Mortar and Grout Screen: 1/4 inch square, polypropylene monofilament screening for preventing grout flow; width sized to match masonry widths.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hohmann & Barnard, Inc.; www.h-b.com; MGS or a comparable product by one of the following:

a. Heckmann Building Products; www.heckmannbuildingprods.com.
b. Wire-Bond; www.wirebond.com.

D. Setting Buttons for Granite: Resilient plastic buttons, nonstaining to granite, sized to suit joint thicknesses and bed depths of granite units without intruding into required depths of pointing materials.

2.10 MASONRY CLEANERS

A. Proprietary Acidic Cleaner – For CMU and Decorative CMU: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Basis-of-Design Product: Subject to compliance with requirements, provide PROSOCO, Inc.; www.prosoco.com: Sure Klean Light Duty Concrete Cleaner or a comparable product by one of the following:

    a. Diedrich Technologies, Inc.; www.diedrichtechnologies.com.

B. Proprietary Nonacidic Cleaner – For Granite: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from granite without discoloring or damaging stone surfaces. Use product expressly approved by cleaner manufacturer for use on granite and adjacent masonry materials.

1. Basis-of-Design: Subject to compliance with requirements, provide PROSOCO, Inc.; www.prosoco.com: Enviro Klean Safety Klean or a comparable product by one of the following:

    a. Diedrich Technologies, Inc.; www.diedrichtechnologies.com.

2.11 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime, masonry cement, or mortar cement mortar unless otherwise indicated.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.

1. For masonry below grade or in contact with earth, use Type M.
2. For reinforced masonry, use Type S.
3. For exterior, load-bearing masonry, use Type S
4. For exterior, above-grade nonload-bearing walls and parapet walls, use Type N.
5. For interior load-bearing and nonload-bearing walls and partitions, use Type N.
6. For granite units: Same Type as wall masonry in which unit is set.
7. For pointing Mortar: Type N.
8. For other applications where another type is not indicated, use Type N.

D. Grout for Unit Masonry: Comply with ASTM C476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 3000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143.

PART 3 - EXECUTION

3.1 SALVAGING GRANITE

A. General: Comply with Section 02 4119 - Selective Demolition.

B. Where indicated, remove and salvage existing granite.

1. Carefully remove granite by hand. Cut out full units from joint to joint.

a. If required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.

2. Salvage as many whole, undamaged granite units as needed for new construction.
3. Take care not to chip, crack or otherwise damage surrounding masonry.

C. Remove mortar, loose particles and soil from salvaged granite by cleaning with hand chisels, brushes and water. Store granite for reuse.

D. Cut granite to required sizes as indicated on Drawings.

E. Clean remaining masonry at edges of removal areas by removing mortar, dust, and loose debris in preparation for new construction.

F. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

3.2 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Verify that substrates are free of substances that impair mortar bond.
5. Verify that built-in items are in proper location, and ready for roughing into masonry work
6. Verify that related items provided under other sections are properly sized and located.
7. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION, GENERAL

A. Coursing and Bonding:

1. Match coursing and bonding of existing masonry, unless otherwise indicated on Drawings.
2. Concrete Masonry Units: Unless otherwise indicated:

a. Bond: Running.
b. Coursing: One unit and one mortar joint to equal 8 inches.
c. Mortar Joints: Concave.
d. Mortar Joint Thickness: 3/8 inch.

3. Establish lines, levels, and coursing indicated. Protect from displacement
4. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

5. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
6. Bond and interlock each course of each wythe at corners.
7. Tooth-in new masonry work with existing, unless otherwise indicated on Drawings.

B. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

C. Build chases and recesses to accommodate items specified in this and other Sections.

D. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

E. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

F. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in.per minute when tested according to ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

E. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

F. Fill cores in hollow CMUs with grout 16 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

G. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.

3.5 MORTAR BEDDING AND JOINTING

A. Lay CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

1. Cut joints flush at the following locations:

a. Where wall tile is scheduled.
b. At masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.
c. Where indicated to receive waterproofing, wall insulation, or air barriers unless otherwise indicated.

3.6 SETTING GRANITE UNITS WITH MORTAR

A. Set granite units in full bed of mortar with head joints filled.

1. Use setting buttons of adequate size, in sufficient quantity, and of thickness required to maintain uniform joint width and to prevent mortar from extruding. Hold buttons back from face of granite units a distance at least equal to width of joint, but not less than depth of pointing materials.
2. Do not set heavy units or projecting courses until mortar in courses below has hardened enough to resist being squeezed out of joint.
3. Support and brace projecting stones until wall above is in place and mortar has set.
4. Embed ends of sills and wall caps in mortar; leave remainder of joint open until final pointing.
5. Leave the following joints open for sealant:

a. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
b. Joints in projecting units.

6. Sealant Joints: Point with sealant; comply with Section 07 9200 - Joint Sealants

3.7 CONTROL AND EXPANSION JOINTS

A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:

1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar, or rake out joint for application of sealant.

C. Form expansion joints in brick as follows:

1. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 07 9200 "Joint Sealants."

D. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 07 9200 "Joint Sealants," but not less than 3/8 inch

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry and as indicated.

3.8 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.9 REINFORCED UNIT MASONRY AND GROUTING

A. Placing Reinforcement: Comply with requirements in TMS 402/602.

B. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 402/602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.
3. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
4. Place and consolidate grout fill without displacing reinforcing.

3.10 TOLERANCES

A. Dimensions and Locations of Elements:

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

B. Lines and Levels:

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

4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2-inc maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C67 for compressive strength.

E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140 for compressive strength.

F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.

G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.

3.12 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean masonry using one or more of the following methods:

    a. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
    b. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
    c. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
    d. Clean granite with a proprietary nonacidic cleaner applied according to manufacturer's written instructions.

3.13 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Masonry Waste Recycling: Return broken CMUs to manufacturer for recycling.

C. Excess Masonry Waste: Remove excess masonry waste that cannot be recycled and legally dispose of off Owner's property.

END OF SECTION 04 2000

SECTION 05 1200 – STRUCTURAL STEEL AND METAL FABRICATIONS

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. Steel framing and supports for:

a. Glass-fiber-reinforced cementitious panels.
b. Decorative metal wall panels.
c. Canopies.
d. Other items as indicated on Drawings.

1.3 COORDINATION

A. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Coordinate steel framing and supports with installation of glass-fiber-reinforced cementitious panels.

1. Refer to Section 07 4400 - Glass-Fiber-Reinforced Cementitious Panels.

C. Coordinate steel framing and supports with installation of decorative metal wall panels.

1. Refer to Section 05 7000 - Decorative Metal.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, glass-fiber-reinforced cementitious panels Installer, decorative metal wall panel installer, structural-support Installer, and installers whose work interfaces with or affects steel framing and supports.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to glass-fiber-reinforced cementitious panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect glass-fiber-reinforced cementitious panels.
6. Review temporary protection requirements for glass-fiber-reinforced cementitious panel assemblies and decorative metal wall panel assemblies during and after installation.
7. Review procedures for repair of panels damaged after installation.
8. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 ACTION SUBMITTALS

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

1. Shop Drawings requirements include but are not limited to the following:

a. Steel framing and supports.

2. Include delegated-design analysis data signed and sealed by the qualified professional engineer responsible for their preparation for shop and field fabricated items.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Qualification Data: For professional engineer.

C. Welding certificates.

D. Research Reports: For post-installed anchors.

1.7 QUALITY ASSURANCE

A. Fabricator: Company specializing in performing the work of this section with minimum 5 years of documented experience.

B. Professional Engineer Qualifications: Professional engineer experienced with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the state in which Project is located.

C. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1, "Structural Welding Code - Steel."
2. AWS D1.2, "Structural Welding Code - Aluminum."

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design shop or field fabricated items.

B. General: Steel framing supports for glass-fiber-reinforced cementitious panel assemblies and decorative metal wall panel assemblies, including cleats, anchors, and fasteners, shall withstand structural movement, thermally induced movement without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed glass-fiber-reinforced cementitious panel assemblies and decorative formed metal assemblies shall not rattle or loosen.

C. Glass-fiber-reinforced cementitious panel assemblies and decorative metal wall panel assemblies shall be designed to accommodate movement due to wind loads, thermal and structural movement, and interstory drift; within the panels, steel support framing and the building.

D. Glass-fiber-reinforced cementitious panel assemblies and decorative metal wall panel assemblies shall be designed to prevent noise or vibration created by wind and thermal and structural movements.

E. Glass-fiber-reinforced cementitious panel assemblies and decorative metal wall panel assemblies shall be designed to prevent loosening or weakening of fasteners, attachments, and other components.

F. Glass-fiber-reinforced cementitious panel assemblies and decorative metal wall panel assemblies shall be designed to maintain panel integrity and prevent micro-cracks and fissures within the panels due to fastener attachments, movement due to wind loads, thermal and structural movement, interstory drift, weathering, or any other outside influences.

G. Structural Performance: Provide steel framing and supports capable of withstanding the effects of the following loads, based on testing according to ASTM E330:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

H. 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 deg F, ambient; 180 deg 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. Ferrous Metals:

1. Steel Plates, Shapes, and Bars: ASTM A36.
2. Steel Tubing: ASTM A500, cold-formed steel tubing.

C. Aluminum:

1. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.
2. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.

2.3 FASTENERS

A. General: Provide Type 304 stainless steel fasteners for exterior use. Select fasteners for type, grade, and class required.

B. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 1.

C. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488, conducted by a qualified independent testing agency.

D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

E. Provide z-clips and related hardware as indicated on Drawings.

2.4 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: Organic zinc-rich coating containing 95 percent metallic zinc by weight in the dried film.

1. Product: ZRC Worldwide; ZRC Cold Galvanizing Repair Compound: www. wrcworldwide. com.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports for:

1. Glass-fiber-reinforced cementitious panels; refer to Section 07 4400 - Glass-Fiber-Reinforced Cementitious Panels.
2. Decorative metal wall panels; refer to Section 05 7000 – Decorative Metal.
3. Canopy.
4. Other items as indicated on Drawings.

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. Canopy Fabrication:

1. Aluminum Tube Framing: Miter and weld corners.

2.7 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.8 STEEL AND IRON FINISHES

A. General:

1. Galvanizing: Provide hot-dip galvanizing at exterior locations, within exterior walls or building enclosure, wet areas, and elsewhere as indicated.

B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153 for steel and iron hardware and with ASTM A123 for other steel and iron products.

C. Galvanizing Repair Paint: Organic zinc-rich coating containing 95 percent metallic zinc by weight in the dried film.

1. Product: ZRC Worldwide; ZRC Cold Galvanizing Repair Compound: www.wrcworldwide.com.

2.9 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

1. Color: Dark bronze to match storefront framing; refer to Section 08 4113 – Aluminum-Framed Storefronts.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Extruded Aluminum: Two coats of clear lacquer.

G. Tolerances

1. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
2. Maximum Offset From True Alignment: 1/4 inch.
3. Maximum Out-of-Position: 1/4 inch.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 REPAIRS

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing using galvanizing repair paint to comply with ASTM A780.

END OF SECTION 05 1200

SECTION 05 3100 – STEEL DECKING

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. Metal deck.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Metal deck.

B. Shop Drawings:

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

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

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

C. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Power-actuated mechanical fasteners.

D. Research Reports: For steel deck, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Manufacturer: Company specializing in performing the work of this section with minimum 5 years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

C. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

2.2 NONCOMPOSITE FORM DECK

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Canam Steel Corporation: www.canam-construction.com.
2. Cordeck, Inc: www.cordeck.com
3. James River Steel, Inc.: www.jamesriversteel.com
4. New Millennium Building Systems, LLC: www.newmill.com
5. Roof Deck, Inc.: www.roofdeckinc.com
6. Vulcraft: www.vulcraft.com.

B. Noncomposite Form Deck: Fabricate ribbed-steel sheet noncomposite deck panels used as a form to comply with SDI NC, with the minimum section properties indicated, and with the following:

1. Galvanized-Steel Sheet: ASTM A653, Structural Steel (SS), Grade 33, G90 zinc coating.
2. Deck Profiles: Corrugated.
3. Profile Depth: As indicated on Drawings.
4. Design Uncoated-Steel Thickness: 0.0295 inch (22 gage), unless otherwise indicated on Drawings.
5. Span Condition: Triple span or more; unless otherwise indicated on Drawings.
6. Side Laps: Overlapped or interlocking seam at Contractor's option; unless otherwise indicated on Drawings.

2.3 ACCESSORIES

A. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch (20 gage) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth; unless otherwise indicated on Drawings.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch (16 gage) thick, with factory-punched hole of 3/8-inch minimum diameter.

I. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch (14 gage) thick, of same material and finish as deck. For drains, cut holes in the field.

J. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch (14 gage) thick, of same material and finish as deck, with 3-inch-wide flanges and level or sloped recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.

K. Galvanizing Repair Paint: Organic zinc-rich coating containing 95 percent metallic zinc by weight in the dried film.
1. Product: ZRC Worldwide; ZRC Cold Galvanizing Repair Compound: www.wrcworldwide.com.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.3 INSTALLATION OF DECK

A. Fasten deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:

1. Weld Diameter: Minimum 5/8 inch, nominal; unless otherwise indicated or required.
2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches apart in the field of roof and 6 inches apart in roof corners and perimeter, based on roof-area definitions in FM Loss Prevention Data Sheet 1-28; unless otherwise indicated or required.

3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 18 inches, and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
2. Contractor’s Option: Fasten with a minimum of 1-1/2-inch-long welds if deck is 0.0474 inch (18 gage) thick, minimum.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum.

D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.

END OF SECTION 05 3100

SECTION 05 4000 - COLD-FORMED METAL FRAMING

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. Miscellaneous framing.
2. Roof rafter framing.

1.3 DEFINITIONS

A. CFMF: Cold-formed metal framing.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

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.

C. Delegated-Design Submittal: For cold-formed steel framing.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer, installer, professional engineer, and testing agency.

B. Welding certificates.

C. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.

1. Steel sheet.
2. Expansion anchors.
3. Mechanical fasteners.
4. Vertical deflection clips.
5. Miscellaneous structural clips and accessories.

D. Research Reports:

1. For nonstandard cold-formed steel framing post-installed anchors from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.
2. For sill sealer gasket, showing compliance with ICC-ES AC380.

E. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

C. Professional Engineer Qualifications: Professional engineer experienced with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the state in which Project is located.

D. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

E. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

F. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products from one of the following:

1. ClarkDietrich Building Systems: www.clarkdietrich.com.
2. Jaimes Industries Inc.: www.jaimesind.com.
3. Marino\WARE: www.marinoware.com.
4. MBA Building Supplies, Inc.: www.mbastuds.com.
5. State Building Products; www.statebp.com.
6. The Steel Network, Inc: www.SteelNetwork.com.
7. Steel Stud Solutions, LLC; www.steelstudsolutions.com.
8. Telling Industries; www.buildstrong.com.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "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: Unless otherwise indicated, design framing systems to withstand design loads without deflections greater than the following:

a. Exterior Wall Framing:

1) With Masonry Veneer: Horizontal deflection of 1/720 of the wall height.
2) Without Masonry Veneer: Horizontal deflection of 1/360 of the wall height.

b. Interior Wall Framing

1) Horizontal deflection of 1/240 of the wall height under a horizontal load of 5 lbf/sq. ft.

a) Exception: Limit deflection of walls to receive hard tile surfaces to 1/360 of the wall height.

c. Roof Rafter Framing:

1) Vertical deflection of 1/240 of the horizontally projected span for live loads.

3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

a. Upward and downward movement of 3/4 inch, unless otherwise indicated.

5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:

1. Floor and Roof Systems: AISI S210.
2. Wall Studs: AISI S211.
3. Headers: AISI S212.
4. Lateral Design: AISI S213.

D. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency acceptable to authorities having jurisdiction.

2.3 COLD-FORMED STEEL FRAMING MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: ST33H but not less than as required by structural performance requirements.
2. Coating: G60; exception, provide G90 at masonry stud backup.

B. Steel Sheet for Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: 33 (230) but not less than as required by structural performance.
2. Coating: G60.

2.4 MISCELLANEOUS FRAMING

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

1. Minimum Base-Metal Thickness: 0.0538 inch (16 gage).
2. Minimum Flange Width: 1-5/8 inches.

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

1. Minimum Base-Metal Thickness: Matching steel studs.
2. Minimum Flange Width: 1-1/2 inches.

C. Slotted Deflection Track: Provide galvanized sheet steel track with slotted holes in flanges for mechanical anchorage of studs that accommodate deflection; provide screws and anti-friction bushings.

1. Minimum Base-Metal Thickness: Matching steel studs.
2. Track Depth: Matching steel studs.
3. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.
4. Provide at partition heads to structure connections, where indicated on Drawings, and elsewhere as required to accommodate axial deflection.
5. Shall prevent cracking of finishes applied to framing resulting from deflection of structure above

2.5 ROOF-RAFTER FRAMING

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

1. Minimum Base-Metal Thickness: 0.0538 inch (16 gage).
2. Minimum Flange Width: 1-5/8 inches.

2.6 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A1003, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing and bridging.
3. Web stiffeners.
4. Miscellaneous Clips.
5. Backer plates.
6. And other miscellaneous items required for a complete installation.

2.7 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A36, zinc coated by hot-dip process according to ASTM A123.

B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel hex-headed bolts and headless, hooked bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153, Class C.

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 ICC-ES AC01, ICC-ES AC193, ICC-ES AC58, or ICC-ES AC308 as appropriate for the substrate.

1. Uses: Securing cold-formed steel framing to structure.
2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
3. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

D. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

E. Welding Electrodes: Comply with AWS standards.

2.8 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A780 or SSPC-Paint 20.

B. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.

2.9 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

3.3 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation, specified in Section 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.

I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.4 INSTALLATION OF MISCELLANEOUS FRAMING

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: 24 inches.

B. Squarely seat studs against top and bottom tracks, with gap not exceeding 1/8 inch between the end of wall-framing member and the web of track.

1. Fasten both flanges of studs to top and bottom tracks.
2. Space studs as follows:

a. Stud Spacing: 16 inches, unless otherwise indicated on Drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing directly over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads or add additional cold-formed metal studs in the field to ensure alignment.

F. Install headers over wall openings wider than stud spacing. Locate headers above openings. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame. Fasten jamb members together to uniformly distribute loads.
2. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

G. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

H. Install horizontal bridging in stud system, spaced vertically 48 inches, unless otherwise indicated on Shop Drawings. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.

a. At Contractor’s option provide the following instead of channel bridging:

1) Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

I. Install miscellaneous framing and connections, including supplementary framing, diagonal bracing straps, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 INSTALLATION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 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 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.

3.7 FIELD QUALITY CONTROL

A. Testing: Owner may engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 4000

SECTION 05 5213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Steel pipe and tube railings.

1.3 COORDINATION

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

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For metal pan stairs and the following:

1. Shop primers.
2. Bituminous paint.
3. Nonshrink, nonmetallic grout.
4. Fasteners.
5. Post-installed anchors.
6. Handrail brackets.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Samples:

1. Railings and Guardrails: Submit 3 samples 12 inches long for each material and finish selected.
2. Infill: Submit 3 samples 12 inches long or 12 by 12 inches, for each material and finish selected.
3. Miscellaneous: Submit 3 samples, full size, of each elbow, wall bracket and end stop.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Qualification Data: For professional engineer.

C. Welding certificates.

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

E. Research Reports: For post-installed anchors, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.6 QUALITY ASSURANCE

A. Fabricator: Company specializing in performing the work of this section with minimum 5 years of documented experience.

B. Installer Qualifications: Fabricator of products.

C. Professional Engineer Qualifications: Professional engineer experienced with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the state in which Project is located.

D. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
b. Infill load and other loads need not be assumed to act concurrently.

3. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Steel Railings: Provide galvanized finish for exterior installations and where indicated.

2.3 STEEL RAILINGS

A. Source Limitations: Obtain each type of railing from single source from single fabricator.

B. Tubing: ASTM A500 (cold formed) or ASTM A513, Type 5.

C. Pipe: ASTM A53, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

D. Plates, Shapes, and Bars: ASTM A36.

2.4 FASTENERS

A. Fastener Materials:

1. Hot-Dip Galvanized Railing Components: Type 304 stainless steel or hot-dip zinc-coated steel fasteners complying with ASTM A153 or ASTM F2329 for zinc coating.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
2. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.

1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.

B. Galvanizing Repair Paint: Organic zinc-rich coating containing 95 percent metallic zinc by weight in the dried film.

1. Product: ZRC Worldwide; ZRC Cold Galvanizing Repair Compound: www.wrcworldwide.com.

C. Bituminous Paint: Cold-applied asphalt emulsion, complying with ASTM D1187.

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.

1. Clearly mark units for reassembly and coordinated installation.
2. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water.

1. Provide weep holes where water may accumulate.
2. Locate weep holes in inconspicuous locations.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint

I. Form changes in direction as follows:

1. By bending or by inserting prefabricated elbow fittings.

a. Provide flush (zero-radius) bends where indicated on Drawings.
b. Bending shall not result in distortion of railing member.

J. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

K. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.

L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

M. Fittings, and Anchors: Provide miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.

1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
2. Coordinate anchorage devices with supporting structure.

2.7 STEEL AND IRON FINISHES

A. Galvanized Railings:

1. Galvanizing: Hot-dip galvanize steel railings, including hardware, after fabrication.

    a. Comply with ASTM A123 for hot-dip galvanized railings.
    b. Comply with ASTM A153 for hot-dip galvanized hardware.

2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
3. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
4. For galvanized railings indicated to be field painted:

    a. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Perform cutting, drilling, and fitting required for installing railings.

1. Fit exposed connections together to form tight, hairline joints.
2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.

B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve, extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

A. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Leave anchorage joint exposed with 1/8-inch nonshrink, nonmetallic grout buildup, sloped away from post and flush with adjacent surface.

C. Anchor posts to metal surfaces with flanges, angle type, or floor type, as required by conditions, connected to posts and to metal supporting members as follows:

1. For steel railings, weld flanges to post and bolt to metal supporting surfaces.

3.5 REPAIR

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing using galvanizing repair paint to comply with ASTM A780.

3.6 CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780.

3.7 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05 5213

SECTION 05 7000 – DECORATIVE METAL

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. Decorative metal wall panels.
2. Decorative metal signage panels with character cutouts.

1.3 COORDINATION

A. Coordinate installation of anchorages for decorative metal wall panels. Furnish setting drawings, templates, and directions for installing anchorages and fasteners.

B. Coordinate installation of decorative metal wall panels with steel framing and supports.

1. Refer to Section 05 1200 – Structural Steel and Metal Fabrications.

C. Coordinate installation of decorative metal wall panels with adjacent construction to ensure that wall assemblies, flashings, trim, and joint sealants, are protected against damage from the effects of weather, age, corrosion, and other causes of deterioration.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, glass-fiber-reinforced cementitious panels Installer, decorative metal wall panel installer, structural-support Installer, and installers whose work interfaces with or affects decorative metal wall panels.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to decorative metal wall panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect decorative metal wall panels.
6. Review temporary protection requirements for decorative metal wall panel assembly during and after installation.
7. Review procedures for repair of panels damaged after installation.
8. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product, including finishing materials.

B. Shop Drawings: Show fabrication and installation details for decorative metal wall panels.

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

2. Indicate materials and profiles of each decorative metal wall panels, fittings, joinery, finishes, fasteners, anchorages, and accessory items.
3. Include delegated-design analysis data signed and sealed by the qualified professional engineer responsible for their preparation for shop and field fabricated items.
4. For metal signage:

    a. Show sign mounting heights and locations of supplementary supports.
    b. Show message list, typestyles, graphic elements, and layout for each sign.

C. Samples for Initial Selection: For products involving selection of color, texture, or design.

D. Samples for Verification: For each type of exposed finish required, prepared on 6-inch-square Samples of metal of same thickness and material indicated for the Work, including perforations.

1. Samples of welded joints showing quality of workmanship.
2. Include sample of laser cut characters.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator and installer.

B. Qualification Data: For professional engineer.

C. Coordination Drawings: For decorative metal elements that house items specified in other Sections. Show dimensions of housed items, including locations of housing penetrations and attachments, and necessary clearances.

D. Welding certificates.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For decorative metal elements, to include in maintenance manuals.

1.8 QUALITY ASSURANCE

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

B. Installer Qualifications: Fabricator of products.

C. Professional Engineer Qualifications: Professional engineer experienced with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the state in which Project is located.

D. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockup of decorative metal wall panel assembly, approximately 10 feet by 10 feet, as shown on Drawings, including corner, soffits, supports, attachments, and accessories.

    a. Include panel system, attachments to support framing, associated air/water barrier materials, weep drainage system, sealants and seals.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.2, "Structural Welding Code - Aluminum."

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver decorative metal products wrapped in protective coverings and strapped together in suitable packs or in heavy-duty cartons. Remove protective coverings before they stain or bond to finished surfaces.

B. Store decorative metal in a well-ventilated area, away from uncured concrete and masonry, and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.

1.10 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with decorative metal by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Decorative metal wall panel assemblies, including cleats, anchors, and fasteners, shall withstand structural movement, thermally induced movement without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed decorative metal panel assemblies shall not rattle or loosen.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design decorative metal wall panel assemblies.

C. Decorative metal wall panel assemblies shall be designed to accommodate movement due to wind loads, thermal and structural movement, and interstory drift; within the panels, steel support framing and the building.

D. Decorative metal wall panel assemblies shall be designed to prevent noise or vibration created by wind and thermal and structural movements.

E. Decorative metal wall panel shall be designed to prevent loosening or weakening of fasteners, attachments, and other components.

F. Decorative metal wall panel assemblies shall be designed to maintain panel integrity and prevent micro-cracks and fissures within the panels due to fastener attachments, movement due to wind loads, thermal and structural movement, interstory drift, weathering, or any other outside influences.

G. Structural Performance: Provide decorative metal wall panel assemblies capable of withstanding the effects of the following loads, based on testing according to ASTM E330:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

H. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.

I. 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 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Use materials with smooth, flat surfaces unless otherwise indicated. Use materials without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

2.3 ALUMINUM

A. Fabricate products from alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper designated below.

B. Plate and Sheet: ASTM B209, Alloy 5005-H32, unless otherwise recommended by fabricator.

1. Perforations: 1 inch round holes, 1-1/4 inch on center, in staggered rows.

a. Locations: Provide perforated panels as indicated on Drawings.
b. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) McNichols Company: www.mcnichols.com
2) Direct Metals Company, LLC: www.directmetals.com.

2.4 FASTENERS

A. Fastener Materials - General: Unless otherwise indicated, provide the following:

1. Aluminum Items: Type 304 stainless steel fasteners.

B. Fasteners for Anchoring to Other Construction: Unless otherwise indicated, select fasteners of type, grade, and class required to produce connections suitable for anchoring indicated items to other types of construction indicated.

1. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 1.

C. Provide concealed fasteners for interconnecting components and for attaching decorative metal items to other work unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For aluminum, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.6 FABRICATION, GENERAL

A. Assemble items in the shop to greatest extent possible to minimize field splicing and assembly.

1. Disassemble units only as necessary for shipping and handling limitations.
2. Clearly mark units for reassembly and coordinated installation.
3. Use connections that maintain structural value of joined pieces.

B. Form decorative metal to required shapes and sizes, true to line and level with true curves and accurate angles and surfaces. Finish exposed surfaces to smooth, sharp, well-defined lines and arris.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.

D. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

E. Mill joints to a tight, hairline fit. Cope or miter corner joints. Fabricate connections that will be exposed to weather in a manner to exclude water.

F. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.

G. Provide necessary rebates, lugs, and brackets to assemble units and to attach to other work. Cut, reinforce, drill, and tap as needed to receive finish hardware, screws, and similar items unless otherwise indicated.

H. Comply with AWS for recommended practices in shop welding. Weld behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded joints of flux, and dress exposed and contact surfaces.

1. Where welding cannot be concealed behind finished surfaces, finish joints to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 Welds: no evidence of a welded joint.

2.7 DECORATIVE METAL WALL PANELS

A. Decorative Metal Wall Panels: Custom fabricated decorative perforated wall panels.

1. Materials: Aluminum plate and sheet; perforated as indicated on Drawings.
2. Welded construction unless otherwise indicated or recommended by fabricator.
3. Unless otherwise indicated on Drawings, for materials less than 1/4 inch thick, hem exposed edges or encapsulate with U-shaped edging trim; ensure any edging trim is permanently secured to metal panel edge.

2.8 DECORATIVE METAL SIGNAGE PANELS

A. Decorative Metal Signage Panels with Character Cutouts: Character cutouts with square-cut, smooth, eased edges; precisely formed lines and profiles; and as follows:

1. Panel Material: Sheet or plate aluminum.
2. Character Heights: As indicated on Drawings.
3. Panel Thickness: As recommended by fabricator but not less than 0.25 inch.
4. Typeface/Fonts: As indicated on Drawings.
5. Includes Logo: Shape and design as indicated on Drawings.
6. Mounting: Provide stainless steel fasteners and hardware as applicable for substrates and conditions indicated on Drawings.

2.9 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.10 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of decorative metal.

1. Examine supporting structural frame and conditions for compliance with requirements for installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Provide anchorage devices and fasteners where needed to secure decorative metal to in-place construction.

B. Perform cutting, drilling, and fitting required to install decorative metal. Set products accurately in location, alignment, and elevation, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items to be built into concrete, masonry, or similar construction.

C. Fit exposed connections accurately together to form tight, hairline joints or, where indicated, uniform reveals and spaces for sealants and joint fillers.

D. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.

E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.3 INSTALLATION OF DECORATIVE METAL WALL PANELS

A. Install decorative metal wall panels in accordance with fabricator’s instructions.

1. Locate and space fasteners in uniform vertical and horizontal alignment.

B. Attach decorative metal wall panels to supports at locations, spacings, and with fasteners recommended by fabricator to achieve performance requirements specified.

C. Install decorative metal wall panels in locations indicated.

D. Install decorative metal wall panels level and plumb.

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align decorative metal wall panels within installed tolerance of 1/4 inch in 20 feet, non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.5 ADJUSTING AND CLEANING

A. Unless otherwise indicated, clean metals by washing thoroughly with water and soap, rinsing with clean water, and drying with soft cloths.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

3.6 PROTECTION

A. Protect finishes of decorative metal items from damage during construction period.

B. Replace decorative metal items that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 05 7000

SECTION 06 1000 - 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, furring, and nailers.
2. Wood sheathing.
3. Cementitious sheathing.

1.3 DEFINITIONS

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

B. Exposed Framing: Framing not concealed by other construction.

C. Timber: Lumber of 5 inches nominal size or greater 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 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 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Post-installed anchors.
4. Metal framing anchors.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 LUMBER PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.

2.2 SHEATHING AND PANEL PRODUCTS, GENERAL

A. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

B. Factory mark panels to indicate compliance with applicable standard.

2.3 WOOD-PRESERVATIVE-TREATED LUMBER

A. Manufacturers: Subject to compliance with requirements, provide products from one of the following:

1. Lonza Group: www. wolmanizedwood. com.
2. Hoover Treated Wood Products, Inc.: www. frtw. com.
3. Koppers Performance Chemicals, Inc.: www. koppersperformancechemicals. com.
4. Viance, LLC: www. treatedwood. com.

B. Preservative Treatment by Pressure Process: AWPA 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.

    a. Inorganic boron (SBX) is prohibited.

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.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

D. Kiln-dry plywood and other wood panels after treatment to maximum moisture content of 15 percent.

E. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.

F. Identify fire-retardant-treated plywood and panels with appropriate classification marking of qualified testing agency.

1. For exposed plywood and other wood panels indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.

G. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

a. At Contractor's option, roof nailers may be non-preservative treated.

2. Plywood and other wood paneling in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing
3. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
4. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
5. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
6. Wood floor plates that are installed over concrete slabs-on-grade.
7. Other items as indicated on Drawings.

2.4 FIRE-RETARDANT-TREATED MATERIALS

A. Manufacturers: Subject to compliance with requirements, provide products from one of the following:

1. Lonza Group: www. wolmanizedwood. com.
2. Hoover Treated Wood Products, Inc.: www. frtw. com.
3. Koppers Performance Chemicals, Inc.: www. koppersperformancechemicals. com.
4. Viance, LLC: www. treatedwood. com.

B. 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.

C. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Treatment 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 D2898. 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 D3201 at 92 percent relative humidity. Use where exterior type is not indicated.

D. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.

E. Identify fire-retardant-treated lumber 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 or omit marking and provide certificates of treatment compliance issued by testing agency.

F. Identify fire-retardant-treated plywood and other wood panels with appropriate classification marking of qualified testing agency.

1. For exposed plywood and other wood paneling indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by testing agency.

G. Application: Treat items indicated on Drawings, and the following:

1. All interior rough carpentry items unless otherwise indicated.
2. Other items as indicated on Drawings.

2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Miscellaneous Framing, Blocking, Furring and Nailers

B. Dimension Lumber Items:

1. Species: Southern pine or mixed southern pine; SPIB.
2. Grade: No. 2 or as follows:

a. Standard Grade, provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

C. 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.

D. For furring strips for installing plywood or other paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 WOOD SHEATHING

A. Plywood Sheathing: DOC PS 1, Exposure 1, Structural I sheathing, Grade C-D.

1. Span Rating: Not less than 48/24.
2. Nominal Thickness: Not less than 3/4 inch.
3. Tongue-and-groove edges.

2.7 CEMENTITIOUS SHEATHING

A. Cementitious Backer Units: ASTM C1325, Type A.

1. Thickness: 5/8 inch.
2. Flame Spread/Smoke Developed: 0/0 per ASTM E84.
3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
4. Products: Subject to compliance with requirements, provide one of the following:

a. National Gypsum Company; PermaBase Brand Cement Board: www.nationalgypsum.com.
b. USG Corporation; Durock Brand Cement Board: www.usg.com.

2.8 MISCELLANEOUS PANELS AND SHEATHING

A. Plywood Concealed from View and Part of Exterior Enclosure: DOC PS 1, Exposure 1, Grade C-D

B. Concealed Plywood at Interior Locations: DOC PS 1, Exposure 2, Grade C-D.

2.9 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.

1. Where rough 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 F1667.

C. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.

D. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

E. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.

1. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C954.

F. Screws for Fastening Composite Nail Base Insulated Roof Sheathing to Metal Roof Deck: Steel drill screws, in type and length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117. Provide washers or plates if recommended by sheathing manufacturer.

G. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 or ICC-ES AC193 as appropriate for the substrate.

1. Interior Locations: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
2. Exterior and high relative Humidity Locations: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

2.10 MISCELLANEOUS MATERIALS

A. Organic Felt: Asphalt-saturated organic felts, nonperforated and complying with the following:

1. ASTM D226/D226M: Type I.

PART 3 - EXECUTION

3.1 LUMBER INSTALLATION, GENERAL

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

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

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.

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 AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. 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 organic felt separator between wood and metal decking.

J. Securely attach rough 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 (IBC).
2. 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 PANEL AND SHEATHING INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. ICC-ES evaluation report for fastener.

D. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

E. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.3 INSTALLATION OF WOOD BLOCKING AND NAILERS

A. Install where indicated and where required for 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.

3.4 WOOD SHEATHING INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Wall and Roof Sheathing:

a. Nail to wood framing.
b. Screw to cold-formed metal framing.
c. Space panels 1/8 inch apart at edges and ends.

3.5 CEMENTITIOUS SHEATHING INSTALLATION

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

END OF SECTION 06 1000

SECTION 06 4013 - EXTERIOR ARCHITECTURAL WOODWORK

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. Exterior benches.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Anchors.
2. Shop finishing materials.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories

1. Include the following:

a. Dimensioned plans, elevations, and sections.
b. Attachment details.

2. Show locations and sizes of furring, blocking, and hanging strips, including blocking and reinforcement concealed by construction and specified in other Sections.
3. Show locations and sizes of cutouts and holes for items installed in architectural woodwork

C. Samples for Initial Selection:

1. Where colors and finishes are not specified, submit 3 sets of color and finish selection charts or chips

D. Samples or Verification: For each exposed product and for each shop-applied color and finish specified. Provide three samples of each of the following:

1. Lumber for Transparent Finish: 4 by 12 inches for each species, cut, and finish; finish on one side and one edge.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Welding certificates.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating and installing the products specified in this section with minimum five years of documented experience

1. Fabricator shall also be the installer.

B. Single Source Responsibility: Provide and install exterior architectural woodwork from single fabricator.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code - Steel."

D. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockups of typical exterior architectural woodwork as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Architectural Woodwork Standards, Section 2.

B. Do not deliver exterior architectural woodwork until painting and similar finish operations that might damage woodwork have been completed in installation areas.

1.8 FIELD CONDITIONS

A. Field Measurements: Where exterior architectural woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being concealed by construction, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL WOODWORK, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of exterior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1. The Contract Documents may contain requirements that are more stringent than the Architectural Woodwork Standards. Comply with Contract Documents and Architectural Woodwork Standards.

B. Wood Moisture Content: Comply with requirements of the Architectural Woodwork Standards for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas and as follows:

1. Wood Moisture Content: 5 to 10 percent.

2.2 WOOD MATERIALS

A. Hardwood Lumber: Ipe.

2.3 METALS

A. Bars: Hot-rolled, carbon steel complying with ASTM A29, Grade 1010. Galvanized.

1. Galvanizing: Hot-dip galvanized, comply with ASTM A153 for steel and iron hardware and with ASTM A123 for other steel and iron products.

a. For galvanized steel to be field painted: Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.

2.4 MISCELLANEOUS MATERIALS

A. Provide self-drilling screws for metal-framing supports, as recommended by metal-framing manufacturer.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage.

1. Provide expansion sleeves or expansion bolts for post-installed anchors.
2. Material: Stainless steel, Type 316

a. Stainless steel bolts, ASTM F593, and nuts, ASTM F594. Alloy Group 2 (A4)

C. Galvanizing Repair Paint: Organic zinc-rich coating containing 95 percent metallic zinc by weight in the dried film.

1. Product: ZRC Worldwide; ZRC Cold Galvanizing Repair Compound: www.wrcworldwide.com.

2.5 FABRICATION, GENERAL

A. Fabricate exterior architectural woodwork to dimensions, profiles, and details indicated.

1. Ease edges to radius indicated for the following:

a. Edges of Solid-Wood (Lumber) Members: 1/16 inch (1.5 mm) unless otherwise indicated.

B. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site.

1. Disassemble components only as necessary for shipment and installation.
2. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.
3. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled.

a. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting.
b. Verify that parts fit as intended, and check measurements of assemblies against field measurements indicated on approved Shop Drawings before disassembling for shipment.

C. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.
3. Form work true to line and level with accurate angles and surfaces.
4. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

D. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint

2.6 BENCHES

A. Quality Standard: Premium Grade, in accordance with AWS, unless noted otherwise.

1. Comply with AWS Section 6 – Millwork, and other sections as relevant to the work.

B. Benches: Fabricated of wood slats and spacers evenly spaced with metal supports as indicated on Drawings.

1. Bench Lengths and Configurations: As indicated on Drawings.
2. Fabricate benches in one piece, unless size dictates multiple pieces.
3. Wood Species: Ipe.
4. Wood Slat Size: 2 by 4 inches, nominal, unless otherwise indicated on Drawings.
5. Wood Slat Spacing/Spacers: 1 by 4 inches, nominal, unless otherwise indicated on Drawings
6. Metal Base: Sizes and configurations as indicated on Drawings.
7. Finishes:

a. Wood Finish: Natural or shop-applied transparent finish/stain; as selected by Architect.
b. Metal Finish: Field-applied paint. Refer to Section 09 9100 – Painting.

2.7 SHOP FINISHING

A. Quality Standard: Comply with AWS Section 5 – Finishing.

1. Grade: Provide finishes of same grades as items to be finished.

B. General: The entire finish of exterior architectural woodwork is specified in this Section, whether shop applied or applied after installation.

1. Shop Finishing: To the greatest extent possible, finish architectural woodwork at the fabrication shop. Defer only final touch up, cleaning, and polishing until after installation.

a. Where field finishing is required, shop apply at least the prime/base coat to the greatest extent possible before delivery.

C. Preparation for Finishing: Comply with Architectural Woodwork Standards, Section 5 for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing exterior architectural woodwork, as applicable to each unit of work.

D. Transparent Finish: Exterior finish as standard with fabricator and as appropriate for exterior weather conditions.

1. Staining: Match Architect's sample, if any.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installing exterior architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming of concealed surfaces.

3.2 INSTALLATION

A. Grade: Install exterior architectural woodwork to comply with same grade as item to be installed.

B. Assemble exterior architectural woodwork and complete fabrication at Project site to the extent that it was not completed during shop fabrication.

C. Install exterior architectural woodwork level, plumb, true in line, and without distortion.

1. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

D. Complete finishing work specified in this Section to extent not completed at shop or before installation of paneling. Fill nail holes with matching filler where exposed.

E. Anchor exterior architectural woodwork to anchors or directly attached to substrates.

1. Secure with countersunk, concealed fasteners or exposed anchors as indicated on Drawings.

3.3 REPAIR

A. Repair damaged and defective exterior architectural woodwork, where possible, to eliminate functional and visual defects and to result in exterior architectural woodwork being in compliance with requirements of Architectural Woodwork Standards for the specified grade.

B. Where not possible to repair, replace defective woodwork.

C. Shop Finish: Touch up finishing work specified in this Section after installation of exterior architectural woodwork.

1. Fill nail holes with matching filler where exposed.

D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing using galvanizing repair paint to comply with ASTM A780.

3.4 CLEANING

A. Clean exterior architectural woodwork on exposed and semiexposed surfaces.

END OF SECTION 06 4013

SECTION 07 2100 - THERMAL INSULATION

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. Blanket insulation.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

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

C. Research Reports: For foam-plastic insulation, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than 5 years of documented experience.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer, with not less than 5 years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 MINERAL-WOOL BLANKET INSULATION

A. Mineral-Wool Blanket Insulation, Unfaced: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; passing ASTM E136 for combustion characteristics.

1. Flame-Spread Index: Not more than 0 when tested in accordance with ASTM E84.
2. Smoke-Developed Index: Not more than 0 when tested in accordance with ASTM E84.

3. Density: 2.5 pcf, minimum.
4. Thermal Resistance: R-value of 3.7 per inch.

    a. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

5. Thickness: 3-1/2 inches, unless otherwise indicated.
6. Products: Subject to compliance with requirements, provide one of the following:

    a. Johns Manville; Mineral Wool Sound Attenuation Fire Batts (SAFB): www.jm.com.
    b. Rockwool; Comfortbatt: www.rockwool.com.
    c. Thermafiber Inc., an Owens Corning Company; UltraBatt: www.owenscorning.com.

7. Locations: Metal studs and miscellaneous locations.

2.2 INSULATION FASTENERS

A. Insulation Adhesive: 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.

1. Provide type recommended by insulation manufacturer for application

B. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washers.

1. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.
3. Self-locking Washers: Self-locking washers formed from 0.016-inch-thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter
4. Manufacturers: Subject to compliance with requirements, provide products from one of the following:

    a. Gemco: www.gemcoinsulation.com.
    b. AGM Industries, Inc.

C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

1. Provide type recommended by insulation anchor manufacturer for application

2.3 ACCESSORIES

A. Wire Mesh: Galvanized steel, hexagonal wire mesh.

B. Foam Sealant: Single-component spray polyurethane insulating foam sealant.

1. Gun-applied.
2. Expands to fill gaps up to 3 inches.
3. Closed Cell Content: 60 percent, minimum; ASTM D2856.
4. Flammability: ASTM E84.

    a. Flame-spread Index: 25, maximum.
    b. Smoke-developed Index: 450, maximum.

5. Thermal Resistance (R) Value: 4 per inch; ASTM C518.
6. Product: Subject to compliance with requirements, provide one of the following:

a. Dow Building Solutions, Dow Chemical Company/DuPont; GreatStuff Pro Gaps & Cracks Sealant: www.dow.com.
b. Or approved equal.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 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.

3.3 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.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. For metal-framed wall cavities where cavity heights exceed 96 inches support unfaced blankets mechanically.

3.4 INSULATION AT MISCELLANEOUS VOIDS

A. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using one or more of the following materials:
1. Mineral-wool blanket insulation.
2. Foam sealant.

B. Install insulation to neatly fit spaces; fill voids completely without compressing insulation.

3.5 FIELD QUALITY CONTROL

A. Inspection: Architect shall inspect board insulation installations at cavity walls and foundation walls. Inspection will include the following:

1. Verification that board insulation installation is continuous without holes or air gaps, including penetrations, joints, and perimeter.
2. Verification that insulation joints are sealed tightly with continuous foam sealant without any gaps.
3. Verification that insulation seals tightly around penetrations and against adjacent materials without any gaps.

B. Do not cover installed insulation until inspections have been completed.

C. Deficiencies shall be corrected by the Contractor at no additional cost to the Owner.

3.6 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 2100

SECTION 07 4400 – GLASS-FIBER-REINFORCED CEMENTITIOUS PANELS

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. Glass-fiber-reinforced cementitious panels.

1.3 COORDINATION

A. Coordinate installation of anchorages for glass-fiber-reinforced cementitious panels. Furnish setting drawings, templates, and directions for installing anchorages and fasteners.

B. Coordinate installation of glass-fiber-reinforced cementitious panels with steel framing and supports.

1. Refer to Section 05 1200 – Structural Steel and Metal Fabrications.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, glass-fiber-reinforced cementitious panels Installer, decorative metal wall panel installer, structural-support Installer, and installers whose work interfaces with or affects glass-fiber-reinforced cementitious panels.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to glass-fiber-reinforced cementitious panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect glass-fiber-reinforced cementitious panels.
6. Review temporary protection requirements for glass-fiber-reinforced cementitious panel assembly during and after installation.
7. Review procedures for repair of panels damaged after installation.
8. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

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

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.

1. Include fabrication and installation layouts of glass-fiber-reinforced cementitious panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim and anchorage.

3. Include delegated-design analysis data signed and sealed by the qualified professional engineer responsible for their preparation for shop and field fabricated items.

C. Samples for Initial Selection: For each type of glass-fiber-reinforced cementitious panel indicated.

1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of glass-fiber-reinforced cementitious panel and exposed finish required, prepared on Samples of size indicated below.

1. Glass-Fiber-Reinforced Cementitious Panels: 12 inches square. Include fasteners.
2. For each finish, submit at least three samples, minimum size 6 inch square, and representing actual product in color and texture

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and installer.

B. Qualification Data: For professional engineer.

C. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For glass-fiber-reinforced cementitious panels, including related accessories, to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least 5 years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least 5 years of documented experience.

C. Professional Engineer Qualifications: Professional engineer experienced with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the state in which Project is located.

D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical glass-fiber-reinforced cementitious panel assembly, approximately 10 feet by 10 feet, as shown on Drawings, including corner, soffits, supports, attachments, and accessories.

a. Include panel system, attachments to support framing, associated air/water barrier materials, weep drainage system, sealants and seals.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, glass-fiber-reinforced cementitious panels, and other manufactured items so as not to be damaged or deformed. Package glass-fiber-reinforced cementitious panel for protection during transportation, storage, and handling.

B. Unload, store, and erect glass-fiber-reinforced cementitious panel in a manner to prevent bending, warping, twisting, and surface damage.

C. Store glass-fiber-reinforced cementitious panels to ensure dryness, with positive slope for drainage of water. Do not store glass-fiber-reinforced cementitious panels in contact with other materials that might cause staining or other surface damage.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of glass-fiber-reinforced cementitious panels to be performed according to manufacturers' written instructions and warranty requirements.

1.11 COORDINATION

A. Coordinate glass-fiber-reinforced cementitious panels installation with flashing, trim, construction of soffits, and other adjoining work.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of glass-fiber-reinforced cementitious panels that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Excessive deflection.
    b. Structural failures including rupturing or cracking.
    c. Deterioration of panels and other materials beyond normal weathering.
    d. Noise and Vibration created by wind, thermal and structural movement.

2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide one of the following products:

1. TAKTL, LLC; TAKTL Standard Panel: www.taktl-llc.com.
2. Or approved equal.

2.2 PERFORMANCE REQUIREMENTS

A. General: Glass-fiber-reinforced cementitious panel assemblies, including cleats, anchors, and fasteners, shall withstand structural movement, thermally induced movement without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed Glass-fiber-reinforced cementitious panel assemblies shall not rattle or loosen.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design glass-fiber-reinforced cementitious panel assemblies.

C. Glass-fiber-reinforced cementitious panel assemblies shall be designed to accommodate movement due to wind loads, thermal and structural movement, and interstory drift; within the panels, steel support framing and the building.

D. Glass-fiber-reinforced cementitious panel assemblies shall be designed to prevent noise or vibration created by wind and thermal and structural movements.

E. Glass-fiber-reinforced cementitious panel assemblies shall be designed to prevent loosening or weakening of fasteners, attachments, and other components.

F. Glass-fiber-reinforced cementitious panel assemblies shall be designed to maintain panel integrity and prevent micro-cracks and fissures within the panels due to fastener attachments, movement due to wind loads, thermal and structural movement, interstory drift, weathering, or any other outside influences.

G. Structural Performance: Provide glass-fiber-reinforced cementitious panel assemblies capable of withstanding the effects of the following loads, based on testing according to ASTM E330:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits:

    a. Deflection Normal to Panel Plane: Limited to edge of panel in a direction perpendicular to panel plane not exceeding L/240 of the panel edge length for each panel or an amount that restricts edge deflection of individual panels to manufacturer's product limitations, whichever is less
    b. Deflection Parallel to Panel Plane: Limited to L/360 of clear span or 1/8 inch, manufacturer's product limitations, whichever is smaller.
    c. Cantilever Deflection: Where framing members overhang an anchor point, limit deflection to 2 times the length of cantilevered member divided by 175, or manufacturer's product limitations, whichever is smaller.
    d. Maximum Panel Deflection: 1/240 of span or less when tested in accordance with positive and negative pressures.

H. Thermal Movements: Provide for in-plane thermal movements resulting from annual ambient temperature changes of 120 deg F.

I. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.

2.3 GLASS-FIBER-REINFORCED CEMENTITIOUS PANELS

A. Glass-Fiber-Reinforced Cementitious Panels: Manufacturer's standard high performance concrete panels manufactured from portland cement, micro aggregates, alkali-resistant glass fibers and 2 layers of alkali-resistant glass fiber reinforcement mesh; including other additives as recommended by panel manufacturer. ASTM C1186, Tyupe A, Grade IV.

1. Panel Sizes:

    a. Panel Sizes: As indicated on Drawings.
    b. Panel Thickness: 5/8 inch, unless otherwise indicated on Drawings or recommended by panel manufacturer for application and conditions indicated on Drawings.
    c. Edges: Square unless otherwise indicated on Drawings.

2. Panel Color: To match TAKTL Select; Titanium 63.
3. Panel Texture: To match TAKTL smooth finish.
4. Physical Properties:

    a. Panel Density: 137 lb/cu ft, minimum; ASTM C1185.
    b. Compressive Strength: 12,000 psi, minimum: ASTM C873

c. Flexural Panel Strength: ASTM C1185.

1) Wet; 3,800 psi, minimum, in long direction, 3, 400 psi, minimum, in short direction.
2) Dry; 3,800 psi, minimum, in long direction, 3, 600 psi, minimum, in short direction.

d. Tensile Strength: 1,319 psi, minimum; ASTM C496.
e. Freeze/Thaw: Pass. No visible cracks and not less than 90% post-exposure strength retention. ASTM C1185.
f. Water Absorption: Less than 4 percent; ASTM C1185.
g. Flammability:

1) Non-combustible per ASTM E136.
2) Smoke and Flame Spread: Class A per ASTM E84

a) Smoke Developed Index: 0
b) Flame Spread Index: 0.

h. Impact Test: Complies with ASTM C1629; Level 3 for Soft and Hard Body.
i. Anchor Pullout Strength: ASTM E488.

1) Tension Peak Load: 520 lbf, minimum.
2) Shear Peak Load: 890 lbf, minimum.

j. Colorfastness and Weathering: 500 hours; ASTM G155-05a and D2244-09a.

1) 2.07 delta E. without coating.

k. Impermeable, chloride, and carbonation resistant.

5. Appearance: Surface imperfections not readily visible when viewed from a right angle from twenty feet away under normal daylight conditions are acceptable.
6. Attachment Method: Visible fasteners

a. Predrill panels for fasteners.

2.4 SUPPORT FRAMING

A. Refer to Section 05 1200 - Structural Steel and Metal Fabrications.

2.5 ACCESSORIES

A. Mounting Hardware: Provide all related fasteners and hardware required for a complete installation at substrates indicated.

B. Fasteners: Panels shall be attached to support assembles with visible fasteners.

1. Self-drilling Type 304 austenitic stainless steel fasteners with powder-coated button heads to match panel colors.

a. Visible Fasteners: Complies with AISI 905.

1) Tension Load: 740 lbf, minimum.
2) Shear Load: 1620 lbf, minimum.

C. Miscellaneous Trim and Accessories: Provide all trim and accessories required for a complete installation.

2.6 FABRICATION

A. Fabricate wall panels and accessory items in accordance with manufacturers' recommendations.

B. Panels shall be fabricated to size, with all fastener anchor holes factory-drilled by the panel manufacturer where practical.

C. Field-cut panels and drill face-fastening anchor holes in accordance with the panel manufacturer's written directions.

D. Fabricate all panels to profiles, colors and textures per samples and approval selected by the Architect.

2.7 FABRICATION TOLERANCES

A. Manufacturing Tolerances: Manufacture panels so each finished unit complies with the following dimensional tolerances.

1. Overall Height and Width of Units, Measured at the Face of Panel: plus or minus 1/16 inch.
2. Weight of finished panels not to exceed 7.4 psf
3. Texture and Reveal Depth: Maximum 1/8 inch.
4. Thickness: 5/8 inch, plus or minus 1/16 inch.
5. Variation from Square or Designated Skew (Difference in Length of Two Diagonal Measurements): Plus, or minus 1/16 inch per 72 inches or plus or minus 1/8-inch total, whichever is greater.
6. Local Smoothness: 1/8 inch per 10 feet.
7. Pre-drilled anchor location: Plus or minus 1/16 inch

B. Position Tolerances: Cladding Installation and Enclosure Fabricators comply with tolerances Measured from datum line locations, as indicated on Shop Drawings.

1. Bowing: Not to exceed L/240 unless unit complies with erection tolerances using connection adjustments. Flatness measured as installed (not panel alone)
2. Length and Width of Block Outs and Openings within One Unit: Plus or minus 1/4 inch.
3. Location of Window Opening within Panel: Plus or minus 1/4 inch.
4. Maximum Permissible Warpage of One Corner out of the Plane of the Other Three: 1/16 inch per 18 inches of distance from nearest adjacent corner.
5. Position Tolerances: Panel Alignment: Plus or minus 1/8 inch.
6. Special Handling Devices: Plus or minus 3 inches.
7. Location of Bearing Devices: Plus or minus 1/16 inch.
8. Cutouts: Plus or minus 3/8 inch.

C. Color Variation and Aggregate Distribution Variation Acceptance Criteria: Per manufacturer's tolerances and acceptance criteria.

D. Blemishes and Chips Acceptance Criteria: Per manufacturer's tolerances and acceptance criteria.

E. Acceptance of installed panels shall be assessed when viewed from a distance of 20 feet., under even light, and from a position 90 degrees to the building elevation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work. Examine supporting structural frame and conditions for compliance with requirements for installation tolerances, and other conditions affecting performance of the Work

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install glass-fiber-reinforced cementitious panels in accordance with manufacturer's instructions.

1. Locate and space fasteners in uniform vertical and horizontal alignment.

B. Attach glass-fiber-reinforced cementitious panels to supports at locations, spacings, and with fasteners recommended by manufacturer to achieve performance requirements specified.

C. Install glass-fiber-reinforced cementitious panels in locations indicated.

D. Install glass-fiber-reinforced cementitious panels level and plumb.

3.3 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align glass-fiber-reinforced cementitious panels within installed tolerance of 1/4 inch in 20 feet, non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles. And as follows:

1. Maximum Joint Taper in 10 Feet: 1/8 inch for 1/2" inch joint.
2. Differential Bowing, as Erected, between Adjacent Panels: 1/4 inch.

3.4 CLEANING

A. Clean glass-fiber-reinforced cementitious panels in accordance with manufacturer's instructions

3.5 PROTECTION AND REPAIRS

A. Protect glass-fiber-reinforced cementitious panels from subsequent construction operations.

B. Replace glass-fiber-reinforced cementitious panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 4400

SECTION 07 5300 – EPDM MEMBRANE ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Ethylene-propylene-diene-monomer (EPDM) roofing assembly; fully adhered. Including, but not limited to, the following:

    a. Substrate board.

1.3 ABBREVIATIONS

A. EPDM: Ethylene-propylene-diene-monomer.

1.4 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.5 PREINSTALLATION MEETINGS

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

1. Meet with Owner, Architect, Construction Manager, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing assembly manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing assembly.
7. Review temporary protection requirements for roofing assembly during and after installation.
8. Review roof observation and repair procedures after roofing installation.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For insulation and roof assembly component fasteners, include copy of FM Approvals' RoofNav listing.

B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:

1. Layout and thickness if insulation.
2. Base flashings and membrane terminations.
3. Flashing details at penetrations.

C. Samples for Verification: Submit three samples 4 by 4 inches in size for each of the following:

1. Roof membrane and flashings of color required.
2. Substrate board

D. Wind Uplift Resistance Submittal: For roofing assembly, indicating compliance with wind uplift performance requirements.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing assembly complies with requirements specified in "Performance Requirements" Article.

a. Submit evidence of complying with performance requirements.

C. Product Test Reports: For components of roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.

D. Evaluation Reports: For components of roofing assembly, from ICC-ES.

E. Field Test Reports:

F. Field quality-control reports.

G. Sample Warranties: For manufacturer's special warranties.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing assembly to include in maintenance manuals.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 5 years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience, and approved by manufacturer.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing assembly manufacturer. Protect stored liquid material from direct sunlight.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.11 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing assembly to be installed according to manufacturer's written instructions and warranty requirements.

1.12 WARRANTY

A. Special Manufacturer’s Warranty: Manufacturer agrees to repair or replace components of roofing assembly that fail in materials or workmanship within specified warranty period.

1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, substrate board, and other components of roofing assembly.
2. Warranty Period: 20 years from Date of Substantial Completion.

B. Special Installer’s Project Warranty: Submit roofing Installer's warranty, signed by Installer, covering the Work of this Section, including all components of roofing assembly such as roof membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, and walkway products, for the following warranty period:

1. Warranty Period: Two years from Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Roof Assembly shall be provided by one of the following:

1. Carlisle SynTec Systems; www. carlislesyntec. com.
2. Firestone Building Products; www. firestonebpco. com.
3. Johns Manville; www. jm. com.

B. Source Limitations: Obtain components for roofing assembly from one roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.

2.2 ROOFING ASSEMBLY - GENERAL

A. Single-ply membrane roofing assembly consisting of the following:

1. EPDM single-ply roof membrane; fully adhered.
2. Substrate board; mechanically fastened.

2.3 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing assembly and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and flashings shall remain watertight.

1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746, ASTM D4272, or the Resistance to Foot Traffic Test in FM Approvals 4470.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

C. Completed roofing shall contain no wrinkles of such size as to restrict roof drainage.

D. Comply with Factory Mutual (FM) Global and FM Approvals' RoofNav Listing requirements as follows:

1. Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals FM 4450 or FM Approvals FM 4470 as part of a roofing assembly, and shall be listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.

a. Fire/Windstorm Classification: Class 1A-90.
b. Hail-Resistance Rating: SH.

2. Comply with the following Property Loss Prevention Data Sheets:

a. Data Sheet FM DS 1-28: Wind Design.
b. Data Sheet FM DS 1-29: Roof Deck Securement and Above-Deck Roof Components.
c. Data Sheet FM DS 1-49: Perimeter Flashing.

2.4 ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

A. EPDM Sheet: ASTM D4637/D4637M, Type II, scrim or fabric internally reinforced, EPDM sheet with factory-applied seam tape.

1. Thickness: 60 mils, nominal.
2. Exposed Face Color: Black.

2.5 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing assembly manufacturer for intended use and compatible with other roofing components.

1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.

B. Sheet Flashing: 60-mil-thick EPDM, partially cured or cured, according to application.

C. Bonding Adhesives: Manufacturer's standard.

D. Seaming Material: Factory-applied seam tape, width as recommended by manufacturer.

E. Lap Sealant: Manufacturer's standard, single-component sealant, colored to match membrane roofing.

F. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.

G. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

H. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening components to substrate, and acceptable to roofing assembly manufacturer.

I. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, molded pipe boot flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

2.6 SUBSTRATE BOARDS

A. Substrate Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum board or ASTM C1278/C1278M, fiber-reinforced gypsum board.

1. Thickness: 1/2 inch.

2. Surface Finish: Factory primed or unprimed.
3. Products: Subject to compliance with requirements, provide one of the following:

    a. Georgia-Pacific Gypsum: DensDeck Prime Roof Board: www. gp. com.
    b. National Gypsum Company; DEXcell Brand FA Glass Mat Roof Board: www. nationalgypsum. com.
    c. United States Gypsum Co.; USG Securock Brand Gypsum-Fiber Roof Board; www. usg. com.

A. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate panel to roof deck.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 05 3100 "Steel Decking."

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing assembly installation according to roofing assembly manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 INSTALLATION OF ROOFING, GENERAL

A. Install roofing assembly according to roofing assembly manufacturer's written instructions and FM Approvals' RoofNav assembly requirements.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing assembly at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.4 INSTALLATION OF SUBSTRATE BOARD

A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches in adjacent rows.

1. At steel roof decks, install substrate board at right angle to flutes of deck.

    a. Locate end joints over crests of steel roof deck.

2. Tightly butt substrate boards together.
3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.

4. Fasten substrate board to top flanges of steel deck according to roofing assembly manufacturers' written instructions and recommendations in FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29.

3.5 INSTALLATION OF ADHERED ROOF MEMBRANE

A. Adhere roof membrane over area to receive roofing according to roofing assembly manufacturer's written instructions.

B. Unroll membrane roof membrane and allow to relax before installing.

C. Start installation of roofing in presence of roofing assembly manufacturer's technical personnel.

D. Accurately align roof membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

E. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.

F. Apply roof membrane with side laps shingled with slope of roof deck where possible.

G. Factory-Applied Seam Tape Installation: Clean and prime surface to receive tape.

1. Firmly roll side and end laps of overlapping roof membrane to ensure a watertight seam installation.
2. Apply lap sealant and seal exposed edges of roofing terminations.

H. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

I. Spread sealant or mastic bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.6 INSTALLATION OF BASE FLASHING

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing assembly manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.7 FIELD QUALITY CONTROL

A. Require site attendance of roof assembly manufacturer daily during installation of the Work.

B. Final Roof Inspection: Arrange for roof assembly manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.

C. Repair or remove and replace components of roofing assembly where inspections indicate that they do not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements

3.8 PROTECTING AND CLEANING

A. Protect roofing assembly from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing assembly, inspect roofing assembly for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing assembly that does not comply with requirements, repair substrates, and repair or reinstall roofing assembly to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 5300

SECTION 07 6200 – SHEET METAL FLASHING AND TRIM

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. Roof edge.
2. Flashings.
3. Counterflashings.
4. Other items as indicated on Drawings.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following

1. Sealants.
2. Seam sealer.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of special conditions.
10. Include details of connections to adjoining work.

C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.

1. Where colors and finishes are not specified, submit 3 sets of color and finish selection charts or chips

D. Samples for Verification: For each type of exposed finish. Submit at least three samples of each of the following:

1. Sheet Metal Flashing: 12 inches long 12 inches long and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator and installer.

B. Product Certificates: For each type of coping and roof edge flashing that is ANSI/SPRI/FM 4435/ES-1 tested.

C. Evaluation Reports: For copings and roof edge flashing, from ICC-ES or other agency acceptable to authority having jurisdiction showing compliance with ANSI/SPRI/FM 4435/ES-1.

D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.7 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 ANSI/SPRI/FM 4435/ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.
2. Fabricator shall be a company specializing in sheet metal work with 5 years of documented experience.

B. Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockup of typical roof edge, including fascia, approximately 10 feet long, including supporting construction cleats, seams, attachments, and accessories.
2. Build mockup of typical wall flashing with counterflashing, approximately 10 feet long, including supporting construction cleats, seams, attachments and accessories.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

2. Protect stored sheet metal flashing and trim from contact with water.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.9 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. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with 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 copings and roof edge flashings tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressure:

1. Design Pressure: As indicated on Drawings.

D. FM Approvals Listing: Manufacture and install copings and roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with name of fabricator and design approved by FM Approvals.

E. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standards, and by Data Sheet FM DS 1-49: Perimeter Flashing, for application, but not less than thickness of metal being secured.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

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

G. Gutters and Downspouts: Size for rainfall intensity determined by a storm occurrence of 1 in 10 years in accordance with SMACNA's "Architectural Sheet Metal Manual," and not less than that indicated on Drawings.

2.2 SHEET METALS

A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B209 (ASTM B209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.

1. Aluminum Sheet Thickness: Not less than 0.032 inches (20 gage).
2. Exposed Coil-Coated Finish:

    a. Two or Three Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish, with suspended mica or metallic flakes as required for selected color, containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coats and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

3. Color: Dark Bronze to match Architect's sample.
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

C. Stainless Steel Sheet: ASTM A240/A240M, Type 304, dead soft, fully annealed; with smooth, flat surface.

1. Stainless Steel Sheet Thickness: Not less than 0.025 inches (24 gage).
2. Finish: ASTM A480/A480M, No. 2D (dull, cold rolled).

    a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

2.3 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

    a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
    b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.

C. Solder:

1. For Stainless Steel: ASTM B32, Grade Sn96, with acid flux of type recommended by stainless steel sheet manufacturer.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.

2.4 FABRICATION, GENERAL

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.

1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified.
3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
6. Fabricate in minimum 96-inch-long lengths, but not exceeding 12-foot-long sections

B. Materials: Unless otherwise indicated on Drawings, use the following materials:

1. Fabricate sheet metal flashing and trim from aluminum sheet in areas exposed to public view.
2. Fabricate sheet metal flashing and trim from stainless steel sheet in areas concealed from public view.

C. Fabrication Tolerances:

1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

D. 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.

E. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

H. Seams:

1. 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.
2. At Contractor's option for stainless steel: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

I. Do not use graphite pencils to mark metal surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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. Provide one of the following unless otherwise indicated on Drawings, but not less than that required to comply with performance requirements.

    a. Install continuous cleats with fasteners spaced not more than 12 inches o.c.
    b. Space individual cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.

6. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
7. Do not field cut sheet metal flashing and trim by torch.
8. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum and stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.

1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
3. Use lapped expansion joints only where indicated on Drawings.

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.

1. Use sealant-filled joints unless otherwise indicated.

a. Embed hooked flanges of joint members not less than 1 inch into sealant.
b. Form joints to completely conceal sealant.
c. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way.
d. Adjust setting proportionately for installation at higher ambient temperatures.

1) Do not install sealant-type joints at temperatures below 40 deg F.

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.

1. Pretin edges of sheets with solder to width of 1-1/2 inches; however, reduce pretinning where pretinned surface would show in completed Work.
2. Do not solder aluminum sheet.
3. Do not use torches for soldering.
4. Heat surfaces to receive solder, and flow solder into joint.

a. Fill joint completely.
b. Completely remove flux and spatter from exposed surfaces.

5. Stainless Steel Soldering:

a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
b. Promptly remove acid-flux residue from metal after tinning and soldering.
c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

3.3 INSTALLATION OF ROOF FLASHINGS

A. Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard.

1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.

1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
2. Extend counterflashing 4 inches over base flashing.
3. Lap counterflashing joints minimum of 4 inches.

4. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.

C. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with butyl sealant and clamp flashing to pipes that penetrate roof.

3.4 INSTALLATION OF WALL FLASHINGS

A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.5 INSTALLATION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 CLEANING

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.

3.7 PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

C. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 07 6200

SECTION 07 9200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:

1. Silicone joint sealants.
2. Latex joint sealants.
3. Joint backings and accessories.

B. Related Sections include the following:

1. Section 08 8000 - Glazing: For glazing sealants.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency, installer, and manufacturer.

B. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.

C. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 5 years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least 5 years of documented experience.

C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1. In addition, provide other sealant mockups not part of an assembly specified in other Sections when requested by the Architect.

a. Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
b. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.6 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with installation, 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 manufacturing requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range, unless otherwise indicated.

2.2 PERFORMANCE REQUIREMENTS

A. Provide exterior joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

2.3 SILICONE JOINT SEALANTS

A. Silicone, Nonstaining – JS1:

1. ASTM C920, Type S, Grade NS, Class 50; Uses NT, A, G, M and O.

2. Non-Staining: No staining of substrates when tested according to ASTM C1248.
3. Cure Type: Single-component, neutral-curing.
4. Hardness Range: Comply with one of the following:

   a. 15 to 35, Shore A, when tested in accordance with ASTM C661.
   b. 25 to 35, Shore A, when tested in accordance with ASTM D2240.

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

   a. Dow Corning Corporation; 756 SMS Building Sealant: www.dowcorning.com.
   b. Momentive Performance Materials, Inc./GE; SCS9000 SilPruf NB: www.siliconeforbuilding.com.
   c. Pecora Corporation; 890NST: www.pecora.com.
   d. Sika Corporation; Sikasil WS-295 FPS: www.usa.sika.com.
   e. Tremco, Inc.; Spectrem 3: www.tremcosealants.com.

B. Silicone, Traffic Grade – JS2:

1. ASTM C920, Type S, Grade NS, Class 100/50; Uses T, M, and O.
2. Cure Type: Single-component, neutral-curing.
3. Hardness Range: Comply with one of the following:

   a. 5 to 15, Shore A, when tested in accordance with ASTM C661.
   b. 50 to 85, Shore 00, when tested in accordance with ASTM D2240.

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

   a. Dow Corning; NS Parking Structure Sealant: www.dowcorning.com.
   b. Pecora Corporation; 311NS: www.pecora.com.
   c. Sika Corporation; Sikasil - 728 NS: www.usa.sika.com.
   d. Tremco, Inc.; Spectrem 800: www.tremcosealants.com.

2.4 LATEX JOINT SEALANTS

A. Acrylic Latex – JS3:

1. Acrylic latex or siliconized acrylic latex
2. ASTM C834, Type OP, Grade NF or Minus 18 Degrees C (0 Degrees F).
3. Products: Subject to compliance with requirements, provide one of the following:

   a. Bostik, Inc.; PWC; www.bostik.com.
   b. Franklin International Inc; Titebond Painter's Plus Caulk: www.titebond.com.

c. Pecora Corporation; AC-20 +Silicone: www.pecora.com.
d. Sherwin Williams; 950A Siliconized Acrylic Latex Caulk: www.sherwin-williams.com.
e. Tremco, Inc.; Tremflex 834: www.tremcosealants.com.

2.5 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 C1330, Type C (closed-cell material with a surface skin) or Type B (bicellular material with a surface skin) as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include, but are not limited to, the following:

a. Concrete.

b. Masonry.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include, but are not limited to, the following:

a. Metal.
b. Glass.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated or recommended by sealant manufacturer.

a. Use masking tape to protect surfaces adjacent to tooled joints.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.

1. Excludes joints in paved roads, parking lots, walkways, and curbing specified in Division 32.
2. Joint Locations:

    a. Isolation and contraction joints in cast-in-place concrete slabs.
    b. Joints between different materials listed above.
    c. Other joints as indicated on Drawings.

3. Joint Sealant: Silicone, Traffic-Grade – JS2.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

    a. Construction joints in cast-in-place concrete.
    b. Control and expansion joints in masonry.
    c. Joints between metal panels.
    d. Joints between different materials listed above.
    e. Perimeter joints between materials listed above and door frames and storefront framing.
    f. Control and expansion joints in soffits and other overhead surfaces.
    g. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, Nonstaiing – JS1.

C. 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 tile flooring.
    c. Control, expansion, contraction, and isolation joints in other horizontal traffic surfaces.
    d. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, Traffic-Grade – JS2.

D. Joint-Sealant Application: Interior latex joints in vertical surfaces and horizontal nontraffic surfaces in the following locations.

1. Joint Locations:

a. Vertical joints on exposed surfaces of masonry and concrete walls and partitions.
b. Control, expansion, contraction, and isolation joints in vertical and horizontal nontraffic surfaces.
c. Perimeter joints between wall surfaces and frames of doors, sidelights and borrowed lights.

1) Excludes exterior aluminum door frames and storefront framing.

d. Other joints as indicated on Drawings.

2. Joint Sealant: Acrylic Latex – JS3.

E. Joint-Sealant Application: Interior silicone joints in vertical surfaces and horizontal nontraffic surfaces in the following locations.

1. Joint Locations:

a. Perimeter joints of exterior aluminum door frames and storefront framing.
b. Tile control and expansion joints.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, Nonstaining – JS1.

END OF SECTION 07 9200

SECTION 08 4113 – ALUMINUM-FRAMED STOREFRONTS

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. Aluminum-framed storefront systems.

    a. Includes: Swing doors.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

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

B. Shop Drawings: For aluminum-framed 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 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.

C. Samples for Initial Selection: For each type of factory-applied finishes.

1. Where colors and finishes are not specified, submit 3 sets of color and finish selection charts or chips

D. Samples for Verification: For each type of exposed finish. Submit at least three samples of each of the following:

1. Submit three samples for each finish specified, not less than 6 inches square or 6 inches long for linear components.
2. Submit three samples of infill panels for each color and finish, not less than 6 inches square.

E. Delegated-Design Submittal: For aluminum-framed 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.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and installer.

B. Qualification Data: For professional engineer.

C. Professional Engineer Qualifications: Professional engineer experienced with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the state in which Project is located.

D. Energy Performance Certificates: For aluminum-framed storefronts, accessories, and components, from manufacturer.

1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed storefront.

E. Product Test Reports: For aluminum-framed storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.

F. Field quality-control reports.

G. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

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

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than 5 years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least 5 years of documented experience.

C. Testing Agency Qualifications: Qualified in accordance with ASTM E699 for testing indicated and acceptable to Owner and Architect.

D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

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.

1.8 MOCKUPS

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. For each type of aluminum-framed storefront, build mockup of typical wall area as shown on Drawings.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed 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 and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty, 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 in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Thermally Broken Storefront Products:

1. Basis of Design Product: Subject to compliance with requirements, provide Kawneer North American, an Arconic company; Trifab VG 451T Framing System: www.kawneer.com, or one of the following comparable products:

a. EFCO Corporation, an Apogee Enterprises, Inc. company; Series 433: www.efcocorp.com.
b. Oldcastle BuildingEnvelope; Series 3000 Thermal Multiplane: www.obe.com.
c. Tubelite Inc, an Apogee Enterprises, Inc. company; 14000 / 14000-I/O Series: www.tubeliteinc.com.
d. Wausau Window and Wall Systems, an Apogee Enterprises, Inc. company; T1400 Series: www.wausauwindow.com.
e. YKK AP America, Inc.; YES 45 TU: www.ykkap.com.

B. Swing Door Manufacturers:

1. Any of the manufacturers specified for storefront products.

C. Source Limitations: Obtain all components of aluminum-framed storefront system, including framing, doors and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed 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 Supporting Glass: At design wind load, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches.
2. Deflection Parallel to Glazing Plane: Limited to [amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than **1/8 inch**.

E. Structural: Test in accordance with ASTM E330 as follows:

1. When tested at positive and negative wind-load design pressures, storefront assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including 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. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 8 lbf/sq. ft..

G. Energy Performance: Certified and labelled by manufacturer for energy performance as follows:

1. Thermal Transmittance (U-factor):

a. Fixed Glazing and Framing Areas: U-factor for the system of not more than 0.42 Btu/sq. ft. x h x deg F as determined in accordance with NFRC 100.

2. Air Leakage:

a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft. when tested in accordance with ASTM E283.

3. Condensation Resistance Factor (CRF):

a. Fixed Glazing and Framing Areas: CRF for the system of not less than 60 as determined in accordance with AAMA 1503.

H. 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.

2.3 ALUMINUM-FRAMED STOREFRONT SYSTEMS

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Storefront System:

a. Framing Profile: 2 by 4-1/2 inches, nominal.
b. Framing Construction: Thermally broken.
c. Glazing System: Retained mechanically with gaskets on four sides.
d. Glazing Plane: Front.
e. Finish: Color anodic finish.
f. Fabrication Method: Field-fabricated stick system.
g. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
h. Steel Reinforcement: As required by manufacturer.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.4 SWING DOORS

A. Swing Doors: Manufacturer’s standard glazed aluminum doors.

1. Style: Wide style.

a. Top Rail: 5 inches wide.
b. Vertical Stiles: 5 inches wide.
c. Bottom Rail: 10 inches wide.

2. Thickness: 1-3/4 inches.
3. Glazing Stops: Square.
4. Finish: Match adjacent aluminum-framed storefront finish.

B. Hardware:

1. For each door, include manufacturer's standard weatherstripping and sill sweep strip.

a. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
b. Sill Sweep Strips: Resilient seal type, of neoprene; provide on all doors.

2. Other Door Hardware: As specified in Section 08 7100 – Door Hardware.

2.5 GLAZING

A. Glazing: Refer to Section 08 8000- Glazing.

2.6 MATERIALS

A. Sheet and Plate: ASTM B209.

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.

C. Structural Profiles: ASTM B308/B308M.

D. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A36.
2. Cold-Rolled Sheet and Strip: ASTM A1008.
3. Hot-Rolled Sheet and Strip: ASTM A1011.

E. Steel Reinforcement 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 in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.

2.7 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.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system, fabricated from 300 series stainless steel.

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 A123 or ASTM A153 requirements.

C. Concealed Flashing: Dead-soft, 0.018-inch-thick stainless steel, complying with ASTM A240, of type recommended by manufacturer.

D. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.

E. Rigid PVC Filler.

2.8 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 exterior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Storefront Framing: Fabricate components for assembly using shear-block system or screw-spline system.

1. Provide head and sill receptors as indicated on Drawings and as recommended by manufacturer.

F. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

2.9 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

1. Color: Dark bronze.

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 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions.

B. Do not install damaged components.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure nonmovement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Seal perimeter and other joints watertight unless otherwise indicated.

G. 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.

H. Set continuous sill members and flashing in full sealant bed, as specified in Section 079200 "Joint Sealants," to produce weathertight installation; unless otherwise recommended by aluminum-framed storefront manufacturer.

I. Install joint filler behind sealant as recommended by sealant manufacturer.

J. Install components plumb and true in alignment with established lines and grades.

3.3 INSTALLATION OF GLAZING

A. Install glazing as specified in Section 08 8000 - Glazing.

3.4 INSTALLATION OF DOOR HARDWARE

A. Install door hardware as specified in Section 08 7100 – Door Hardware.

3.5 ERECTION TOLERANCES

A. Install aluminum-framed 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 inch wide, limit offset from true alignment to 1/16 inch.
    b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, 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; 1/2 inch over total length.

3.6 FIELD QUALITY CONTROL

A. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed storefronts.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested in accordance with AAMA 501.2 and shall not evidence water penetration.

    a. Perform testing prior to 10, 35, and 70 percent completion.

        1) At each stage of completion, perform a minimum of three tests in up to three areas as directed by Architect.

2. At Owner's discretion, engage testing agency to perform additional tests and inspections.

   a. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
   b. Frequency: For each major façade or elevation:

      1) Perform testing prior to 10, 35, and 70 percent completion.

         a) At each stage of completion, perform testing in up to three areas as directed by Architect.

   c. Testing to include the following:

      1) Air Leakage: ASTM E783 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 6.2 lbf/sq. ft.
      2) Water Penetration: ASTM E1105 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 8 lbf/sq. ft, and shall not evidence water penetration.

B. Aluminum-framed storefronts will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.7 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

3.8 CLEANING AND PROTECTION

A. Remove temporary protective coverings on completion of installation, clean finished surfaces, including removing unused fasteners and related installation materials. Maintain storefront systems in a clean condition during construction.

B. Replace portions of storefront systems that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 08 4113

SECTION 08 7100 - DOOR HARDWARE

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. Hardware for hollow metal, wood, aluminum, and FRP-faced aluminum doors.
2. Electrically operated and controlled hardware.
3. Cylinders for doors or locks specified in other Sections.

B. Door hardware set schedules included at end of this section.

1.3 REFERENCE STANDARDS

A. References:

1. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
2. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2004 (Reapproved 2012).
3. BHMA (CPD) - Certified Products Directory Current Edition.
4. BHMA A156.1 - American National Standard for Butts and Hinges 2016.
5. BHMA A156.19 - American National Standard for Power Assist and Low Energy Power Operated Doors 2013.
6. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches 2017.
7. BHMA A156.3 - American National Standard for Exit Devices 2014.
8. BHMA A156.4 - American National Standard for Door Controls - Closers 2013.
9. BHMA A156.5 - American National Standard for Cylinders and Input Devices for Locks 2014.
10. BHMA A156.6 - American National Standard for Architectural Door Trim 2015.
11. BHMA A156.7 - American National Standard for Template Hinge Dimensions 2016.
12. BHMA A156.8 - American National Standard for Door Controls - Overhead Stops and Holders 2015.
13. BHMA A156.16 - American National Standard for Auxiliary Hardware 2018.
14. BHMA A156.18 - American National Standard for Materials and Finishes 2016.
15. BHMA A156.21 - American National Standard for Thresholds 2014.
16. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems Sponsor 2017.
17. BHMA A156.28 - American National Standard for Recommended Practices for Mechanical Keying Systems 2018.
18. BHMA A156.31 - American National Standard for Electric Strikes and Frame Mounted Actuators 2013.
19. DHI (KSN) - Keying Systems and Nomenclature 1989.
20. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.
21. ITS (DIR) - Directory of Listed Products current edition.
22. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
23. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2019.
24. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
25. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives 2019.
26. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2017.
27. UL (DIR) - Online Certifications Directory Current Edition.
28. UL 1034 - Standard for Burglary-Resistant Electric Locking Mechanisms 2015.
29. UL 10B - Standard for Fire Tests of Door Assemblies Current Edition, Including All Revisions.

30. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.
31. UL 294 - Access Control System Units Current Edition, Including All Revisions.
32. UL 1784 - Standard for Air Leakage Tests of Door Assemblies Current Edition, Including All Revisions.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Attendance is required by affected installers and the following:

a. Architect.
b. Hardware Installer.
c. Owner's Security Consultant.

2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Inspect and discuss preparatory work performed by other trades.
4. Inspect and discuss electrical roughing-in for electrified door hardware.
5. Review sequence of operation for each type of electrified door hardware.
6. Review required testing, inspecting, and certifying procedures.
7. Review questions or concerns related to proper installation and adjustment of door hardware.

B. Electrified Hardware Coordination Conference:

1. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

C. Keying Requirements Meeting: Conduct conference at Project site.

1. Attendance is required by the following:

a. Owner.
b. Architect.
c. Hardware Installer.
d. Owner's Security Consultant.

2. Establish keying requirements. Incorporate conference decisions into keying schedule after reviewing door hardware keying system including, but not limited to, the following:

a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
b. Preliminary key system schematic diagram.
c. Requirements for key control system.
d. Requirements for access control.
e. Address for delivery of keys

1.5 COORDINATION

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

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

B. Shop Drawings: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.

1. List and describe each opening separately; include doors with identical hardware, except hand, in single heading. Include door number, room designations, degree of swing, and hand.
2. List hardware items; include manufacturer's name, quantity, product name, catalog number, size, base metal, finish, fasteners, and related details where applicable.
3. List related details; include dimensions, door and frame material and other conditions affecting hardware.
4. Electrified Door Hardware:

a. Submit diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:

1) Submit front and back elevations of each door opening showing electrified devices with connections installed.
2) Submit operations narrative describing how opening operates from either side at any given time.
3) Submit point-to-point wiring diagram that shows each device in door opening system with related colored wire connections to each device.

C. Samples for Verification: Provide upon Architect’s request; for each type of exposed product, in each finish specified.

1. Sample Size: Full-size units or minimum 2-by-4-inch Samples for sheet and 4-inch long Samples for other products.
2. Tag Samples with full product description to coordinate Samples with door hardware schedule.

D. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

E. Keying Schedule:

1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

1.7 INFORMATIONAL SUBMITTALS

A. Manufacturer's Qualification Statement.

B. Installer's Qualification Statement.

C. Architectural Hardware Consultant (AHC) inspection reports.

D. Product Certificates:

1. For each type of electrified door hardware.

2. Certify that door hardware for use on each type and size of labeled fire-rated doors complies with listed fire-rated door assemblies.

E. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.

F. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of door hardware to include in maintenance manuals.

B. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

C. Schedules: Final door hardware and keying schedule.

1.9 MAINTENANCE MATERIAL

A. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

1.10 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least five years of documented experience and approved by manufacturer, and shall have on staff an Architectural Hardware Consultant who is available during the course of the Work to consult Contractor, Architect, and Owner about door hardware and keying.

C. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as an Architectural Hardware Consultant (AHC) and an Electrified Hardware Consultant (EHC).

1.11 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.12 WARRANTY

A. Warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion.

1. Butt Hinges: One year, minimum.
2. Exit Devices and Trim: Three years, minimum.

a. Electrified Exit Device Components: One year, minimum.

3. Closers: Thirty years, minimum.
4. Overhead stops and holders: One year, minimum.
5. Automatic Operators: Two years, minimum.
6. Other Hardware: One year, minimum.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Provide door hardware products that comply with the following requirements:

1. Listed and certified compliant with specified standards by BHMA (CPD).
2. Applicable provisions of federal, state, and local codes.
3. Applicable provisions of NFPA 101.
4. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
5. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that complies with requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

    a. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg of water.

6. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

    a. Listed and classified by UL (DIR) as suitable for the purpose specified.
    b. Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection.

7. 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.
8. Accessibility: ADA Standards and ICC A117.1.

    a. 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.
    b. Comply with the following maximum opening-force requirements:

        1) Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
        2) Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
        3) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

    c. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
    d. 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.
    e. Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.

9. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.

D. Fasteners:

1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.

   a. Aluminum fasteners are not permitted.
   b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.

2. Fire-Rated Applications: Comply with NFPA 80.

2.2 BUTT HINGES

A. Basis-of-Design: Subject to compliance with requirements, provide products indicated in hardware sets or a comparable product from one of the following:

1. Bommer Industries, Inc: www.bommer.com.
2. Hager Companies: www.hagerco.com.
3. Ives; an Allegion company: www.us.allegion.com
4. McKinney; an Assa Abloy Group company: www.assaabloydss.com.
5. Stanley; a Dormakaba Group company: www.stanleyhardwarefordoors.com.

B. Butt Hinges: Comply with BHMA A156.1, Grade 1.

1. Templated Hinges: Comply with BHMA A156.7.
2. Provide hinge width as required to clear surrounding trim.
3. Provide butt hinges on every swinging door unless otherwise indicated.

   a. Provide five-knuckle full mortise butt hinges unless otherwise indicated.

      1) Provide ball-bearing hinges at each door.

   b. Provide stainless steel hinges at exterior doors.

      1) Provide non-removable pins at outswinging exterior doors.

   c. Provide heavy weight hinges at fire rated doors.

4. Provide following quantity of butt hinges for each door:

   a. Door Height - Up to 60 inches: Two hinges.
   b. Door Height - 60 to 90 inches: Three hinges.
   c. Door Height - 90 to 120 inches: Four hinges.
   d. Door Height - Over 120 inches: One additional hinge per each additional 30 inches in height.

5. For 1-3/4 inch thick doors, provide following butt hinge sizes:

   a. Doors up to 36 inches wide: 4-1/2 high x 4-1/2 wide.
   b. Doors 36 to 48 inches wide: 5 high x 4-1/2 wide.
   c. Doors over 48 inches wide: 6 high x 5 wide.

2.3 EXIT DEVICES

A. Basis-of-Design: Subject to compliance with requirements, provide products indicated in hardware sets or a comparable product from one of the following:

1. Sargent; an Assa Abloy Group company: www.assaabloydss.com.
2. Von Duprin; an Allegion company: www.us.allegion.com,

B. Exit Devices: Complying with BHMA A156.3, Grade 1.

1. Provide exit devices in functions as specified in hardware sets.
2. Lever Style: To match Von Duprin Style 07.

a. Provide vandal resistant outside trim.

3. Provide dogging on non-rated devices.

a. Hex key dogging.
b. Where indicated, provide cylinder dogging instead of hex key dogging.

4. Provide exit devices properly sized for door width and height.
5. Provide strike as recommended by manufacturer for application indicated.
6. Provide less bottom rod (LBR) at scheduled locations to eliminate use of floor mounted strikes.
7. Provide UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.
8. Where indicated, provide electrified exit devices that comply with above requirements and as follows:

a. Voltage: 24 VDC.

1) Provide power supplies by same manufacturer as exit devices.

b. Provide fail-secure exit devices unless otherwise indicated.
c. Provide electrified exit devices from same manufacturer as mechanical exit devices.
d. For electrical options, provide quick connect plug-in pre-wired connectors.

2.4 CYLINDERS AND CORES

A. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.

1. Provide small format interchangeable core (SFIC) type cylinders, Grade 1, with seven-pin core in compliance with BHMA A156.5.

a. Provide cylinders from same manufacturer as locking device.
b. Provide all cores from one supplier regardless of door type, locking device, and location.

1) Core manufacturer, brand, and model shall match Owner's existing products; key to existing keying system.

c. Provide cams and/or tailpieces as required for locking devices.

2. Construction Cores:

a. Provide disposable or keyed construction cores for use during construction period.

1) Prior to Owner occupancy and near the end of the construction period, replace construction cores with permanent cores.

2.5 KEY CONTROL SYSTEMS

A. Manufacturers:

1. Key control system manufacturer shall be the same as the core manufacturer.

B. Key Control Systems: Complying with guidelines of BHMA A156.28.

1. Provide keying information in compliance with DHI (KSN) standards.

2. Hardware Supplier shall meet with Owner to finalize master keying system requirements and obtain any special keying instructions.
3. Keying: Grand master keyed.
4. Include keying of construction cores.
5. Supply keys in following quantities:

    a. Change Keys per cylinder or keyed alike group; 3.
    b. Master Keys; 2 per master key group.
    c. Grand Master Key; 2 per grand master key group.
    d. Construction Core Keys per cylinder or keyed alike group; 2.

2.6 DOOR PULLS AND PUSH BARS

A. Basis-of-Design: Subject to compliance with requirements, provide products indicated in hardware sets or a comparable product from one of the following:

1. DORMA USA, Inc.; a Dormakaba Holding Inc. company; www.dorma.com.
2. Hager Companies: www.hagerco.com.
3. Ives, an Allegion company: www.allegion.com/us.
4. Rockwood; an Assa Abloy Group company: www.assaabloydss.com.
5. Trimco: www.trimcohardware.com.

B. General:

1. Material: Stainless steel, unless otherwise indicated.
2. Bar Size: 1 inch round, unless otherwise indicated.
3. Mounting: Provide back-to-back bar mounting or decorative thru-bolt at non back-to-back locations, unless otherwise indicated.

    a. Decorative blind thru-bolt shall be similar to Ives Type O Mount.

C. Door Offset Pull: Complying with BHMA A156.6.

1. Pull Type: Offset pull bar.
2. Center to Center Size: 10 inches.
3. Mounting: Decorative blind thru-bolt similar to Ives Type O Mount.

2.7 CLOSERS

A. Basis-of-Design: Subject to compliance with requirements, provide products indicated in hardware sets or a comparable product from one of the following:

1. LCN; an Allegion company: www.us.allegion.com
2. Sargent; an Assa Abloy Group company: www.assaabloydss.com.

B. Closers: Complying with BHMA A156.4, Grade 1.

1. Type: Surface mounted to door; heavy duty.
2. Provide closers for fire-rated doors in compliance with UL 10C.
3. Comply with ICC A117.1 accessibility standards.
4. Provide metal covers.
5. Provide closers with adjustable swing speed, latching speed, and backcheck features.
6. Provide mounting brackets, drop plates, and any other associated hardware or accessories required by door and frame conditions.
7. Provide rust inhibiting coating on closers at the following locations:

    a. Exterior doors.
    b. Other doors as indicated.

8. Provide door closers on the following doors:

    a. Each exterior door.
    b. Each fire-rated and smoke-rated door.
    c. Other doors as indicated.

9. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.
10. Mounting locations: Mount closers as follows:

    a. At corridor entry doors, mount closer on room side of door.
    b. At exterior doors, mount closer on interior side of door.

2.8 LOW ENERGY AUTOMATIC DOOR OPERATORS

A. Basis-of-Design: Subject to compliance with requirements, provide products indicated in hardware sets or a comparable product from one of the following:

1. Assa Abloy Group: www.assaabloyentrances.us.
2. LCN; an Allegion company: www.us.allegion.com

B. Provide surface-applied electrohydraulic door operator; power opened and spring-action closed.

1. Complying with BHMA A156.19, Grade 1.
2. Complying with ICC A117.1 accessibility standards.
3. Complying with UL 10C at fire-rated doors.
4. Provide operators with adjustable opening speed, opening force, and timing.
5. Provide operators with easily accessible on-off switch and hold open function.
6. Provide mounting brackets and any other associated hardware or accessories required by door and frame conditions.
7. Electrical:

    a. Input Power: 120 VAC at 1.5 amps.
    b. Onboard Low-Voltage Supply: 24 VDC at 1 amp.

C. Provide surface-applied electromechanical door operator; power opened and power closed.

1. Complying with BHMA A156.19, Grade 1.
2. Complying with ICC A117.1 accessibility standards.
3. Complying with UL 10C at fire-rated doors.
4. Provide operators with programmable functions including, but not limited to, opening and closing speed, backcheck speed and position, and timing.
5. Provide operators with auto reverse safety feature which will reverse the door's swing direction if it comes into contact with an object during opening or closing.
6. Provide mounting brackets and any other associated hardware or accessories required by door and frame conditions.
7. Electrical:

    a. Input Power: 120 VAC.
    b. Onboard Low-Voltage Supply: 24 VDC.

D. Actuator Controls:

1. Manufacturers:

    a. Actuator controls manufacturer shall be the same as the automatic door operator manufacturer.

2. Wall Mounted Push Plate:

    a. Type: Flush mounted; hard-wired, low voltage.
    b. Size: 4-3/4 inches square, nominal.
    c. Push Plate: Stainless steel with blue-filled handicap symbol and engraved "Push to Open" text.
    d. Weather and vandal resistant.

3. Jamb Mounted Push Plate:

    a. Type: Flush mounted; hard-wired, low voltage.
    b. Size: 1-1/2 inches wide by 4-3/4 inches high, nominal.
    c. Push Plate: Stainless steel with blue-filled handicap symbol and engraved "Push to Open" text.
    d. Weather and vandal resistant.

2.9 OVERHEAD STOPS AND HOLDERS

A. Basis-of-Design: Subject to compliance with requirements, provide products indicated in hardware sets or a comparable product from one of the following:

1. Architectural Builder's Hardware Mfg. Inc.: www.abhmfg.com.
2. Hager Companies: www.hagerco.com.
3. DORMA USA, Inc.; a Dormakaba Holding Inc. company; www.dorma.com.
4. Glynn-Johnson; an Allegion company: www.us.allegion.com
5. Rixson; an Assa Abloy Group company: www.assaabloydss.com.
6. Rockwood; an Assa Abloy Group company: www.assaabloydss.com

B. Overhead Stops and Holders (Door Checks): Complying with BHMA A156.8, Grade 1.

1. Provide overhead stop or holder at doors that are capable of swinging more than 110 degrees before striking wall or where door will strike fixed object such as sink, cabinet, and similar obstructions.
2. Provide overhead stop or holder at all outswinging exterior doors where indicated and at other locations as indicated.

    a. Stops and holders at exterior doors shall be stainless steel.

3. Stops and holders shall be heavy duty, concealed, overhead mounted stops and holders unless otherwise indicated.

    a. Provide overhead holders only where indicated, otherwise provide an overhead stop.
    b. Provide overhead stops at fire-rated doors; overhead holders are prohibited.

4. Stops used in conjunction with automatic door operators shall not include a shock-absorbing mechanism.

2.10 REMOVABLE MULLIONS

A. Basis-of-Design: Subject to compliance with requirements, provide products indicated in hardware sets or a comparable product from one of the following:

1. Sargent; an Assa Abloy Group company: www.assaabloydss.com.
2. Von Duprin; an Allegion company: www.us.allegion.com

3. Exception: Provide Von Duprin Model KR9954 at fire-rated doors.
4. Removable mullion manufacturer shall be the same as the exit device manufacturer.

B. Removable Mullions: Easily removed mullions that provide single door performance in double door openings.

1. Material: Aluminum.
2. Provide complete with stabilizer hardware.
3. Provide mullions with keyed top-mounting assembly.

a. Mullions self-lock when reinstalled.

4. Provide UL Listed mullions at fire rated openings.
5. Provide all associated hardware, including spacer blocks and brackets, as required for a complete installation and to suit frame and floor conditions.

2.11 THRESHOLDS

A. Basis-of-Design: Subject to compliance with requirements, provide products indicated in hardware sets or a comparable product from one of the following:

1. National Guard Products, Inc.: www.ngpinc.com.
2. Pemko; an Assa Abloy Group company: www.assaabloydss.com.
3. Reese Enterprises, Inc.; www.reeseusa.com.
4. Zero International, Inc., an Allegion company: www.zerointernational.com.
5. Hager Companies: www.hagerco.com.

B. Thresholds - Saddle: Complying with BHMA A156.21.

1. Provide threshold at each exterior door, unless otherwise indicated.
2. Type: Saddle.
3. Material: Aluminum.
4. Threshold Surface: Fluted horizontal grooves across full width.
5. Comply with ICC A117.1 for barrier free threshold requirements.
6. Field cut threshold to profile of frame and width of door sill for tight fit.
7. Provide non-corroding fasteners at all locations.

2.12 ELECTRIC POWER TRANSFERS

A. Basis-of-Design: Subject to compliance with requirements, provide products indicated in hardware sets or a comparable product from one of the following:

1. Securitron; an Assa Abloy Group company: www.assaabloydss.com.
2. Von Duprin; an Allegion company: www.us.allegion.com

B. Electrified Power Transfer: Provide concealed mortised electric power and data transfer device; provides connection between frame and door with sufficient number and gage of conductors to accommodate function of hardware specified.

1. Material: Aluminum or steel.

2.13 FINISHES

A. Finishes: Identified in Hardware Set Schedule in Part 3 of this Section.

B. Comply with BHMA A156.18.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

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

3.2 PREPARATION

A. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

B. Wood Doors: Comply with door and hardware manufacturers' written instructions.

3.3 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

C. Install hardware for smoke and draft control doors in accordance with NFPA 105.

D. Use templates provided by hardware item manufacturer.

E. Mounting Heights: Mount door hardware units at heights 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.

F. 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.

G. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.

H. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

I. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.4 FIELD QUALITY CONTROL

A. Perform field inspection and testing.

B. Provide an Architectural Hardware Consultant (AHC) to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

1. AHC shall be provided by Contractor.
2. AHC shall provide a written inspection report.

3.5 ADJUSTING

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

1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper function and finish.

D. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

E. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain door hardware.

3.8 DOOR HARDWARE SET SCHEDULE - GENERAL

A. General:

1. Hardware schedule lists primary components of a hardware set. Provide all associated hardware, including, but not limited to, fasteners, extensions, drop plates, mounting brackets, and electrical components and wiring for a complete, coordinated, and properly operating installation.

B. Manufacturer abbreviations used in Hardware Schedule:

1. GJ: Glynn-Johnson; an Allegion company: www.us.allegion.com.
2. IVE: Ives; an Allegion company: www.us.allegion.com.
3. LCN: LCN; an Allegion company: www.us.allegion.com.
4. NGP: National Guard Products, Inc.: www.ngpinc.com.
5. VD: Von Duprin; an Allegion company: www.us.allegion.com.

C. Hardware Set Schedule Format:

1. Hardware sets are described in schedule(s) as follows:

SET NO. Hardware set number

Doors: Door numbers belonging to this hardware set; separated by forward slashes.

Quantity	Item Description	Model	BHMA Finish Numbers	Manufacturer Abbreviation
Quantity	Item Description	Model	BHMA Finish Numbers	Manufacturer Abbreviation
Quantity	Item Description	Model	BHMA Finish Numbers	Manufacturer Abbreviation
Quantity	Item Description	Model	BHMA Finish Numbers	Manufacturer Abbreviation

Description of Door's Sequence of Operation

3.9 HARDWARE SET SCHEDULE

SET NO. 01

Doors: 101A

3	HINGES	5BB1HW	613	IVE
1	POWER TRANSFER	EPT-10	689	VD
1	EXIT DEVICE	QEL-98 NL-OP	612	VD
1	CYLINDER+CORE	--	612	--
1	OFFSET PULL	8190HD	612	IVE
1	AUTO DR OPERATOR	4640	695	LCN
1	OVHD CONC STOP	100SE	613	GJ
2	ACTUATORS	8310-853TWP	--	LCN
1	WEATHERSTRIPPING	BY DOOR MANUFACTURER	--	--
1	BOTTOM SWEEP	BY DOOR MANUFACTURER	--	--
1	THRESHOLD	425	MILL	NGP

ACTIVATING ACTUATOR RETRACTS LATCH ALLOWING AUTOMATIC DOOR OPERATOR TO OPEN DOOR. AFTER A PREDETERMINED AMOUNT OF TIME DOOR CLOSES AND LATCHES.

SET NO. 02

Doors: 101B

3	HINGES	5BB1HW	613	IVE
1	POWER TRANSFER	EPT-10	689	VD
1	EXIT DEVICE	QEL-98 NL-OP	612	VD
1	CYLINDER+CORE	--	612	--
1	OFFSET PULL	8190HD	612	IVE
1	AUTO DR OPERATOR	4640	695	LCN
1	OVHD CONC STOP	100SE	613	GJ
2	ACTUATORS	8310-853TWP	--	LCN
1	WEATHERSTRIPPING	BY DOOR MANUFACTURER	--	--
1	BOTTOM SWEEP	BY DOOR MANUFACTURER	--	--

ACTIVATING ACTUATOR RETRACTS LATCH ALLOWING AUTOMATIC DOOR OPERATOR TO OPEN DOOR. AFTER A PREDETERMINED AMOUNT OF TIME DOOR CLOSES AND LATCHES.

SET NO. 03

Doors: 103A

6	HINGES	5BB1HW	613	IVE
1	EXIT DEVICE	98 EO	612	VD
1	EXIT DEVICE	98 NL-OP	612	VD
1	CYLINDER+CORE	--	612	--
2	OFFSET PULLS	8190HD	612	IVE
1	REMOVE MULLION	KR5654	612	LCN
1	CYLINDER+CORE	--	612	--
2	CLOSERS	4111	695	LCN
2	OVHD CONC STOP	100S	613	GJ
1	WEATHERSTRIPPING	BY DOOR MANUFACTURER	--	--
1	BOTTOM SWEEP	BY DOOR MANUFACTURER	--	--
1	THRESHOLD	425	MILL	NGP

SET NO. 04

Doors: 102B / 103B

6	HINGES	5BB1HW	613	IVE
2	EXIT DEVICES	98 EO	612	VD
2	OFFSET PULLS	8190HD	612	IVE
1	REMOVE MULLION	KR5654	612	LCN
1	CYLINDER+CORE	--	612	--
2	CLOSERS	4111	695	LCN
2	OVHD CONC STOP	100S	613	GJ
1	WEATHERSTRIPPING	BY DOOR MANUFACTURER	--	--
1	BOTTOM SWEEP	BY DOOR MANUFACTURER	--	--
1	THRESHOLD	425	MILL	NGP

SET NO. 05

Doors: 103C

6	HINGES	5BB1HW	613	IVE
1	EXIT DEVICE	98 EO	612	VD
1	EXIT DEVICE	98 NL-OP	612	VD
1	CYLINDER+CORE	--	612	--
2	OFFSET PULLS	8190HD	612	IVE
1	REMOVE MULLION	KR5654	612	LCN
1	CYLINDER+CORE	--	612	--
2	CLOSERS	4111	695	LCN
2	OVHD CONC STOP	100S	613	GJ
1	WEATHERSTRIPPING	BY DOOR MANUFACTURER	--	--
1	BOTTOM SWEEP	BY DOOR MANUFACTURER	--	--

SET NO. 06

Doors: 102D / 103D

6	HINGES	5BB1HW	613	IVE
2	EXIT DEVICES	98 EO	612	VD
2	OFFSET PULLS	8190HD	612	IVE
1	REMOVE MULLION	KR5654	612	LCN
1	CYLINDER+CORE	--	612	--
2	CLOSERS	4111	695	LCN
2	OVHD CONC STOP	100S	613	GJ
1	WEATHERSTRIPPING	BY DOOR MANUFACTURER	--	--
1	BOTTOM SWEEP	BY DOOR MANUFACTURER	--	--

SET NO. 07

Doors: 102A

6	HINGES	5BB1HW	613	IVE
1	POWER TRANSFER	EPT-10	689	VD
1	EXIT DEVICE	QEL-98 NL-OP	612	VD
1	CYLINDER+CORE	--	612	--
1	EXIT DEVICE	98 EO	612	VD
2	OFFSET PULL	8190HD	612	IVE
1	REMOVE MULLION	KR5654	612	LCN
1	CYLINDER+CORE	--	612	--
1	AUTO DR OPERATOR	4640	695	LCN
1	CLOSER	4111	695	LCN
1	OVHD CONC STOP	100S	613	GJ
1	OVHD CONC STOP	100SE (AT AUTO DR OPER)	613	GJ
2	ACTUATORS	8310-853TWP	--	LCN
1	WEATHERSTRIPPING	BY DOOR MANUFACTURER	--	--
2	BOTTOM SWEEP	BY DOOR MANUFACTURER	--	--
1	THRESHOLD	425	MILL	NGP

ACTIVATING ACTUATOR RETRACTS LATCH ALLOWING AUTOMATIC DOOR OPERATOR TO OPEN DOOR. AFTER A PREDETERMINED AMOUNT OF TIME DOOR CLOSES AND LATCHES.

SET NO. 08

Doors: 102C

6	HINGES	5BB1HW	613	IVE
1	POWER TRANSFER	EPT-10	689	VD
1	EXIT DEVICE	QEL-98 NL-OP	612	VD
1	CYLINDER+CORE	--	612	--
1	EXIT DEVICE	98 EO	612	VD
2	OFFSET PULL	8190HD	612	IVE
1	REMOVE MULLION	KR5654	612	LCN
1	CYLINDER+CORE	--	612	--
1	AUTO DR OPERATOR	4640	695	LCN
1	CLOSER	4111	695	LCN
1	OVHD CONC STOP	100S	613	GJ
1	OVHD CONC STOP	100SE (AT AUTO DR OPER)	613	GJ
2	ACTUATORS	8310-853TWP	--	LCN
1	WEATHERSTRIPPING	BY DOOR MANUFACTURER	--	--
2	BOTTOM SWEEP	BY DOOR MANUFACTURER	--	--

ACTIVATING ACTUATOR RETRACTS LATCH ALLOWING AUTOMATIC DOOR OPERATOR TO OPEN DOOR. AFTER A PREDETERMINED AMOUNT OF TIME DOOR CLOSES AND LATCHES.

END OF SECTION 08 7100

SECTION 08 8000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Monolithic glazing.
2. Laminated glazing.
3. Insulating glazing.
4. Miscellaneous glazing materials.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.4 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances to achieve proper safety margins for glazing retention under each design load case, load case combination, and service condition.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples:

1. Glass Samples: Submit three samples 12 by 12 inch in size for each glass type.

a. Non-insulated types may be 4 by 4 inches in size.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

D. Delegated Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, primary glass manufacturer, and fabricated-glass manufacturer.

B. Product Certificates: For glass.

C. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

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. GANA Publications: “GANA Sealant Manual.”
3. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Delegated Design: Engage a qualified professional engineer licensed in the State in which the Project is located to design glazing.

C. Fabricated-Glass Manufacturer Qualifications: A qualified manufacturer of fabricated glass units who is approved by primary glass manufacturer.

D. Installer Qualifications: A qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors and who employs glazing technicians certified under the Architectural Glass and Metal Technician (AGMT) certification program.

E. Source Limitations for Glass:

1. Obtain clear float glass from single source from single manufacturer.
2. Obtain tinted and coated glass from single source from single manufacturer.
3. Obtain laminated glass and insulated glazing units from a single source from a single fabricator.

F. Source Limitations for Glazing Accessories: For each product and installation method, obtain from single source from single manufacturer.

G. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Install glazing in mockups specified in the following sections:

a. Section 08 4113 - Aluminum-Framed Entrances and Storefronts.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

1.10 WARRANTY

A. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty for Heat-Soaked Tempered Glass: Manufacturer agrees to replace heat-soaked tempered glass units that spontaneously break due to nickel sulfide (NiS) inclusions at a rate exceeding 0.3 percent (3/1000) within specified warranty period. Coverage for any other cause is excluded.

1. Warranty Period: 10 years from date of Substantial Completion.

D. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS MANUFACTURERS

A. Float Glass Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Guardian Glass, LLC: www.guardianglass.com.
2. Pilkington North America Inc: www.pilkington.com.
3. Viracon, Inc: www.viracon.com.
4. Vitro Architectural Glass (formerly PPG Industries, Inc.): www.vitroglazings.com.

B. Laminated Glass Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Any of the manufacturers specified for float glass or a fabricator approved by one of the specified float glass manufacturers.

C. Insulating Glass Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Any of the manufacturers specified for float glass or a fabricator approved by one of the specified float glass manufacturers.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Thickness: Indicated glass thicknesses are minimums. Provide glass that complies with performance requirements and load designs, and is not less than the thickness indicated.

C. Glass Strength:

1. 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.
2. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with performance requirements.

D. Glass Distortion Tolerances:

1. Roller Wave: Maximum 0.003 inch from peak to valley within the main body of the sheet and maximum 0.008 inch within 10.5 inches of a leading or trailing edge.
2. Localized Warp: Maximum 0.03 inch over any 12 inch span, but limited to 0.31 inch.

E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, in accordance with NFRC 100 and based on most current non-beta version of LBL's WINDOW computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
5. SHGC and Visible Transmittance: Center-of-glazing values, in accordance with NFRC 200 and based on most current non-beta version of LBL's WINDOW computer program.
6. Visible Reflectance: Center-of-glazing values, in accordance with NFRC 300.

F. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated, including assembly dead loads and live loads, in accordance with local building codes and ASTM E1300.

1. Design Wind Pressures: Determine design wind pressures applicable to Project in accordance with ASCE/SEI 7, and as indicated on Drawings.
2. Probability of Breakage for Glass Sloped:

a. Not more than 15 degrees from vertical:

1) Design glass for a probability of breakage not greater than 0.008 (8 lites per 1,000)

b. More than 15 degrees from vertical:

1) Design glass for a probability of breakage not greater than 0.001 (1 lite per 1,000).

3. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 the short side length or 1 inch, whichever is less.
4. Thermal Loads (Differential Shading): Design glazing to resist thermal stress breakage induced by differential temperature conditions and limited air circulation within individual glass lites and insulated glazing units.

G. Insulating Glass:

1. Insulating Glass Certification Program: Provide insulating glass units that are certified by the Insulating Glass Certification Council (IGCC).

a. Provide permanent markings with appropriate certification label of IGCC on either the spacer or one lite of each insulated unit.

H. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

1. Provide permanent markings on safety-rated glazing in compliance with applicable safety glazing standards, ICC (IBC), local building code and authorities having jurisdiction.
2. Glass indicated to be fully tempered (Kind FT) glass or laminated glass shall comply with safety glazing requirements.

2.3 FLOAT GLASS

A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.

B. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

C. Heat-Strengthened Float Glass: ASTM C1048, 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.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.4 LAMINATED GLASS

A. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Float glass laminated with a polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.

a. Unless otherwise indicated:

1) Laminated glass shall consist of two plies of clear annealed float glass with a polyvinyl butyral interlayer.
2) Glass plies shall be of equal thicknesses.

2. Interlayer:

a. Material: Polyvinyl butyral.
b. Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.

1) Minimum Thickness: 0.030 inch thick, unless otherwise indicated.

c. Color: Clear unless otherwise indicated.

3. Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air pockets.

2.5 GLASS COATINGS

A. General: Float glass with one or more glass coatings.

B. Low-E-Coated Glass: Comply with ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on float glass; Kind CV (vision glass) and Kind CS (spandrel glass) as indicated.

1. Basis-of-Design Product: Vitro Architectural Glass (formerly PPG Industries, Inc.; Solarban 70, or a comparable product from any of the manufacturers specified for float glass.

2.6 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of float glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190.

B. Perimeter Spacer: Warm-edge spacer.

1. General:

a. Material: Manufacturer's standard low conductivity silicone, polymer, stainless steel, or hybrid material.
b. Spacer Color: Black or Gray.
c. Spacer Width: As required for specified insulating glass unit.
d. Edge Seal: Duel-sealed system.

1) Primary Seal: Applied between spacer and glass panes.
2) Secondary Seal: Applied around perimeter of insulated unit.
3) Edge Seal Color: Black.

e. Use edge seal materials as recommended by spacer manufacturer and insulating glass manufacturer.

2. Products: Subject to compliance with requirements provide one of the following systems:

a. Quanex IG Systems, Inc; Super Spacer Premium Enhanced: www.quanex.com.

1) Spacer Material: Silicone foam with integral desiccant and vapor barrier backing.
2) Primary Seal: High performance acrylic adhesive.
3) Secondary Seal: Hot melt or curative butyl sealant.

b. Technoform Glass Insulation; TGI-Spacer M: www.glassinsulation.us.

1) Spacer Material: Polypropylene top with integral desiccant and stainless steel back.
2) Primary Seal: Butyl sealant.
3) Secondary Seal: Butyl sealant.

c. Viracon, Inc; Viracon Thermal Spacer (VTS): www.viracon.com.

1) Spacer Material: Thermoplastic with integral desiccant.
2) Primary Seal: Polyisobutylene (PIB) sealant.
3) Secondary Seal: Butyl sealant.

d. Vitro Architectural Glass (Formerly PPG); Intercept Spacer System: www.vitroglazings.com.

1) Spacer Material: Stainless steel.
2) Primary Seal: Polyisobutylene (PIB) sealant.
3) Secondary Seal: Butyl sealant.

C. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.7 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.

B. General Glazing Silicone Sealant: Neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 25 or 50, Use NT.

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

a. Dow Corning Corporation; 795 Silicone Building Sealant: www.dowcorning.com.
b. Dow Corning Corporation; 899 Silicone Glazing Sealant: www.dowcorning.com.
c. GE/Momentive Performance Materials, Inc: SCS2800 SilGlaz II: www.siliconeforbuilding.com
d. Pecora Corporation: 896: www.pecora.com.
e. Tremco, Inc.: Spectrem 2: www.tremcosealants.com.

2. Color: Black.

2.8 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:

1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks:

1. EPDM, silicone, or neoprene with Shore A durometer hardness of 85, plus or minus 5.
2. Type recommended in writing by sealant or glass manufacturer.

D. Spacers:

1. EPDM, silicone, or neoprene blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated, but not less than 50 to 60 Shore A durometer hardness.
2. Type recommended in writing by sealant or glass manufacturer.

E. Edge Blocks:

1. EPDM, silicone, or neoprene with Shore A durometer hardness per manufacturer's written instructions.
2. Type recommended in writing by sealant or glass manufacturer.

F. Glazing Gaskets and Splines: Resilient EPDM or polyvinyl chloride extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black

G. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.10 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Glazing:

1. Exterior Glass: Unless otherwise indicated, exterior glass shall be insulating-glass units.

a. Provide Low-E-coating unless otherwise indicated.
b. Provide safety glass where indicated and as required by local building code and authorities having jurisdiction.

2. Interior Glass: Unless otherwise indicated, all interior glass shall be monolithic glass units.

a. Provide safety glass where indicated and as required by local building code and authorities having jurisdiction.

3. Exterior doors at vestibule entrances shall have monolithic safety glass; interior vestibule doors shall have monolithic safety glass.

a. Monolithic safety glass shall comply with interior glass above.

B. Installation Method:

1. Use one or more of the specified glazing methods as recommended by GANA, glass manufacturer, fabricator, and installer, and as required to comply with performance requirements.

C. 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.

D. 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.

E. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

F. 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.

G. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

H. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch- (3-mm-) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

I. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.

J. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

K. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

L. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

M. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended in writing by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant as recommended by GANA.

G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape as recommended by GANA..

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 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.

3.7 CLEANING AND PROTECTION

A. Immediately after installation, remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 GLAZING SCHEDULE

A. GL-1: Clear monolithic safety glass.

1. Clear laminated safety glass.
2. Minimum Overall Thickness: 1/4 inch (6 mm).
3. Safety glazing required.

B. GL-2: Low-E-coated, clear insulating glass.

1. Overall Unit Thickness: 1 inch.
2. Outdoor Lite: Clear annealed float glass.

    a. Minimum Thickness: 1/4 inch (6 mm).
    b. Low-E Coating: On 2nd surface.

3. Airspace:

    a. Width: 1/2 inch.
    b. Interspace Content: Air.

4. Indoor Lite: Clear annealed float glass.

    a. Minimum Thickness: 1/4 inch (6 mm).

5. Performance:

    a. Winter Nighttime U-Factor: 0.28 maximum.
    b. Visible Light Transmittance: 64 percent minimum.
    c. Solar Heat Gain Coefficient: 0.27 maximum.

C. GL-3: Low-E-coated, clear, insulating safety glass

1. Overall Unit Thickness: 1 inch.
2. Outdoor Lite: Clear fully tempered float glass.

    a. Minimum Thickness: 1/4 inch (6 mm).
    b. Low-E Coating: On 2nd surface.

3. Airspace:

    a. Width: 1/2 inch.
    b. Interspace Content: Air.

4. Indoor Lite: Clear laminated float glass.

    a. Minimum Overall Thickness: 1/4 inch (6 mm).

5. Safety glazing required.
6. Performance:

    a. Winter Nighttime U-Factor: 0.28 maximum.
    b. Visible Light Transmittance: 64 percent minimum.
    c. Solar Heat Gain Coefficient: 0.27 maximum.

END OF SECTION 08 8000

SECTION 09 2216 - NON-STRUCTURAL METAL FRAMING

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. Non-load-bearing steel framing systems for interior partitions, ceilings, and soffits.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Indicate component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories and items of other related work.
2. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement of framing connections.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's Qualification Statement.

B. Installer's Qualification Statement.

C. Evaluation Reports: For firestop tracks, 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. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products from one of the following:

1. ClarkDietrich Building Systems: www.clarkdietrich.com.
2. Jaimes Industries Inc.: www.jaimesind.com.
3. Marino\WARE: www.marinoware.com.
4. MBA Building Supplies, Inc.: www.mbastuds.com.
5. State Building Products; www.statebp.com.
6. The Steel Network, Inc: www.SteelNetwork.com.
7. Steel Stud Solutions, LLC; www.steelstudsolutions.com.
8. Telling Industries; www.buildstrong.com.

2.2 PERFORMANCE REQUIREMENTS

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Protective Coatings: Equivalent (EQ) coatings are not acceptable; products shall be hot-dip galvanized as indicated.

C. Embossed (equivalent thickness) steel framing products are not acceptable; products shall be in steel thicknesses indicated.

D. 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 E119 by an independent testing agency.

E. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

F. Horizontal Deflection: For wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft.

1. Exception: Limit deflection of walls to receive hard tile surfaces to 1/360 of the wall height based on horizontal loading of 5 lbf/sq. ft.

2.3 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.
2. Protective Coating: ASTM A653/A653M, G40 (Z120), hot-dip galvanized unless otherwise indicated.

B. Studs and Tracks: ASTM C645.

1. Steel Studs and Tracks:

a. Minimum Base-Steel Thickness: 0.0329 inch (20 gage).
b. Depth: As indicated on Drawings.

C. Slotted Deflection Track: Provide galvanized sheet steel track with slotted holes in flanges for mechanical anchorage of studs that accommodate deflection; provide screws and anti-friction bushings.

1. Comply with the following:

a. Provide at partition heads to structure connections, where indicated on Drawings, and elsewhere as required to accommodate axial deflection.
b. Shall prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above
c. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
d. Comply with ASTM C645 and ASTM C754.
e. Protective Coating: ASTM A653/A653M, G40, hot-dip galvanized.
f. Minimum Metal Thickness: Same material thickness as studs.
g. Track Depth: Matching studs.
h. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems indicated on drawings.

D. Cold-Rolled Channel Bridging: 0.064 inch thick (16 gage), galvanized minimum base-steel thickness, with minimum 1/2-inch-wide flanges.

1. Depth: 1-1/2 inches.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- (16 gage) thick, galvanized steel.

E. Hat-Shaped, Rigid Furring Channels: Galvanized steel sheet members.

1. Minimum Base-Steel Thickness: 0.0329 inch (20 gage).
2. Depth: 7/8 inch, unless otherwise indicated on Drawings.

F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Steel Thickness: 0.064 inch thick (16 gage), galvanized.

2.4 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 the following:

1. 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.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Williams; Everlastic EVA 200; www.williamsproducts.net.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Installation Standard: ASTM C754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

B. Install framing, suspension systems and other related accessories and components in accordance with manufacturer’s instructions.

C. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

D. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

E. Install bracing at terminations in assemblies.

F. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.3 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.

1. Install studs at 16 inches o.c. unless otherwise indicated or required by horizontal deflection performance requirements.

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. Slotted Deflection Tracks: Where framing extends to overhead structural supports, install slotted deflection tracks 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 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

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. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. Curved Partitions:

    a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
    b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.

E. 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 2116

SECTION 09 2900 – GYPSUM BOARD

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. Gypsum board.
2. Finishing materials.
3. Trim accessories.
4. Acoustic insulation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

1. Include locations of control joints.

C. Samples: For the following products:

1. Submit three samples of each board type, 4 inches square in size
2. Trim Accessories: Submit three samples of each type of trim, full-size in 4-inch-long lengths.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's Qualification Statement.

B. Installer's Qualification Statement.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.7 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 interior gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

C. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

D. Horizontal Deflection: For wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft.

1. Exception: Limit deflection of walls to receive hard tile surfaces to 1/360 of the wall height based on horizontal loading of 5 lbf/sq. ft.

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 GYPSUM BOARD

A. Gypsum Wallboard: Paper-faced gypsum panels; ASTM C1396/C1396M.

1. Thickness: 1/4 and 1/2 inch.
2. Long Edges: Tapered with paper face wrapping edge.
3. Short Edges: Square cut.
4. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; Regular Gypsum Board: www.certainteed.com.
b. Continental Building Products; Regular Drywall: www.continental-bp.com.
c. Georgia-Pacific Gypsum; ToughRock Gypsum Board: www.gp.com.
d. National Gypsum Company; Gold Bond Brand Gypsum Board: www.nationalgypsum.com.
e. USG Corporation; Sheetrock Brand Gypsum Panels: www.usg.com.

B. Gypsum Board, Type X: Paper-faced gypsum panels with fire-resistant core; ASTM C1396/C1396M.

1. Thickness: 5/8 inch.
2. Long Edges: Tapered with paper face wrapping edge.
3. Short Edges: Square cut.
4. Type: Fire resistance rated Type X, UL or WH listed.
5. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; Type X Gypsum Board: www.certainteed.com.
b. Continental Building Products; Firecheck Type X: www.continental-bp.com.
c. Georgia-Pacific Gypsum; ToughRock Fireguard X: www.gp.com.
d. National Gypsum Company; Gold Bond Brand Fire-Shield Gypsum Board: www.nationalgypsum.com.

e. USG Corporation; Sheetrock Brand Firecode X Panels: www.usg.com.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
2. Shapes:

a. Cornerbead.
b. LC-Bead (J-shaped) or L-Bead (L-shaped) at exposed edges.
c. Expansion (control) joint.

3. Manufacturers: Subject to compliance with requirements, available manufacturers with products that may be incorporated into the Work include, but are not limited to, the following:

a. ClarkDietrich Building Systems: www.clarkdietrich.com.
b. Marino\WARE: www.marinoware.com.
c. Telling Industries; www.buildstrong.com.
d. Phillips Manufacturing Co: www.phillipsmfg.com.
e. USG Corporation: www.usg.com.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M.

B. Joint Tape: Paper, 2 inches wide, creased for joints and corners.

1. Manufacturers: Subject to compliance with requirements, provide products from one of the specified gypsum wall board manufacturers.

C. Joint Compound: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping or drying-type, all-purpose compound.

a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping or drying-type, all-purpose compound.
4. Finish Coat: For third coat, use setting-type, sandable topping or drying-type, all-purpose compound.

2.6 AUXILIARY MATERIALS

A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Joint Compound: As recommended by gypsum board manufacturer.
2. Adhesives: Subject to compliance with requirements, provide one of the following

a. Franklin International, Inc; Titebond GREENchoice Professional Drywall Adhesive; www.titebond.com.
b. PPG Architectural Coatings; Liquid Nails DWP-24 Drywall Construction Adhesive: www.liquidnails.com.

C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

1. Use screws complying with ASTM C954 for fastening panels to steel members (cold-formed metal framing) from 0.033 to 0.112 inch thick.

D. Sound-Attenuation Blankets: Produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
2. Acoustic Insulation: Provide one of the following types:

a. Mineral Fiber/Rock Wool Batts: ASTM C665; preformed mineral fiber, friction fit type, unfaced.

1) Thickness: 3 inches, unless otherwise indicated.
2) Density: 2.5 pcf.
3) Flame Spread/Smoke Developed: 0/0 per ASTM E84.
4) Products: Subject to compliance with requirements, provide one of the following:

a) JohnsManville; Mineral Wool Sound Attenuation Fire Batts (SAFB): www.jm.com.
b) Owens Corning; Thermafiber SAFB (Sound Attenuation Fire Batts): www.owenscorning.com.
c) Rockwool; Safe'n'Sound: www.rockwool.com.

b. Fiberglass Batts: ASTM C665; preformed glass fiber, friction fit type, unfaced.

1) Thickness: 3-1/2 inches, unless otherwise indicated.
2) Products: Subject to compliance with requirements, provide one of the following:

a) CertainTeed Corporation/Saint-Gobain; NoiseReducer Sound Attenuation Batts: www.certainteed.com.
b) Johns Manville; Formaldehyde-Free Fiberglass Insulation: www.jm.com.
c) Knauf Insulation; EcoBatt Insulation with ECOSE Technology: www.knaufinsulation.com.
d) Owens Corning Corporation; EcoTouch Sound Attenuation Batts: www.owenscorning.com.

E. Acoustical Sealant: Nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Reduces airborne sound transmission through perimeter joints and openings in wall assemblies.

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

a. Franklin International Inc; Titebond GreenChoice Professional Acoustical Smoke & Sound Sealant: www.titebond.com.
b. PPG Architectural Coatings; Liquid Nails AS-825 Acoustical Sound Sealant: www.liquidnails.com.
c. Pecora Corporation; AC-20 FTR: www.pecora.com.
d. Pecora Corporation; AIS-919: www.pecora.com.
e. United States Gypsum Co.; USG Sheetrock Brand Firecode Smoke-Sound Sealant: www.usg.com.
f. United States Gypsum Co.; USG Sheetrock Brand Acoustical Sealant: www.usg.com.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

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

3.2 INSTALLATION AND FINISHING OF PANELS, GENERAL

A. Comply with ASTM C840, GA-216, and manufacturer's instructions.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft.in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of panels.

3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

B. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

C. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.4 INSTALLATION OF TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect. Place control joints consistent with lines of building spaces and as follows:

1. Not more than 30 feet apart on walls and ceilings, unless otherwise indicated.
2. Submit control joint locations to Architect for approval prior to installation.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead or L-Bead: Use at exposed panel edges.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.

   a. Exception: Fire-Rated Construction shall comply with requirements of assembly listing

2. Level 2: In utility areas, behind cabinetry, and in similar locations that shall not be painted or finished, and at tile backing board to receive tile finish.
3. Level 4: At areas that will be exposed to view; unless otherwise indicated.

3.6 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

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

3.7 FIELD QUALITY CONTROL

A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board until deficiencies have been corrected.

1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:

    a. Installation of 80 percent of lighting fixtures, powered for operation.
    b. Installation, insulation, and leak and pressure testing of water piping systems.
    c. Installation of air-duct systems.
    d. Installation of air devices.
    e. Installation of mechanical system control wiring.
    f. Installation of ceiling support framing.

END OF SECTION 09 2900

SECTION 09 6813 – TILE CARPETING

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. Carpet tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.

B. Shop Drawings: For carpet tile installation, plans showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Transition details to other flooring materials.

C. Samples for Initial Selection: For each type of carpet tile.

D. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.

E. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.6 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. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd..

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than 5 years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least 5 years of documented experience, and as follows:

1. Shall be certified by the International Certified Floorcovering Installers Association at the Commercial II certification level

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Architect.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Carpet and Rug Institute's CRI 104.

1.9 FIELD CONDITIONS

A. Comply with the Carpet and Rug Institute's CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

1.10 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, the following:

a. More than 10 percent edge raveling, snags, and runs.
b. Dimensional instability.
c. Excess static discharge.
d. Loss of tuft-bind strength.
e. Loss of face fiber.
f. Delamination.

3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Performance Characteristics:

1. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
2. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.

2.2 CARPET TILE

A. Carpet Tile: CPT-01

1. Product: Subject to compliance with requirements, provide the following:

a. Interface, Inc.; SR799, 1388502500: www.interfacecom.
b. No substitutions.

2. Size: 19.69 by 19.69 inches.
3. Backing System: GlasBac.
4. Colors and Patterns:

a. Colors: 104934 Smoke.

5. Installation Method: As selected by Architect.

2.3 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.

1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft, and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

    a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
    c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with the Carpet and Rug Institute's CRI 104 and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with the Carpet and Rug Institute's CRI 104, Section 10, "Carpet Tile," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer but not less than the following:

1. Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns as indicated on Drawings and as recommended in writing by carpet tile manufacturer.

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:
1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with the Carpet and Rug Institute's CRI 104, Section 13.7.

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 6813

SECTION 09 9100 - PAINTING

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. Exterior painting.
2. Interior painting.

1.3 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this section

B. DFT: Dry film thickness, measured in mils.

C. WFT: Wet film thickness, measured in mils.

D. Mils: One one-thousandth of an inch. Used to measure thickness of coating films.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions. Include the following:

1. Indicate VOC content.
2. Manufacturer's name, product name and/or catalog number, and general product category.

a. Example of general product categories:

1) Interior finish coat - latex, eggshell.
2) Exterior primer for ferrous metal.

3. For each paint system and substrate, indicate which paint products are to be used.

a. Examples:

1) Interior latex eggshell system for gypsum board:

a) Primer: Name of specific product provided.
b) Finish Coats: Name of specific product provided.

2) Exterior latex semigloss system for ferrous metals.

a) Primer: Name of specific product provided.
b) Finish Coats: Name of specific product provided.

4. Use same designations indicated on Drawings and Schedules.

B. Samples: Submit 3 paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating each color and sheen specified.

1. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry and storefront finishes, have been approved.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installer and manufacturer.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Paint Maintenance Manual: Submit coating maintenance manual including:

1. Finish schedule showing where each product, color, and sheen was used.
2. Product technical data sheets.
3. Material safety data sheets (MSDS).
4. Care and cleaning instructions.
5. Touch-up procedures.
6. Repair of painted and finished surfaces.

B. Color Chips: After final approval of all colors, submit color chips of all coatings used with manufacturer's name, product, and mix formulation of each color, sheen, and coating for the purpose of future re-ordering of coatings.

1. Color chips shall be at least six (6) inches square.
2. Include in Paint Maintenance Manual.

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

1. Paint Products: 2 percent of that installed, but not less than 1 gal. of each material, color, and sheen applied.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum 5 years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years documented experience.

1. Only qualified journeypersons, as defined by local jurisdiction, shall be engaged in painting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyperson in accordance with trade regulations.

C. Mockups: Apply mockups of each paint system indicated for each substrate, color, sheen, and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..

1) Include mock-up for each dryfall paint system and color.
2) Include mock-up for each non-bridging paint system and color.

3) Include mock-up for each video (green) screen paint system and color.
4) Include mock-up for each dry erase coatings system and color.

b. Doors and Frames: Provide mock-up samples of one complete door and frame.
c. Railings and Other Lineal Materials: Provide mock-up samples of at least 8 lineal feet.
d. Other Items: Architect will designate items or areas required.

2. Galvanized surfaces. For each galvanized surface, prepare substrate and apply a test patch prior to applying paint to entire fabrication:

a. After cleaning and preparing, apply a test patch of primer/paint and allow to dry for 7 days.
b. After 7 days, test primer/paint adhesion using method recommended by paint manufacturer.
c. Do not proceed with work until adhesion test is approved by Architect.

3. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. 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.

1.9 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures of less than 5 deg F above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

C. Apply paint only to dry, clean, and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations:

1. Provide paint and coating products from same manufacturer, unless otherwise specified.
2. Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats, unless otherwise specified.
3. Exceptions shall be permitted, provided approval of Architect is obtained using specified procedures for substitutions.

B. Paint Manufacturers - General: For each paint type specified in Part 2, provide one of the products listed, subject to compliance with requirements. Products shall be from one of the following:

1. Benjamin Moore: Benjamin Moore & Co.: www: benjaminmoore.com.
2. PPG: PPG Industries, Inc., Architectural Coatings: www.ppgpaints.com.
3. Sherwin-Williams: The Sherwin-Williams Company: www: sherwin-williams.com.

2.2 PAINT MATERIALS, GENERAL

A. 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.

B. VOC Content:

1. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction
2. For field applications that are inside the weatherproofing system, paints and coatings shall comply with the following VOC content limits unless stricter limits are required by authorities having jurisdiction:

a. Flat Paints and Coatings: 50 g/L.
b. Nonflat Paints and Coatings: 50 g/L.
c. Dry-Fog (Dryfall) Coatings: 150 g/L.
d. Primers, Sealers, and Undercoaters: 100 g/L.
e. Rust-Preventive Coatings: 100 g/L.
f. Zinc-Rich Industrial Maintenance Primers: 100 g/L.

C. Supply each paint material in quantity required to complete entire project's work from a single production run.

D. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

E. Sheen/Gloss Criteria.

1. Product names are not acceptable as gloss level identification.
2. Determine gloss value of paint finish by testing paint samples according to ASTM D523, using 60 degree geometry. Sheen/Gloss levels shall be defined as follows:

a. Gloss Level 1: Flat/Matte, value between 0 and 5 units.
b. Gloss Level 2: Velvet, value between 5 and 10 units.
c. Gloss Level 3: Eggshell, value between 10 and 20 units.
d. Gloss Level 4: Satin, value between 20 and 35 units.
e. Gloss Level 5: Semigloss, value between 35 and 70 units.
f. Gloss Level 6: Gloss, value between 70 and 85 units.
g. Gloss Level 7: High Gloss, value more than 85 units.

3. Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

F. Colors: As indicated in Room Finish Schedule on Drawings or, if not indicated, to match Architect's samples.

1. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as indicated color.
2. Provide tinted deep tone primers at deep tone colors, and as recommended by paint manufacturer.

2.3 EXTERIOR PAINTS

A. General:

1. Unless otherwise indicated, each exterior paint system consists of the following:

a. Primer: One coat based on substrate material.
b. Finish Coats: Two coats based on required sheen and substrate material.

2. Required Sheens: For each paint system, provide paint sheens as follows unless otherwise indicated:

a. All exterior paint systems: Semigloss.

B. Exterior Paint Systems - Latex

1. Primers:

a. Primer for aluminum, ferrous metal, and galvanized steel: Rust-inhibitive acrylic/latex primer, water-based.

1) Benjamin Moore; Super Spec HP Acrylic Metal Primer, P04; DFT 2.0 mils.
2) PPG; Pitt-Tech Plus Int./Ext. DTM Industrial Primer, 90-912 Series; DFT 3.0 mils.
3) Sherwin Williams; Pro Industrial DTM Acrylic Primer/Finish, B66W1 Series; DFT 3.5 mils.

2. Finish Coats:

a. Semigloss Sheen: Acrylic/latex paint, water-based.

1) Finish coats for all surfaces except metals:

a) Benjamin Moore; Aura Waterborne Exterior Paint Semi-Gloss Finish 632; DFT 1.7 mils.
b) PPG; Speedhide Exterior 100% Acrylic Semi-Gloss, 6-900XI Series; DFT 1.4 mils.
c) Sherwin-Williams; SuperPaint Exterior Latex Gloss, A84 Series; DFT 1.5 mils.

2) Finish coats for aluminum, ferrous metal, and galvanized steel:

a) Benjamin Moore; Ultra Spec HP DTM Acrylic Semi-Gloss, WH29; DFT 2.3 mils.
b) PPG; Pitt-Tech Plus Int./Ext. Semi-Gloss DTM Industrial Enamel, 90-1210 Series; DFT 2.0 mils.
c) Sherwin-Williams; Pro Industrial DTM Acrylic Semi-Gloss, B66W01100 Series; DFT 2.5 mils.

2.4 INTERIOR PAINTS

A. General:

1. Unless otherwise indicated, each interior paint system consists of the following:

   a. Primer: One coat based on substrate material.
   b. Finish Coats: Two coats based on required sheen and substrate material.

2. Required Sheens: For each paint system, provide paint sheens as follows unless otherwise indicated:

   a. Ceilings, Soffits and Ceiling Drops: Flat sheen.
   b. Gypsum Board (except at ceilings):

      1) Semigloss Sheen: Storage rooms, janitor closets, electrical rooms, mechanical rooms, closets, and similar non-public areas.
      2) Eggshell Sheen: Public areas.

B. Interior Paint Systems - Latex.

1. Primers:

   a. Primer for gypsum board: Acrylic/latex primer, water-based.

      1) Benjamin Moore; Ultra Spec 500 Interior Latex Primer, N534; DFT 1.4 mils.
      2) PPG; Pure Performance Interior Latex Primer - 9-900; DFT 1.4 mils.
      3) Sherwin Williams; ProMar 200 Zero VOC Interior Latex Primer, B28W02600; DFT 1.0 mils.

   b. Primer for previously painted surfaces; including concrete and masonry: Acrylic/latex stain-blocking primer/sealer with high adhesion, water-based.

      1) Benjamin Moore; Sure Seal Latex Primer Sealer, 027; DFT 1.3 mils.
      2) PPG; Seal Grip Interior/Exterior Acrylic Universal Primer/Sealer, 17-921 Series; DFT 1.6 mils.
      3) Sherwin Williams; PrepRite ProBlock Interior/Exterior Latex Primer/Sealer, B51-600 Series; DFT 1.4 mils.

2. Finish Coats:

   a. Semigloss Sheen: Acrylic/latex paint, water-based.

      1) Finish coats for all surfaces except metals:

         a) Benjamin Moore; Ultra Spec 500 Interior Semi-gloss Finish, N539; DFT 1.8 mils.
         b) PPG; Speedhide Zero Interior Zero-VOC Latex Semi-Gloss, 6-4500 Series; DFT 1.3 mils.
         c) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series; DFT 1.6 mils.

      2) Finish coats for aluminum, ferrous metal, and galvanized steel:

         a) Benjamin Moore; Ultra Spec HP DTM Acrylic Semi-Gloss, WH29; DFT 2.3 mils.
         b) PPG; Pitt-Tech Plus Int./Ext. Semi-Gloss DTM Industrial Enamel, 90-1210 Series; DFT 2.0 mils.

c) Sherwin-Williams; Pro Industrial DTM Acrylic Semi-Gloss, B66W01100 Series; DFT 2.5 mils.

b. Eggshell Sheen: Acrylic/latex paint, water-based.

1) Finish coats for all surfaces:

a) Benjamin Moore; Ultra Spec 500 Interior Eggshell Finish, N538; DFT 1.8 mils.
b) PPG; Speedhide Zero Interior Zero-VOC Latex Eggshell, 6-4300 Series; DFT 1.5 mils.
c) Sherwin Williams; ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-2600 Series; DFT 1.7 mils.

c. Flat Sheen: Acrylic/latex paint, water-based.

1) Finish coats for all surfaces:

a) Benjamin Moore; Benjamin Moore; Ultra Spec 500 Interior Flat Finish, N536; DFT 1.8 mils.
b) PPG; Speedhide Zero Interior Zero-VOC Latex Flat, 6-4100 Series; DFT 1.4 mils.
c) Sherwin Williams; ProMar 200 Zero VOC Interior Latex Flat, B30-2600 Series; DFT 1.6 mils.

2.5 ACCESSORY MATERIALS

A. Accessory Materials: Provide cleaning materials, preparation materials, and miscellaneous materials required to properly prepare and apply paints and coatings.

1. Includes materials required for marking fire and smoke assemblies

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. 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 applicable to substrates and paint systems indicated.

B. Protect adjacent surfaces not to be painted.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. For coatings applied over previously painted surfaces, test application to check for lifting and other adhesion problems. Perform test in an isolated area where practicable.
2. Remove incompatible coatings and primers or apply barrier tie coat as recommended by paint manufacturer and as required to produce paint systems indicated.

D. 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.

E. Galvanized-Metal Substrates: Remove passivation coating/rinse, grease and oil residue from galvanized metal to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints. Clean using methods recommended in writing by paint manufacturer but not less than ASTM D6386, ASTM D7396, and the following:

1. Remove surface contamination and oils in accordance with SSPC-SP 1 - Solvent Cleaning.
2. Remove loose paint, rust, and other debris according to SSPC-SP 2 - Hand Tool Cleaning.
3. Lightly profile galvanized surfaces and remove zinc oxide and zinc hydroxide layers in accordance with SSPC-SP16 – Brush-Off/Sweep Blast Cleaning.
4. Apply paint within 1 hour of cleaning and preparation.

F. Previously Painted Surfaces - General:

1. Remove all surface contamination such as, oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mold, mildew, mortar, and any other surface contamination.
2. Remove masking tape, labels, adhesives, and other materials that would either be deleterious to adhesion of, or show through, new paint.
3. Scrape all loose, blistered, peeling, scratched or otherwise imperfect paint down to bare substrate and sand adjacent tightly adhering paint to feather edge.
4. Spot prime all bare areas with appropriate primer before priming entire surface.

G. Repair of Existing Gypsum Board:

1. Fill hairline cracks, small holes, and imperfections with filler compound and sand smooth.

3.3 APPLICATION - GENERAL

A. Apply paints and coatings according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.

B. Provide smooth, opaque coatings of uniform finish, color, appearance, and coverage without brush marks, runs, sags, laps, ropiness, holidays, spotting, cloudiness, or other surface imperfections.

C. Terminate paint in neat lines; cut in sharp lines and color breaks.

D. Apply paint products to properly prepared surfaces.

1. Do not apply coatings over dirt, rust, scale, grease, moisture, or other conditions detrimental to application of coatings.

E. Primers:

1. Apply first coat of primer to surfaces as soon as practical after preparation and before subsequent surface deterioration.

F. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.

1. Sand between coats as recommended by manufacturer; before applying next coat clean surfaces of loose particles and use tack cloth to remove any remaining dust and particles just prior to applying next coat.

G. Provide completed work matching approved samples for color, sheen, texture, coverage and quality of work.

1. Remove, refinish, or repaint work not complying with requirements.

H. Number of Coats: Each paint system in Part 2 specifies a number of coats. This is the minimum number required.

1. If undercoats, stains, or other imperfections are visible after final coat of paint, apply additional coats until paint is of uniform finish, color, and appearance without defects or imperfections.

I. Minimum Coating Thickness: Provide dry film thickness for each coating as indicated, but not less than that recommended by the coating manufacturer.

1. Number of coats and film thicknesses required are same regardless of application method.
2. Ensure edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.

3.4 SURFACES TO BE PAINTED

A. General: Paint all exposed surfaces except where indicated not to be painted or where listed in “Surfaces Not to Be Painted” Article in this section.

1. The term "exposed" includes areas visible through permanent and built-in fixtures when they are in place.
2. If surface, material, or item is not specifically mentioned, paint in same manner, color, and sheen as similar surfaces, materials, or items, regardless of whether indicated or not.
3. Paint surfaces that are cut and patched including, but not limited to, cutting and patching to permit installation of electrical services, piping, and ductwork.

3.5 SURFACES NOT TO BE PAINTED

A. Do not paint or finish the following unless otherwise indicated:

1. Factory-finished items; factory-primed items are not considered factory-finished.
2. Items indicated to receive other finish.
3. Items indicated to remain naturally finished.
4. Fire rating labels.
5. Equipment serial number and capacity labels.
6. Operating parts of equipment.
7. Aluminum components.
8. Polished and brushed stainless steel items.
9. Metal flashings.
10. Brick.
11. Cast-in-place concrete.
12. Floors.

13. Surfaces concealed by suspended ceilings.
14. Concealed piping, ductwork, and conduit.
15. Surfaces within pipe and duct spaces.
16. Acoustical materials.

3.6 FIELD QUALITY CONTROL

A. Subject to the opinion of the Architect, paint shall be rejected and considered unacceptable for any of the following reasons:

1. Lacking minimum dry film thicknesses.
2. Poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, and corners.
3. Damage from touching, or disturbing paint in any other manner, before sufficiently dry.
4. Damage from application to moist surfaces or damage caused by inadequate protection from the weather.
5. Damage or contamination of paint from blown contaminants including but not limited to dust.
6. Paint shall be rejected if any of the following are evident under natural lighting for exterior surfaces and final lighting source, including daylighting, for interior surfaces:

    a. Visible defects are evident on vertical surfaces when viewed at normal viewing angles from a distance of not less than 48 inches.
    b. Visible defects are evident on horizontal surfaces when viewed at normal viewing angles from a distance of not less than 48 inches.
    c. Visible defects are evident on ceiling, soffit and other overhead surfaces when viewed at normal viewing angles from a distance of not less than 48 inches.

B. Visible defects are defined as follows:

1. Brush and roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.
2. When the final coat on any surface exhibits a lack of uniformity of color, sheen, texture, and hiding across full surface area.

C. Rejected paint shall be repaired or replaced at the expense of the Contractor.

1. Small affected areas shall be touched up.
2. Large affected areas shall be repainted.
3. Small and large areas shall be as defined by the Architect.
4. Areas without sufficient dry film thickness shall be repainted.
5. Paint runs and sags shall be removed by scraper or sanding and repainted.

3.7 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

1. Do not clean equipment with free-draining water. Prevent solvents, thinners, cleaners, and other contaminants from entering waterways, sanitary and storm drain systems, and ground.
2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
3. Allow empty paint cans to dry before disposal.

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.

END OF SECTION 09 9100

SECTION 26 0500 – COMMON WORK RESULTS FOR ELECTRICAL

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 work of this Section.

B. This Section shall apply to all Division 26 Sections.

1.2 SUMMARY

A. This Section includes general administrative and procedural requirements for electrical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 01 Sections.

1. Codes and standards
2. Quality assurance
3. Examination of drawings and premises
4. Substitutions
5. Alternates that apply to the electrical work
6. Permits, fees and inspections
7. Changes involving Electrical Work
8. Submittals
9. Project record documents
10. Operation and maintenance manuals and equipment
11. Delivery, storage and handling
12. Warranty
13. Description of electrical systems
14. Scope of work specified in Division 26
15. Related work specified in other Divisions
16. Systems provided by the Owner

B. Part II – Products:

1. This Section includes basic requirements for materials and installations for electrical work, including but not limited to:

    a. Access doors
    b. Sealing of openings
    c. Sleeves
    d. Expansion fittings

C. Part III – Execution:

1. This section includes basic requirements for installations for electrical work.

    a. Electrical demolition work
    b. Temporary services
    c. Cutting and patching
    d. Excavation and backfill
    e. Coordination with other trades
    f. Assembly and connection of equipment
    g. Field quality control

1.3 CODES AND STANDARDS

A. The electrical characteristics, physical properties, design, performance characteristics, methods of construction, all material and the installation techniques, shall be in accordance with the latest issue of the various, applicable Standard Specifications of the following recognized authorities:

1. ADA – Americans with Disabilities Act
2. AEIC – Association of Edison Illuminating Companies
3. ANSI - American National Standards Institute
4. ASTM - American Society for Testing Materials
5. BICSI - Building Industry Consulting Service International
6. FCC - Federal Communication Commission
7. ICEA - Insulated Cable Engineers Association
8. IEC – International Electrotechnical Commission
9. IEEE - Institute of Electrical and Electronics Engineers
10. MBC – Michigan Building Code
11. MIOSHA – Michigan Occupational Safety Hazard Association
12. NEC - National Electrical Code
13. NETA – International Electrical Testing Association
14. NEMA - National Electrical Manufacturer's Association
15. NFPA - National Fire Protection Association
16. OSHA – Occupational Safety and Health Act
17. UL - Underwriters Laboratories, Inc.

1.4 QUALITY ASSURANCE

A. Furnish all labor, materials, equipment, technical supervision, and incidental services required to complete, test and leave ready for operation the electrical systems as specified in the Division 26 Sections and as indicated on Drawings.

1. The Electrical Drawings indicate the general design and extent of the electrical system. Comply with the Drawings as closely as actual construction of the building and the work of other Trades permit.

B. Perform all work in a first class and workmanlike manner, in accordance with the latest accepted standards and practices for the Trades involved.

1. All equipment of the same or similar systems shall be by the same manufacturer.

C. Regulatory Requirements:

1. Ordinances, Codes and Standards: Perform all work in accordance with applicable Federal, State and local ordinances and regulations. Perform all work to comply with Codes and Standards identified in these specifications.

   a. Notify the Architect/Engineer before submitting his proposal should any changes in Drawings or Specifications be required to conform to the above codes, rules or regulations. After entering into Contract, make all changes required to conform to above ordinances, rules and regulations without additional expense to the Owner.
   b. Barrier-Free Regulations: All materials and installations shall comply with the requirements of the State of Michigan Handicapped Barrier-Free Regulations and with the Americans with Disabilities Act (ADA).

D. Rules of Local Utility Companies:

1. Perform work in accordance with the rules of local utility companies. Before submitting the bid check with each utility supplying service to this Project. Determine from them all equipment and charges which they will require and include the cost in the bid.

E. Field Measurements:

1. Drawings are not intended to be scaled for roughing-in or to serve as shop drawings. Take all field measurements required for fitting the installation to the building.

F. Sequencing and Scheduling: Sequence and schedule work so as to avoid interference with the work of other Trades. Be responsible for removing and relocating any work which in the opinion of the Owner's Representatives causes interference.

1.5 EXAMINATION OF DRAWINGS AND PREMISES

A. Before submitting Bids, examine the site, architectural, mechanical and other trades' drawings and specifications.

1. Notify Architect/Engineer should any discrepancies occur between them and the electrical work.
2. No additional charges will be allowed because of failure to make this examination, or to include all materials and labor required for the Electrical Work specified in other trade's documents or required due to existing conditions.
3. Before submitting Bids, examine the premises to determine existing conditions for performing the Work. No additional charges will be allowed because of failure to make this examination or to include all materials and labor to complete the Work.
4. The Architectural Drawings take precedence in all matters pertaining to the building structure, Mechanical drawings in all matters pertaining to Mechanical trades and Electrical drawings in all matters pertaining to Electrical trades installation. However, where there are conflicts or differences between the Drawings for the various trades, report such conflicts or differences to the Architect/Engineer who shall determine the course of action to be taken.

1.6 SUBSTITUTIONS

A. Base Bid shall be in accordance with materials or products specified. Any exceptions to this shall be approved in writing by the Architect/Engineer ten (10) days or more prior to bidding.

1.7 ALTERNATES

A. Mandatory Alternates:

1. The Contractor shall refer to Alternates listed in Division 01 and Proposals and shall submit price quotations for the alternates that apply to the electrical work.

B. Voluntary Alternates:

1. Voluntary alternates may be submitted for consideration, with listed addition or deduction to the Bid, but will not affect the awarding of the Contract.

1.8 PERMITS, FEES AND INSPECTIONS

A. Obtain all permits, licenses, inspections and test required. Upon completion of the Work, obtain and send certificates of inspections and approvals to the Architect/Engineer.

1. Pay all fees and expenses for permits, licenses, tests and inspections.
2. A copy of the final approved Certificate of Electrical Inspection shall be provided as a requirement prior to final payment.

1.9 CHANGES INVOLVING ELECTRICAL WORK

A. The design of the electrical systems is based on the mechanical and building equipment specified and scheduled on the Drawings.

1. Where equipment changes are made that involve additional electrical work (increased motor horsepower or increased unit full load amperes, requirements for a disconnect switch scheduled to be part of the equipment, requirements for a starter scheduled to be part of the equipment, additional wiring of equipment, etc.) the Mechanical or respective trades involved shall compensate the electrical trades for the cost of the additional work required.

1.10 SUBMITTALS

A. The following is in addition to the requirements for submittals in Division 01.

B. Material List: Submit a complete list of all materials, equipment, and their manufacturers, for approval by the Architect/Engineer within 15 days after award of contract and prior to submittal of shop drawings.

C. Provide equipment submittals in the form of letters of intent, product data catalog sheets or shop drawings as hereinafter specified for all materials provided on the project.

D. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

1. Provide a space approximately 4” x 5” on the label or beside the title block on shop drawings to record the Contractor’s review and approval markings and the action taken.
2. Include the following information on the label for processing and recording action taken.

a. Project Name
b. Date
c. Name and address of Architect/Engineer
d. Name and address of Contractor
e. Name and address of Subcontractor
f. Name and address of Supplier
g. Name of Manufacturer
h. Number and title of appropriate Specification Section
i. Drawing number, identification mark, fixture type, panelboard number, specification section number, and detail references, or as noted on the electrical drawings.

E. Equipment submittals shall be reviewed by the Electrical Contractor for completeness and accuracy and prior to submitting to the Architect/Engineer for review. Submittals shall be dated and signed by the Electrical Contractor. Note on the submittal any and all exceptions or changes to the drawings and specifications required by the submittal to meet the specified products.

F. Partial submittals for equipment shall not be permitted. Where partial submittals are transmitted to the Architect/Engineer, they will be returned "Rejected”.

G. Where the equipment submittals consist of manufacturer's standard detail drawing or schedules and contain data for a variety of similar equipment, indicate the data pertinent to the equipment furnished for this project only. Standard detail drawings and schedules not clearly indicating which data is associated with this Project shall be returned "Rejected".

H. Where accessories and/or options are specified and do not appear as part of manufacturer's standard detail drawings, state each accessory that is to be provided with the equipment on the standard detail drawings.

I. Letter of Intent shall state that the product is exactly as specified with no exceptions, and that the product is being manufactured by one of the specified manufacturers. The Letter of Intent shall include the specification section number, the product description, the name of the selected manufacturer and the catalog number of the product. The aforementioned information shall be typed on the Electrical Contractor's letterhead and submitted with one (1) product data sheet for each product itemized in the Letter of Intent for record.

J. Lighting fixture submittals shall be submitted as one (1) package including all fixtures intended to be used for this Project.

K. As part of the lighting fixture submittal the emergency lighting fixtures shall be submitted and include the following:

1. Catalog cut sheets for the emergency lighting fixture specified.
2. Catalog cut sheets for the lamps specified including horizontal and vertical isofootcandle distribution curves with lamp lumen information.
3. Building floor plans indicating the emergency lighting fixture locations and the aiming point of each lamp indicated. The floor plans shall indicate point-by-point footcandle calculations (prepared by the lighting fixture manufacturer) along the path of egress on two foot centers. The footcandle levels shall meet the Consumer and Industry Services Office of Fire Safety policy number 2-19, referencing Section 5-9.2.1 of NFPA 101 Life Safety Code, 1997 edition. The maximum to minimum lighting uniformity shall be submitted as of the point-by-point calculations. Lighting levels shall not be less than .1 fc with an average of 1 footcandle and a maximum to minimum uniformity of 40:1.

L. As part of the lighting fixture submittals, the following shall be submitted at the completion of the lighting system installation:

1. Provide field verification of the installation's emergency lighting levels in accordance with the requirements of the State of Michigan Consumer and Industry Services Office of Fire Safety policy number 2-19, referencing Section 5-9.2.1 of NFPA 101 Life Safety Code, 1997 edition.
2. Field verification shall be made by obtaining actual light level measurements using a light meter in a grid pattern at floor level with measurements points a maximum of 10 foot on center. Measurements shall be taken at night in order to obtain accurate readings. Required power equipment shutdowns shall occur in order to simulate power loss and properly operate the emergency lighting equipment.
3. Contractor shall submit floor plans denoting the actual field measurements as taken. Additionally, the contractor shall submit a letter on company letterhead indicating the specific dates and times of all field measurements, names of personnel performing measurements, make and model of light meter used, and date of last calibration of the light meter. The letter shall also indicate the following specific light readings:

    a. Maximum light level
    b. Minimum light level
    c. Average light level
    d. Maximum to minimum ratio.

M. CADD files of the electrical drawings will be provided by the Architect/Engineer for this Contractor's use in preparing lighting calculations, layout shop drawings and final record drawings. Refer to Division 01 for the forms and procedures for requesting electronic files/media.

N. Shop Drawings: Prepare layout shop drawings drawn to scale in electronic format and submit to the Architect/Engineer for review, together with required number of additional copies as required by the General Conditions. After the shop drawings are reviewed, they will be stamped and returned. Refer to Division 01 for submittals and quantities.

1. Layout shop drawings shall show building floor plans to scale and shall include lighting and power distribution systems, all details of electrical construction, routing of conduits, wiring, circuiting and

related information necessary for the installation and future maintenance of the electrical wiring systems.

O. No apparatus or equipment shall be shipped from stock or fabricated until equipment submittals for them have been reviewed and approved by the Architect/Engineer. By the review of shop drawings, the Architect/Engineer does not assume responsibility for actual dimensions or for the fit of completed work in position, nor does such review relieve Electrical Trades of full responsibility for the proper and correct execution of the work required.

P. Submittals shall be provided on all major electrical systems and/or equipment, including the following:

REMARKS LEGEND
Provide the following as indicated:

1. Factory Test Report
2. Field Testing Report
3. Record Drawings
4. Mock-Up
5. Material & Equip. List/Certificate
6. Operation & Maintenance Manuals
7. Construction Schedule
8. Points List
9. Sequence of Operation
10. Certificate of Inspection
11. Installer Certificate & Master Label
12. Fire Marshal Approval
13. Tools/Spare Parts
14. _____

Section Number	Section Title	Shop Dwgs.	Product Data	Letter of Intent	Samples	Warranty	Remarks
26 0500	Common Work Results for Electrical					X	6, 7, 10
	Materials List			X			5
26 0519	Low Voltage Electrical Power Conductors and Cables (0-600V)						
	Cable			X			1
	Splicing Connectors			X			
	Termination Lugs			X			
26 0526	Grounding and Bonding for Electrical Systems						
	Grounding Cable			X			
	Grounding Connections/fittings			X			
26 0533	Raceways and Boxes for Electrical Systems						
	EMT Conduit and Fittings			X			
	RGS Conduit and Fittings			X			
	Flexible Steel Conduit and Fittings			X			
	Liquid-Tite Flexible Steel Conduit and Fittings			X			
	Outlet Boxes			X			
	Pull Boxes			X			
26 0553	Identification for Electrical Systems						
	Electrical Identification Product		X		X		

Section Number	Section Title	Shop Dwgs.	Product Data	Letter of Intent	Samples	Warranty	Remarks
26 0570	Electrical Testing and Power System Studies						
	Testing Firm			X			
	Short Circuit, Arc Flash Hazard and Protective Device Coordination Study						2
	Tests on 15KV Power Cables						2
	Tests on 4.8, 4.16 or 2.4KV Power Cables						2
	Tests on 600 Volt Cables						2
	Tests on Control Cable						2
	Tests on Unit Substation Transformers						2
	Tests on High Voltage Switchgear						2
	Tests on 480 Volt Switchgear						2
	Tests on Distribution Transformers						2
	Tests on Rotating Equipment						2
	Tests on 480 Volt Busways						2
	Tests on Motor Control Centers						2
	Tests on Control Devices						2
	Tests on Grounding						2
	Tests on Relays						2
	Tests on Transformer Insulating Liquids						2
26 0923	Lighting Control Devices						
	Photoelectric Controllers		X				
	Time Switches		X				
	Lighting Contactors		X				
	Lighting Control Panel	X					
26 2726	Wiring Devices						
	Wall Switches		X				2
	Receptacles		X				2
	Device Plates		X				
26 2816	Enclosed Switches and Circuit Breakers						
	Safety Switches		X				
26 5119	LED Interior Lighting		X				

1.11 PROJECT RECORD DOCUMENTS

A. Project Record Documents: Revise layout shop drawings as required during construction to indicate the as-built condition.

1. At the completion of the Project, resubmit to the Owner's Representative the revised set of “redlined” bluelines, (or electronic files with all changes from the bid documents bubbled) and one set of prints indicating “as-built” conditions for Owner's record. The Drawings shall contain all title block information as originally issued by the Architect/Engineer with the addition of the electrical contractor’s company name, address, telephone number, company’s project number, date of issuance by the electrical contractor, and issued for “Final Issue” conditions in title.

2. Furnish and deliver to the Owner's Representative a manual of all shop drawings and product data upon substantial completion. The manual shall consist of a standard hard cardboard, vinyl covered, 3-ring binder, letterhead size, 8-1/2" x 11". Shop drawings shall be folded and punched. All items and pages shall be numbered with typewritten index inserted at front of manual.
3. Submit final project record documents as described in Division 1.

1.12 OPERATION AND MAINTENANCE MANUALS AND EQUIPMENT

A. Operation and Maintenance Manuals: The manuals shall contain operating instructions, service instructions, parts lists, etc., which are shipped with electrical equipment. On completion of the work, transmit these items to the Architect/Engineer, for the Owner's use. If this information is not shipped with the equipment, obtain from the manufacturer.

B. Maintenance Materials: Retain all portable and detachable portions of the installation such as keys, tools, manuals, etc., until the completion of the work and then transmit them to the Owner and obtain itemized receipt. This receipt shall be attached to the "Final Application" for payment.

C. Furnish three (3) sets of bound operation and maintenance manuals to the Architect/Engineer. Each set shall include:

1. One (1) copy of all shop drawings and product data
2. One (1) copy of operation and maintenance instructions and manuals
3. One (1) copy of all electrical testing results
4. One (1) copy of as-built drawings

1.13 DELIVERY, STORAGE AND HANDLING

A. Storage and Protection: Provide adequate storage space for all electrical equipment, conduit and materials delivered to the job site under a weather protected enclosure. Location of the space will be designated by the Owner's Field Representative. Equipment set in place in unprotected areas must be provided with temporary protection.

1. Be responsible for the care and protection of electrical equipment until it has been fully tested and accepted.
2. Protect materials with permanent factory finish from damage by covering.
3. Protect conduit openings with temporary plugs or caps.

1.14 WARRANTY

A. Warranty: Provide a one year parts and labor warranty for all equipment and installation. Comply with requirements of the General Conditions.

1.15 DESCRIPTION OF ELECTRICAL SYSTEMS

A. Utility Electrical Secondary Service Voltage (Customer Service Entrance): 480/277 volt, 3 phase, 4 wire, 60 hertz, neutral solidly grounded at the source.

B. Power Systems: 480, 480/277 volts, 3 phase, 4 wire, 60 hertz, neutral solidly grounded at the source.

C. Lighting Systems: 480/277 volts, 3 phase, 4 wire, 60 hertz, solidly grounded neutral.

D. Small Power System: 208/120 volts, 3 phase, 4 wire, 60 hertz, solidly grounded neutral.

1.16 SCOPE OF WORK SPECIFIED IN DIVISION 26 SECTIONS

A. Furnish all labor, materials, equipment, technical supervision, and incidental services required to complete, test and leave ready for operation the electrical systems as specified in the Division 26 Sections.

B. The principal items of electrical work to be furnished and installed shall include but not necessarily be limited to the following items:

1. A complete facade lighting system including fixtures, branch circuit wiring, controls, etc.
2. An emergency power system consisting of emergency generator, panelboards, feeder and branch circuit wiring and all connections complete.
3. Lighting system (egress lighting) consisting of selected general area lighting fixtures.
4. A battery-operated emergency lighting system for egress and exit lighting.
5. Miscellaneous branch circuit devices and rework to facilitate building renovation.

1.17 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Furnishing and installing field prime and finish painting – Division 09, except as specified in Division 26.

PART 2 - PRODUCTS

2.1 ACCESS DOORS

A. Furnish access doors as required to make accessible all controls, motors, electrical boxes and other equipment installed by Electrical trades or as required by Code.

1. Architectural trades will install the access doors provided under this Section.
2. Access door size shall be minimum 12” x 12” in walls, 24” x 24” in ceilings.
3. Plaster or acoustical tile inserts shall be by Architectural trades.
4. Equip access doors with screwdriver operated cam lock.

    a. Recessed panel access doors shall be designed to receive plaster or acoustical tile inserts. Furnish a plastic grommet and sleeve at the lock location.

5. Access doors in fire rated walls or ceilings shall be 1-1/2 hour rated, “B” label, 250 degF maximum temperature rise in 30 minutes, self-closing and self-latching and shall carry Underwriters Laboratories, Inc. (UL) or Warnock-Hersey Label.

B. In non-fire rated gypsum board, veneer plaster, masonry or ceramic tile walls, furnish “Type M, 3202 Series” access doors as manufactured by Milcor Ltd. Partnership or approved equal.

C. In non-fire rated gypsum board or veneer plaster walls and ceilings, furnish “Type DW, 3203 Series” by Milcor Ltd. Partnership or approved equal.

D. In fire-rated gypsum board, veneer plaster, masonry or ceramic tile walls, furnish “3208 Series” by Milcor Ltd. Partnership or approved equal.

E. In non-fire rated gypsum board, veneer plaster or plaster ceilings, furnish “Type M, 3202 Series” by Milcor Ltd. Partnership or approved equal.

F. In non-fire rated plaster walls or ceilings, furnish “Type K, 3200 Series” by Milcor Ltd. Partnership or approved equal.

G. In non-fire rated plaster or acoustical tile ceilings, furnish “Type AP, 3206 Series” and “Type AT 3205 Series” by Milcor Ltd. Partnership or approved equal.

2.2 SEALING OF OPENINGS

A. Seal openings around electrical materials (Conduit, raceways, cable trays, panels, etc.) where floors, fire rated walls and smoke barriers are penetrated. (Fiberglass is not acceptable.) Fire and/or smoke barriers shall be UL Listed fire and smoke stop fittings and shall have fire rating equal to or greater than the penetrated barrier. Refer to Section 078413 “Through Penetration Firestop Systems”.

2.3 SLEEVES

A. Provide conduit sleeves where conduits pass through concrete floors, walls, beams and ceilings.

B. Sleeves shall be galvanized rigid steel conduit. Do not use aluminum conduit. Where specific sizes are not indicated on the Drawings, sleeves shall be sized to provide one-half (1/2) inch clearance around the outside surface of the item for which they were installed. They shall be cut flush with wall surfaces, and shall extend one inch, or as directed through floor. Sleeves shall be packed with approved non-combustible packing material and sealed with sealant to prevent passage of air, liquid or fumes from one area to another. The filler and sealant materials used shall be rated at least equal in fire resistance to the construction material being penetrated. Floor sleeves shall be sealed between floor and sleeve with concrete grout.

2.4 EXPANSION FITTINGS

A. Provide expansion fittings in all conduits, cable trays, and feeder bus duct runs that cross building expansion joints, both in concrete slabs and where exposed.

PART 3 - EXECUTION

3.1 ELECTRICAL DEMOLITION WORK

A. General: Perform electrical demolition work in a systematic manner. Use such methods as outlined below to complete Work indicated on the Drawings.

B. Obtain approval from the Owner prior to interrupting existing services. All service interruptions shall be at a time suitable to the Owner. Where the Owner approves service interruptions at times resulting in premium time work to this Contractor, this Contractor shall include the premium time in his Base Bid.

C. The associated conduit, wire, junction boxes, supports, etc., of equipment indicated to be demolished shall be removed from the utilization equipment back to the source panel and the associated circuit breaker or fused switch shall be relabeled as “spare”, unless otherwise noted. All associated wiring shall be removed back to the “sources” as noted below:

1. Power: Remove conduit and wire back to the panel or power source.
    a. When the circuit originates from the panel and serves no other loads, remove conduit and wire back to the panel.
    b. When the circuit originates from a panel but continues on to other loads not intended to be removed, remove conduit and wire back to first junction box.
    c. When the removal of the circuit to the equipment to be demolished affects “downstream” devices not indicated to be demolished, re-feed “downstream” devices.
2. Fire alarm wiring: Remove as indicated on the drawings. Fire alarm system shall remain operational during building occupied hours in all tenant occupied spaces.
3. Data system wiring, telephone wiring or other special wirings: Remove wiring back to communication room or other source.
4. Conduit in walls to remain: Abandon in place. Install blank coverplates.
5. Conduit accessible above ceilings and/or other location: Remove conduit.

D. Perform a circuit trace prior to deactivating feeders and branch circuits to insure maintaining electrical power in adjacent unrenovated area.

E. Conduit in floor slabs being demolished shall be cut 1/2 inch below the floor and patched.

F. Where applicable, existing in-place conduit may be reused for new work providing that the installation is in accordance requirements for new work found in Division 26.

G. Where equipment or fixtures are removed, outlets shall be properly blanked-off, and conduits capped. After alterations are completed, the entire installation shall present a “finished” look, as approved by the Architect/Engineer. The original function of the present electrical work to be modified shall not be changed unless required by the specific revisions to the system as specified or as indicated.

H. Materials salvaged from this work shall not be reused except where reuse is specifically indicated.

I. Existing fixtures and electrical equipment removed, not reused and not specifically indicated to be turned over to the Owner, shall be legally and properly disposed of off Owner’s property.

J. Existing fixtures and electrical equipment specifically indicated to be turned over to the Owner shall be disconnected, removed and turned over to the Owner in an undamaged condition to an on sight storage area as directed by the Owner.

3.2 TEMPORARY SERVICES

A. Provide temporary lighting, power and telephone service as described in Division 01.

B. The existing building will be occupied during construction. Maintain electrical services and provide necessary temporary connections and their removal at no additional expense.

3.3 CUTTING AND PATCHING

A. Refer to Division 01 for requirements for cutting, patching and refinishing work necessary for the installation of Electrical Work.

B. Direct miscellaneous cutting and patching of the existing building construction for the installation of the Electrical Work.

C. The cutting of holes through the existing building construction shall only be done by the use of abrasive saws and rotary coring machines. The use or hammer and drill points will not be permitted. The openings shall not be cut larger than necessary for the installation of the electrical work. Openings shall then be grouted in. Where existing piping, etc. is removed, the unused openings shall be grouted in.

D. The drilling or punching of structural members, such as holes through beams or columns, shall not be done without the specific permission of the Architect/Engineer.

E. Cutting of holes through floors and walls shall be done only at such locations as may be directed by the Architect/Engineer.

F. Cooperate with the other Contractors so that all cutting and repairing in any given area will be done simultaneously.

G. Electrical work which may interfere with changes in piping, ducts or other mechanical equipment, as well as conduits and outlets that may be uncovered by the cutting of new openings in present building shall be removed at the direction of the Architect/Engineer.

3.4 CHASES AND RECESSES

A. Provide sizes and locations of chases and recesses affecting the electrical work for provision by general trades.

3.5 EXCAVATION AND BACKFILL

A. Furnish excavating and backfilling to install work specified in the Electrical Division. Refer to electrical drawings and Division 31 for methods and materials.

3.6 EQUIPMENT FOUNDATIONS AND SUPPORTS

A. Furnish foundations and supports for electrical equipment and materials as required by codes, as listed hereinafter and shown or noted on the Drawings.

B. Provide necessary inserts, rod, structural steel frames, brackets, platforms, etc., for equipment suspended from ceilings or walls, such as conduits, transformers, panels, etc.

C. Inserts for equipment support shall be lead shield anchors for small work and expansion shields for large work. Wooden plugs will not be allowed. Do not use metal roof decking and cellular floors for supporting equipment.

D. Provide and install concrete bases 4" above finished floor, with leveling channels, where noted, for floor-mounted equipment such as unit substations, transformers, switchboards, distribution panels, motor control centers, etc.

E. Enclosures for panelboards, motor starters, disconnect switches and motor control centers shall be mounted on 1/2” spacers when mounted in a room below grade on exterior walls or 1/4” spacers when mounted in a room at or above grade on an exterior wall.

3.7 COORDINATION WITH OTHER TRADES

A. Install Work so as to avoid interferences with the Work of other trades. Be responsible for removing and relocating any work which, in the opinion of the Owner’s Representative, causes interferences.

B. Should construction conditions prevent the installation of switches, conduit, outlet boxes, junction boxes, conductors, lighting fixtures and/or other related equipment at locations shown on the drawings, minor deviations may be permitted and shall be as directed by the Architect/Engineer, and shall be made without additional cost to Owner.

C. The Electrical Trades will be responsible for all damage to other Work caused by their Work or through the neglect of their workers.

1. All patching and repairing of any such damaged Work shall be performed by the trades which installed the Work, but the cost shall be paid by the Electrical Trades.

3.8 ASSEMBLY AND CONNECTION OF EQUIPMENT

A. Assembly of Equipment:

1. The Contract Drawings and Specifications indicate items to be purchased and installed which are noted by a manufacturer's name, catalog number and/or brief description.
2. The catalog number may not designate all the accessory parts and appurtenances required for the particular use or function.
3. Arrange with the manufacturer for the purchase of all items required for the complete installation and efficient operation.

B. Equipment Connections:

1. Connections to equipment, motors, elevator controllers, lighting fixtures, etc., shall be made in accordance with the shop drawings and rough-in measurements furnished by the manufacturers of the particular equipment furnished.
2. Any and all additional connections not shown on the Drawings but called for by the equipment manufacturer's shop drawings or required for the successful operation of the particular equipment furnished shall be installed as part of this Contract at no additional charge to the Owner.

3.9 FIELD QUALITY CONTROL

A. Tests and Inspection:

1. When the systems are completed, operate equipment as directed by Architect/Engineer. Replace all faulty equipment. Make necessary adjustments before final acceptance.
2. Tests shall include but not be limited to panels, lighting fixtures, receptacles, fire alarm system, emergency lighting, branch circuits, lighting controls, etc.
3. Perform all tests required by State, City, County and/or other agencies having jurisdiction.
4. Provide all materials, equipment, etc., and labor required for tests.
5. Perform cable and equipment testing as specified.

B. Cleaning:

1. Keep premises free from accumulation of waste materials and rubbish. At completion of work remove all rubbish from and about the building and leave the electrical systems clean and ready for use.
2. Final clean-up shall include washing of fixture lenses, lighting panels, etc., to remove shipping and/or construction dust and debris. Fixture reflectors and/or lenses with water marks or cleaning streaks will not be accepted.

C. Painting:

1. In general, no painting is required by Electrical Trades other than touch-up of factory-finished electrical equipment.
2. All factory finished electrical equipment shall be cleaned at completion of the job. Equipment showing rust or mars shall be thoroughly cleaned and sanded, prime coated and touched up with enamel of color to match original finish.

END OF SECTION 26 0500

SECTION 26 0519 – LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (0-600V)

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 work of this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Conductors and cabling for buildings and structures electrical systems under 600 volts.
2. Wire and cable systems as required, and all material and equipment, including wire, cable, connectors, lugs, fittings, and identification, as indicated or specified.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.

1. Conductors - Each type and size of wire and cable. Identify material, construction data, insulation thickness, and jacket thickness.
2. Connectors
3. Lugs
4. Labels
5. Insulating tape
6. Submit color coding schemes for branch circuit wiring.
7. Submit cable identifications.

B. Samples: Submit samples on request of the Architect-Engineer.

C. Submit test data for wire and cable upon request of the Architect-Engineer. Do not install wire and cable for which test data has been requested until test data is approved.

1.4 QUALITY ASSURANCE

A. Wire, Cable and Components: Listed by Underwriters' Laboratories as meeting National Electrical Code and NFPA 70 requirements and be so labeled.

B. Furnish wire and cable on which standard factory tests established by AEIC, ANSI, ASTM, ICEA and NEMA have been performed.

C. Furnish cable tests as specified in 260570.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver all wire and cable to the site on reels or in coils, plainly marked for complete identification, including the wire or cable size, the number of conductors, type of wire or cable, length, weight, thickness and character of the insulation and the name of the manufacturer.

PART 2 - PRODUCTS

2.1 WIRE AND CABLE

A. General Requirements: Furnish wire and cable per standard specifications established for such material and construction by ASTM, ANSI, IPCEA and NEMA, where applicable. All conductors shall be copper unless otherwise specified. Minimum size of conductors shall be No. 12 AWG, except 120 volt control conductors which may be No. 14 AWG and 90 volt and less shall be as specified. Furnish conductor sizes as indicated. Conductors shall be stranded for sizes No. 14 AWG and larger. Conductors smaller than #14 AWG shall be as specified in the sections requiring use of such conductors.

1. Manufacturer: Provide products of one of the following:

    a. Cerro Wire
    b. Encore
    c. General Cable Corporation
    d. Prysmian
    e. Republic Wire
    f. Southwire
    g. United Copper Industries

B. Wire for Exposed Cord Connection to Lighting Fixtures: Three conductor stranded copper, NEC Type SO rated 60 degC, 600 volts.

C. Wire for General Interior and Exterior Use: Single conductor, annealed copper, NEC Type XHHW, THHN and THHW rated 90°degC or THHN/THWN rated 90 degC in dry locations and 75 degC in wet locations, or NEC Type THW, THWN and XHHW rated 75 degC, all with 600 volt insulation.

D. Cable types MC, MI, NM, NMC or NMS shall not be used unless specifically noted on the drawings or in the specifications.

2.2 CONNECTORS FOR SPLICING COPPER CONDUCTORS

A. Connectors for Straight Splicing (Butt Splice) Conductors Up To and Including No. 8 AWG: Uninsulated solderless compression type.

1. Manufacturer: Provide one of the following:

    a. Burndy "Hylink” Type YSVXX
    b. Panduit
    c. Thomas & Betts "Sta-Kon"

B. Connectors for Straight Splicing Conductors No. 6 AWG and Larger: Uninsulated solderless compression 2-way type.

1. Manufacturer: Provide one of the following:

    a. Burndy “Hylink” Type YSXX-T
    b. Thomas & Betts 54500 Series

C. Connectors for Pigtail Splicing Conductors Up To and Including No. 8 AWG: Solderless type with a metallic insert connector within a plastic insulating cover having a temperature rating of 105 degC, 600 volts.

1. Manufacturer: Provide one of the following:

a. Buchanan
b. Ideal
c. Scotchlok

D. Connectors for 3-Way Splicing Conductors No. 6 AWG and Larger: Uninsulated solderless compression type.

1. Manufacturer: Provide one of the following:

a. Burndy YST-XXXX
b. Thomas & Betts 54700 Series

2.3 LUGS FOR TERMINATING COPPER CONDUCTORS

A. Lugs for Terminating Power Conductors Up To and Including No. 8 AWG: Solderless type, manufacturer's standard, unless otherwise specified.

B. Lugs for Terminating Power Conductors No. 6 AWG and Larger: Solderless compression type, one hole for No. 6 AWG through No. 4/0 AWG inclusive, and two hole for larger sizes.

1. Manufacturer: Provide one of the following:

a. Burndy Type YA-L
b. Thomas & Betts Series 54000

C. Lugs for Terminating Control and Switchboard Wiring: Solderless compression type with tinned ring tongue.

1. Manufacturer: Provide one of the following:

a. Burndy "Hylug"
b. Thomas & Betts "Sta-Kon"

2.4 TERMINAL BLOCKS

A. Terminal Blocks for Use in Control Wiring of Control Panels and Terminal Cabinets: Molded barrier type rated 30 amperes, 600 volts, with washer head binding screws and white marking strip.

1. Manufacturer: Provide one of the following:

a. Cutler-Hammer, Inc., Bulletin 10987
b. General Electric EB-5
c. Marathon 2000 Series

2.5 INSULATING TAPE

A. General Use Tape:

1. Tape shall be vinyl all weather designed for continuous operation in -18°C to 105° applications and shall be 7 mils thick.
2. Manufacturer: Provide one of the following:

   a. Okonite Type CLF Catalog Series 602-20
   b. 3M Scotch Super 33

2.6 MISCELLANEOUS

A. Wire Labels for Identification of Conductors.

1. Manufacturer: Provide products of one of the following:

   a. Brady
   b. Westline

B. Lubricating Compound:

1. Manufacturer: Provide products of one of the following:

   a. American Polywater Corporation
   b. Ideal 77 Yellow
   c. Wire Lube

PART 3 - EXECUTION

3.1 GENERAL

A. Install all wiring in raceway systems unless otherwise specified. Install wiring only in completed raceway systems and when systems are protected from the weather. Install conductors continuous, without splices, between equipments, where possible. Where splices are required, make up splices in boxes; do not use fittings for same.

B. Install phase and neutral conductors of each branch or feeder circuit in a single conduit except where paralleling circuits are indicated. Install paralleling circuits of identical makeup and length as the paralleled circuit, and terminate conductors at the same location, mechanically and electrically, at both ends, to ensure equal division of the total current between conductors.

C. All 120 volt branch circuits exceeding 100 feet in length shall be minimum size #10 AWG.

D. All 277 volt branch circuits exceeding 200 feet in length shall be minimum size #10 AWG.

E. For interior branch circuits, provide a separate neutral conductor for each phase conductor for circuits supplying 120 volt convenience receptacles, fluorescent ballasts and high intensity discharge ballasts. Sharing neutrals between phase conductors shall not be permitted.

F. Continuously lubricate all non-armored cables of the larger sizes at the pull-in point of conduit systems with an approved compound compatible with conductor insulation or jacket.

G. Install conductors in such a manner that the bending radius of any wire or cable is not less than the minimum recommended by IPCEA and/or the manufacturer. Do not exceed manufacturer's recommended values for maximum pulling tension applied to any wire or cable.

H. Connect all power wiring to equipment such that phasing shall be A-B-C-N left to right, top to bottom and front to back, where possible, and permanently identify phasing on the structure or housing adjacent to bus. Phase identification A-B-C is equivalent to transformer phase identification X1-X2-X3 and H1-H2-H3.

I. Connect phase wiring to all 3 phase receptacles to insure the same phase rotation in all receptacles with interchangeable plugs.

3.2 COLOR CODING, CONDUCTOR AND CABLE IDENTIFICATION

A. Provide single conductor cables having black insulation for power feeders and subfeeders. Identify individual feeder and subfeeder conductors as to phase connection and voltage by means of wire labels and color coding at each pull box, junction box, manhole, handhole, vault, lighting fixture handhole, splice and termination.

B. Refer to Section 26 0553 “Identification for Electrical Systems” for conductor and cable identification requirements.

3.3 SPLICES AND TERMINATIONS

A. Splice and terminate conductors with connectors and lugs as specified for the specific size and type of conductor. Do not splice armored cable except where cable lengths are limited by reel capacity. Do not splice direct burial cable underground. Indent all compression type connectors and lugs with tools as recommended by the connector or lug manufacturer.

B. Thoroughly clean wire ends before connectors or lugs are applied. Before installing a compression connector or lug on an aluminum conductor, apply an aluminum joint compound to the exposed conductor and wire brush through the compound to remove the aluminum oxide film. Install the connector or lug immediately after wire brushing the conductor.

C. Whenever aluminum or copper lugs are terminated on aluminum bus, use a Belleville washer and two tin or cadmium plated washers, one on each side in combination with aluminum joint compound on all contacting surfaces. Tighten bolts until Belleville washer is flat.

D. Insulate all bare surfaces of conductors with a minimum of four layers (half lap in two directions) of electrical insulating tape. On larger splices and terminals, build up connection with electrical insulating putty before applying tape, to eliminate both sharp edges and voids.

E. Terminate all armored cables at equipment with an approved type of armored cable terminator and terminate cable ground conductors on equipment ground bus. Where splices are required in armored cables, use approved splicing sleeves. Locate splicing sleeve outside of and adjacent to the tray, not in the tray.

3.4 FIELD QUALITY CONTROL

A. Perform testing on all conductors as indicated in the Electrical Testing and Power Systems (26 0570) Section.

END OF SECTION 26 0519

SECTION 26 0526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Grounding Conductors:

a. For General Use Above and Below Grade: Bare.
b. In Conduit with Phase Conductors: Insulated.

2. Grounding Connections:

a. In Earth or Inaccessible Locations: Bolted mechanical type.
b. To Structural Steel Used for Main Building Framing: Bolted lugs.
c. To Non-Permanently Fixed Equipment: Lugs bolted to the equipment.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Ground electrical system neutrals and non-current carrying parts of electrical equipment per the minimum requirements of the National Electrical Code, except where additional requirements are indicated or specified.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.

B. Submit shop drawings and complete product data on each item. Coordinate the items, as they relate to the work, prior to submittal. Shop drawings shall include:

1. Grounding connections and fittings

PART 2 - PRODUCTS

2.1 GROUNDING CONDUCTORS

A. Bare Grounding Conductors: stranded annealed copper.

B. Insulated Grounding Conductors: stranded annealed copper insulated with a heat and moisture resistant polyvinyl chloride compound and meeting UL Requirements for Type (THWN) (XHHW), 75 degC, rated 600 volts, color-coded green. Conductor No. 10 AWG and smaller may be solid in lieu of stranded.

1. Manufacturer: Provide products of one of the following:

a. Southwire
b. Cerrowire
c. Encore
d. General Cable

e. Prysmian
f. Republic Wire

2.2 GROUNDING CONNECTIONS

A. Grounding Fittings for Connecting to Water Pipe:

1. Manufacturer: Provide products of one of the following:

a. Hubbell/Anderson Type GC
b. Hubbell/Burndy GD or GG
c. ABB/Thomas & Betts Series 3902 to 3909

B. Grounding Fittings for Bonding a Ground Conductor to Its Own Conduit:

1. Manufacturer: Provide products of one of the following:

a. Appleton Type GIB
b. Burndy Type NE
c. Penn Union Type BD
d. O-Z Type GB
e. Thomas & Betts Type TIG or 3800 Series

C. Grounding Fittings for Connection of Grounding Conductor to Fencing:

1. Manufacturer: Provide the following:

a. Hubbell/Anderson GC-110 or GC-143
b. Hubbell/Burndy GAR Series
c. Penn Union GU or GH
d. Erico/nVent FC Series

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install conductors of size required by the NEC. except that where sizes are otherwise indicated, provide these sizes.

B. Thoroughly clean all bonding surfaces of non-conducting materials. Where bolted connections are used, treat surfaces with a corrosion-inhibiting compound.

C. Where insulated conductors are used, thoroughly tape all exposed splices and connections.

D. Where metallic conduit is used for mechanical protection of a ground conductor, bond conductor to the conduit at each end.

E. For electrical system neutral grounding, do not use conductor sizes smaller than No. 8 AWG.

F. Where non-metallic conduit is used, install a ground conductor in the conduit with the circuit conductors. The ground conductor may be a separate conductor, a conductor of a multi-conductor cable, or wires in the interstices of cabled circuit conductors. Size the ground conductors per NEC requirements except where noted otherwise.

G. Lighting branch circuits in EMT or flexible conduit and lighting fixture cord and plug assemblies shall have an equipment grounding conductor.

H. Provide an equipment grounding conductor, within the raceway along with phase conductors, for all feeders and branch circuits.

I. Provide an equipment grounding conductor within all flexible conduits.

J. The metallic enclosures and exposed noncurrent-carrying metal parts of all electrical equipment shall be grounded by connection with an equipment grounding conductor. This includes boxes, panels, lighting fixtures, ballasts and poles, receptacles, etc.

END OF SECTION 26 0526

SECTION 26 0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Conduit and cable support devices.
2. Support for conductors in vertical conduit.
3. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
4. Fabricated metal equipment support assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

a. Clamps.
b. Hangers.
c. Sockets.
d. Eye nuts.
e. Fasteners.
f. Anchors.
g. Saddles.
h. Brackets.

2. Include rated capacities and furnished specialties and accessories.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M.
2. AWS D1.2/D1.2M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame Rating: Class 1.
2. Self-extinguishing according to ASTM D635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

B. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

C. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M,Grade A325.
6. Toggle Bolts: Stainless-steel springhead type.
7. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 05 5000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA 101
3. NECA 102.
4. NECA 105.
5. NECA 111.

B. Comply with requirements in Section 07 8413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

C. Comply with requirements for raceways and boxes specified in Section 26 0533 "Raceways and Boxes for Electrical Systems."

D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 05 5000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in [Section 09 9113 "Exterior Painting"] [Section 09 9123 "Interior Painting"] [and] [Section 09 9600 "High-Performance Coatings"] <Insert painting Sections> for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 26 0529

SECTION 26 0533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Raceway systems as required, and all equipment and material, including conduit, fittings, boxes, wireways, and cable trays, as indicated or specified.

1.3 SUBMITTALS

A. Product Data: Submit complete data on each item. Coordinate the items, as they relate to the work, prior to submittal. Shop drawings shall include:

1. Conduit and fittings
2. Boxes
3. Wireways

B. Submit Owner's Operation and Maintenance Manuals for systems and equipment as follows:

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Work in Hazardous Areas in accordance with Article 500 of the National Electrical Code.

PART 2 - PRODUCTS

2.1 CONDUIT

A. Rigid Galvanized Steel (RGS) Conduit, Elbows, and Couplings: Zinc-coated hot dip galvanized threaded steel per ANSI C80.1 "Specification for Rigid Steel Conduit, Zinc-Coated" and UL6. Each length of conduit shall be threaded on both ends.

1. Manufacturer: Provide products of one of the following:

a. Allied
b. Republic
c. Wheatland

B. Intermediate Metal Conduit (IMC), Elbows and Couplings: Zinc-coated hot dip galvanized per UL 1242. Each length of conduit shall be threaded on both ends.

1. Manufacturer: Provide products of one of the following:

a. Allied
b. Republic
c. Wheatland

C. Electrical Metallic Tubing (EMT): Zinc-coated steel per ANSI C80.3-1977 "Specification for Electrical Metallic Tubing, Zinc-Coated".

1. Manufacturer: Provide products of one of the following:

a. Allied
b. Republic
c. Wheatland

D. Flexible Steel Conduit: Per UL-1, "Flexible Steel Conduit".

1. Manufacturer: Provide products of one of the following:

a. Anaconda
b. Electriflex

E. Liquid-Tight Flexible Steel Conduit: Per UL-1, "Flexible Steel Conduit", with a PVC jacket.

1. Manufacturer: Provide products of one of the following:

a. Anaconda
b. Sealtite
c. Electriflex

2.2 CONDUIT FITTINGS

A. Fittings for Rigid Galvanized Steel or Intermediate Metal Conduit: Cast or malleable iron bodies, cadmium or zinc-plated, with taper threads, screw attached cover plates, and gaskets when located in areas requiring gaskets as specified in Part 3.

1. Manufacturer: Provide products of one of the following:

a. Appleton Form 35
b. Crouse-Hinds Form 8
c. Steel City/Thomas & Betts
d. Topaz

B. Expansion Fittings for Rigid Galvanized Steel or Intermediate Metal Conduit: Cast or malleable iron bodies, with threaded end caps for receiving fixed and movable conduits, metallic pressure packing and copper bonding jumper assembly, and providing for a minimum of 2 inches movement of the conduit in either direction.

1. Manufacturer: Provide products of one of the following:

a. Appleton Type XJ
b. Crouse-Hinds Type XJ
c. O-Z Type AX
d. Thomas & Betts Type XJG

C. Couplings and Connectors for EMT: Zinc-plated steel, compression or set screw type.

1. Manufacturer: Provide products of one of the following:

a. Appleton
b. ETP
c. Midwest
d. Steel City/Thomas & Betts

D. Conduit Unions on Continuous Run:

1. Manufacturer: Provide products of the following:

a. Erickson

E. Expansion Fittings for EMT:

1. Manufacturer: Provide products of the following:

a. Thomas & Betts Type XJG

F. Fittings for Flexible Steel Conduit: Malleable iron or steel, zinc or cadmium plated, securing the conduit by clamping action around the periphery of the conduit. Do not furnish fittings that anchor the conduit by means of set screws.

1. Manufacturer: Provide products of one of the following:

a. Appleton
b. ETP
c. Steel City/Thomas & Betts

G. Fittings for Liquid-Tight Flexible Steel Conduit: Designed to maintain the liquid-tight feature of the installation.

1. Manufacturer: Provide products of one of the following:

a. Appleton ST Series
b. ETP
c. Thomas & Betts 5331 to 5360

H. Locknuts for Rigid Steel or Intermediate Metal Conduit: Malleable iron or steel, zinc or cadmium plated.

I. Bushings for 1 Inch and Smaller Rigid Steel Conduits, Intermediate Metal Conduits or Aluminum Conduits: Insulating plastic type of non-burnable thermosetting phenolic, conforming to Underwriters' Laboratories requirements. Do not furnish non-rigid plastic bushings.

J. Bushings for 1-1/4 Inch and Larger Rigid Steel or Intermediate Metal Conduits: Malleable iron or steel, zinc or cadmium plated, with insulating insert of thermosetting plastic as specified for smaller conduit bushings, molded and locked into the bushing ring.

2.3 OUTLET BOXES

A. Sheet Steel Boxes: Galvanized or sherardized stock not less than No. 14 gage, with knockout openings, single or multiple gang, with extensions, adapters, plaster rings, tile covers, fixture studs and cover plates. Furnish accessories with same gage and finish as specified for boxes, except where special finishes are specified for covers and device plates in Section 26 2726. Provide sizes per NEC requirements for wiring space, except where minimum sizes are specified under Part 3.

1. Manufacturer: Provide products of one of the following:

a. Appleton
b. RACO
c. Steel City

B. Cast or Malleable Iron Boxes: Galvanized or cadmium plated, single or multiple gang, with taper threaded hubs, adapters and cover plates. Furnish cast metal, galvanized or cadmium plated accessories, except where special device plates are specified in Section 26 2726. Furnish gaskets when located in areas requiring gaskets as specified in Part 3. Provide sizes per NEC requirements for wiring space, except where minimum sizes are specified under Part 3.

1. Manufacturer: Provide products of one of the following:

a. Appleton
b. Crouse-Hinds
c. Pyle-National
d. Russelstoll
e. Steel City/Thomas & Betts

2.4 PULL AND JUNCTION BOXES

A. Boxes Less than 5 Inches by 5 Inches: Conform to requirements specified for Outlet Boxes.

B. Sheet Metal Boxes: Code gage, full seam welded with bent-in flanges seam welded at corner joints, screw fastened cover of same gage as box. Fasten cover with brass machine screws. Galvanize box and cover after fabrication. Provide sizes conforming to NEC requirements for wiring space, except where boxes of larger size are indicated. Furnish gaskets when located in areas requiring gaskets as specified in Part 3.

C. Cast or Malleable Iron Boxes: Code gage, with threaded hubs or conduit bosses for field drilling and tapping, screw fastened cover of same gage as box. Fasten cover with brass machine screws. Galvanize box and cover after fabrication. Provide sizes conforming to NEC requirements for wiring space, except where boxes of larger size are indicated. Furnish gaskets when located in areas requiring gaskets as specified in Part 3.

1. Manufacturer: Provide products of one of the following:

a. Hoffman
b. O-Z

D. Aluminum or Aluminum Alloy Boxes: Code gage, with threaded hubs or conduit bosses for field drilling and tapping, screw fastened cover of same gage as box. Fasten cover with stainless steel machine screws. Provide sizes per NEC requirements for wiring space, except where boxes of larger size are indicated. Furnish gaskets when located in areas requiring gaskets as specified in Part 3.

1. Manufacturer: Provide products of one of the following:

a. Hoffman
b. O-Z

2.5 SURFACE RACEWAY

A. Where necessary to run exposed on existing walls and/or ceilings in finished areas, use surface raceway series type, as required for each individual circuit, or as shown on drawing. Paint the new surface raceway to match the existing surface.

1. Manufacturer: Provide products of one of the following:

a. Hubbell
b. Mono-Systems
c. Wiremold

2.6 MISCELLANEOUS

A. Trapeze Hangers

1. Manufacturer: Provide products of one of the following:

a. Kindorf
b. Powerstrut
c. Unistrut

B. Shielding Paint

1. Manufacturer: Provide products of one of the following:

a. Thomas & Betts "KopR-Shield"

C. Sealant: Single component, non-sage urethane:

1. Manufacturer: Provide products of one of the following:

a. Sika Corporation “Sikaflex 1a”
b. Pecora Corporation "Dynatrol 1"
c. Sonneborn "Sonolastic NP-1"
d. Tremco “Dymonic”

PART 3 - EXECUTION

3.1 CONDUIT SYSTEMS

A. Install RGS conduit for conduit in “unfinished” or “open” areas up to 10’-0” above finished floor.

B. Install RGS conduit for conduits passing through foundation walls with a 3 inch minimum concrete wall around the conduits and five (5) feet both sides of the wall.

C. Install RGS conduits for all exposed exterior locations and wet locations.

D. EMT compression type connectors and couplings shall be used for all EMT conduits routed in damp locations or when the use of EMT in lieu of RGS is approved by the Engineer for exposed exterior locations. The use of set screw connectors and couplings is permitted for all other EMT raceways where equipment ground wires exist.

E. Install EMT concealed in wall cavities in offices and similarly “finished areas,” above suspended ceilings and in “unfinished areas” 10’-0” above finished floor.

F. Install flexible conduit in lieu of RGS or EMT for service to individual recessed fixtures, 1/2 inch minimum size. Use liquid-tight type of flexible conduit in lieu of non-jacketed flexible conduit in damp or wet locations.

G. Install liquid-tight flexible steel conduit for final connection to fixtures. Flexible conduits shall not exceed 6’-0” in length.

H. Install conduit systems as indicated, as required by the NEC, and as specified. Install conduit sizes as indicated. Where conduit sizes are not indicated, install sizes per NEC requirements, except do not use conduit sizes smaller than 3/4 inch. The use of 1/2” conduit is permitted from receptacle outlet boxes and switch outlet boxes to the nearest junction mounted in the ceiling space. 3/4” conduit minimum shall be

used from the panelboards to the junction boxes and between junction boxes. Use 1/2 inch fixture stems optionally, unless otherwise indicated.

I. Install conduit concealed in office and similar finished areas, and exposed in all other areas unless otherwise indicated or specified.

J. Install all exposed and concealed conduit runs parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings. Keep conduit at least six inches away from parallel runs of high temperature surfaces, such as steam or hot water pipes and do not run conduit directly under cold water lines.

K. Group conduit for common support, where indicated and elsewhere as directed by the Architect-Engineer.

L. Do not install crushed or deformed conduits and avoid trapped runs in damp or wet locations. Take care to prevent the entrance of water and the lodging of concrete, plaster, dirt or trash in conduit, boxes, fittings and equipment during the course of construction. Free conduit of obstructions or replace the conduits. Where conduit joints occur in concrete slabs, or in damp or wet locations, make joints watertight by applying an approved compound on the entire thread area before assembling. Draw up all conduit joints as tightly as possible. Cap exposed empty conduits which do not terminate in outlets, panels, cabinets, etc. with standard galvanized plumbers pipe caps. Plug empty conduits which terminate flush with floors or walls with flush coupling and brass plug.

M. Install conduit sleeves for all exposed conduits and cables passing through walls, ceilings or floors, and fill the void between sleeve and conduit with sealant flush with the end of the sleeve to seal the opening.

1. For conduit sleeves passing through fire rated walls, floors or ceilings, comply with requirements of Section 078413 “Through-Penetration Firestop Systems”.

N. Make changes in direction of runs with symmetrical bends, fittings or pull boxes. Do not use bends around outside corners; use fittings for same. Install elbows, bends and offsets having a minimum radius of curvature of 24 inches for 2 inch and 2-1/2 inch conduit, and 36 inches for 3 inch and larger conduit. Except where conduit runs are shown in exact detail, install pull points at not greater than 200 foot intervals in straight runs. Where bends are included between pull points, reduce this maximum permissible 200 foot separation between pull points by 50 feet for each 90 degree bend and 25 feet for each 45 degree bend. Figure deductions for all other angle bends on a similar basis. When bends are made in the field, make bends with an approved hickey or conduit bending machine. Make bends in 1-1/4 inch and larger conduits with standard conduit ells where possible.

O. Provide conduit nipples with two independent sets of threads. Do not use running threads on any part of the conduit system. Where conditions require joining two fixed conduits into a continuous run, use a conduit union, in place of running threads and coupling.

P. Install expansion fittings in exposed conduit runs of excessive length, where conduits cross building expansion joints, and where indicated.

Q. Install double locknuts and bushings on all rigid conduit terminations into threadless openings. Increase length of conduit threads at terminations sufficiently to permit the bushing to be fully seated against the end of the conduit.

R. Use one hole malleable iron galvanized pipe straps for support of single conduits, or clevis type hangers. Support groups of conduit on trapeze hangers. Use threaded rod or pipe for hanger support. Do not use perforated strap or wire for conduit or hanger support. Use beam clamps or malleable iron or wrought steel with hook rods to grip the beam flange for conduit or hanger support; do not use C-clamp type fittings. Support exposed conduit at least every 8 feet if smaller than 2 inch, and every 10 feet if 2 inch and larger unless otherwise noted.

3.2 OUTLET, SWITCH, JUNCTION AND PULL BOXES

A. Outlet Boxes for Use with Rigid Steel Conduit in Non-Hazardous Areas: Sheet steel for flush or concealed work in dry locations; cast or malleable iron in exposed, damp or wet locations. Do not use sheet steel outlet boxes in utility or factory areas.

B. Outlet Boxes for Use with Electrical Metallic Tubing: Sheet steel for flush or concealed work; cast or malleable iron for exposed locations.

C. Flush Mounted Boxes: For single gang outlets and two gang outlets, use boxes not less than 4 inches square and 2-1/8 inches deep with single gang and two gang plaster reducing ring. For multiple outlets, use gang type boxes not less than 2-1/4 inches deep. Plaster rings shall not be less than 3/4 inches deep. For ceiling outlets in concrete slabs, use boxes not less than 3 inches deep.

D. Gaskets: Provide cover gaskets for boxes in damp or wet locations and in factory areas.

E. Pull and Junction Boxes for Use with Each Type of Conduit: As specified for outlet boxes for each conduit type under above paragraphs.

F. Install boxes in the wiring or raceway systems as required for pulling of wires, making connections, and mounting of devices and fixtures.

G. Install extension rings, adapters, raised covers and plaster rings on flush mounted boxes as required. Equip flush mounted boxes in masonry block or tile walls with tile covers.

H. Install separate concealed boxes for semi-flush or recessed fixtures when required by the fixture terminal operating temperature. Make boxes readily accessible on removal of the fixture or provide ceiling access panels as approved by the Architect-Engineer.

I. Locate outlets in offices and other finished areas with due regard for the finish and interior architectural treatment so that outlets are centered with respect to panels, joints or moldings, and so that plaster rings, frames and tile covers are properly located with respect to the finished surface.

J. Install outlets for wall switches controlling lighting on the latch side of door where possible.

K. Support boxes independent of conduit and secure rigidly in place. Install boxes used for fixture support such that they are capable of carrying 100 pounds.

L. In concrete, anchor boxes securely to reinforcing steel and to forms to prevent shifting when concrete is placed.

M. Above suspended ceilings, support boxes to the building steel or structural floor above and independent of the ceiling pads; flush mounted boxes for suspended ceilings fasten boxes to the ceiling support system by bar hanger or other approved support; flush boxes in drywall ceilings fasten boxes to ceiling support system by bar hanger or other approved support system.

3.3 WIREWAYS

A. Install wireways at locations indicated. Where wireways are located on surfaces susceptible to moisture on exterior masonry or concrete walls, do not install wireway in contact with such surfaces; support wireways with not less than 1/4 inch air separation from the surface.

B. Provide supports at a maximum of 5 foot intervals.

C. Where pendant supports are indicated or required, provide 1/2 inch diameter threaded rods with beam clamps as specified for conduit supports. Provide lateral bracing at not greater than 10 foot intervals.

END OF SECTION 26 0533

SECTION 26 0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Raceway identification
2. Power and control cable identification
3. Cable ties
4. Miscellaneous identification products

1.3 ACTION SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 [and IEEE C2].

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 RACEWAY IDENTIFICATION

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits as specified voltages:

1. Black letters on a yellow field for 250V or less.
2. Black letters on a red field for over 250V and less than 600V.

C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

2.2 POWER AND CONTROL CABLE IDENTIFICATION

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.3 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black except where used for color-coding.

2.4 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50 foot maximum intervals in straight runs, and at 25 foot maximum intervals in congested areas.

G. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

H. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.2 RACEWAYS AND CONDUCTOR IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits 100 amperes or more and 120 volts or more to ground:

1. Self-adhesive vinyl tape applied in bands. Install labels at 30 foot maximum intervals.

B. Accessible Raceways, Cables, Junction Box Cover Plates and Pull Box Covers:

1. Self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

a. Emergency power
b. Power
c. UPS

C. Conductor Identification, 600 V or Less:

1. Identify individual phase conductors, neutral conductor and ground conductor of branch power and lighting circuits as to phase and system voltage by means of color coding in conformance with Sections 200-6 and 210-5 of the NEC.
2. Use the following identification scheme unless there are existing schemes being utilized by the Owner:

Phase			Neutral		Equipment Grounding Conductor	System
A	**B**	**C**	**Normal Power**	**Emergency Power**		
X	Y	Z	N	N	GRD.	Any Voltage
Black	Red	Blue	White	White/Red tracer	Green	120/208 Volt
Brown	Orange	Yellow	Gray	Gray/Red tracer	Green/Yellow Tracer	277/480 Volt

3. Where color schemes deviate from above, submit color schemes for approval of the Architect-Engineer prior to implementation. Provide conductor color coding by means of colored

insulating materials or by means of colored wire labels attached to individual conductors in all outlet, pull or junction boxes and at all terminations.

4. Install color coding scheme labels at each switchboard, panelboard, distribution panel, power panel and motor control center.
5. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

D. Identify cable groups and conduit at entering and leaving locations in manholes, handholes and at terminations.

E. Tags shall be 1/8 inch thick lead die-stamped tags with punched ears. Fasten tags around the cable group or conduit with No. 12 AWG copper wire.

F. Identify cables in cable tray at intervals of 40 feet, at each side of walls, and at terminations and splices by means of strip aluminum with raised letters.

G. Identify cables entering or exiting conduits, passing through pull boxes, at each pullbox and at each termination location.

H. Designate source and load, or feeder or cable identification on tags. Submit identification for the approval of the Architect-Engineer.

I. Auxiliary Systems Conductor Identification:

1. Identify field-installed alarm, control, and signal connections.
2. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
3. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
4. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

   a. Power transfer switches.
   b. Controls with external control power connections.

END OF SECTION 26 0553

SECTION 26 0923 – CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. The objective of this section is to ensure the proper installation of the following lighting control devices:

    a. Wall switch occupancy sensors
    b. Indoor occupancy sensors
    c. Emergency power transfer devices

2. Contractor's work to include all labor, materials, tools, appliances, control hardware, sensors, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational occupancy sensor lighting control system with automatic emergency power transfer, as described herein.
3. The occupancy sensor based lighting control devices shall accommodate all conditions of space utilization and all irregular work hours and habits.
4. The location and quantities of sensors shown on the Drawings are diagrammatic and indicate only the rooms which are to be provided with sensors. Provide additional sensors as required to properly and completely cover the respective room.

1.3 SUBMITTALS

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

B. Shop Drawings: Provide installation details for occupancy and light-level sensors.

1. Lighting plans indicating location, orientation, and coverage area of each sensor and each power transfer device. The locations and quantities of sensors and transfer devices indicated on the Drawings are diagrammatic and indicate only the rooms which are to be provided with sensors and emergency lighting. Provide layout shop drawings indicating all power transfer devices and all sensors including any additional sensors required to properly and completely cover the respective areas. Include locations of power transfer devices (PTD).
2. Interconnection diagrams showing field-installed wiring.

C. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.4 WARRANTY

A. Contractor shall warrant all equipment furnished in accordance with this specification to be undamaged, free of defects in materials and workmanship, and in conformance with the specifications. The suppliers obligation shall include repair or replacement, and testing without charge to the owner, all or any parts of equipment which are found to be damaged, defective or non-conforming and returned to the supplier. The warranty shall commence upon the owner's acceptance of the project. Warranty shall be for a minimum period of one (1) year.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Products supplied shall be from a single manufacturer that has been continuously involved in the manufacturing of occupancy sensors for a minimum of five (5) years. Mixing of manufacturers shall not be allowed.

C. All components shall be U.L. listed and meet all state and local applicable code requirements.

D. Wall switch products shall be capable of withstanding the effects of inrush current. Submittals shall clearly indicate the method used.

E. It shall be the contractor's responsibility to make all proper adjustments to assure owner's satisfaction with the occupancy sensor system.

F. It shall be the manufacturer's responsibility to verify all proper adjustments and train owner's personnel to ensure owner's satisfaction with the occupancy system. A minimum of four (4) hours at the jobsite building shall be included for training.

1.6 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, fire-suppression system, and partition assemblies.

B. Contractor shall coordinate all work described in this section with all other applicable plans and specifications, including but not limited to wiring, conduit, fixtures, HVAC systems and building management systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. All products shall be provided by one of the following:

1. Leviton
2. Sensor Switch
3. Watt Stopper

2.2 WALL SWITCH OCCUPANCY SENSOR

A. Switching mechanism shall be latching air gap relay, compatible with electronic ballasts, compact fluorescent, and inductive loads. Triac and other harmonic generating devices shall not be allowed. Zero Crossing Circuitry shall be used to increase the relay life, protect from the effects of inrush current, and increase the sensor's longevity.

B. Sensor shall be capable of detecting presence in the control area by detecting changes in the infrared energy. Small movements shall be detected such as when a person is writing while seated at a desk.

C. To avoid false ON activations and to provide high sensitivity to minor motion, Pulse Count Processing and Detection Signature Analysis shall be used to examine the frequency, duration, and amplitude of the signal received by the sensor to ensure response only to those signals caused by human motion.

D. Sensor shall utilize signal technology to provide immunity to RFI and EMI.

E. Sensor shall utilize a temperature compensated, dual element sensor and a multi-element Fresnel lens. Fresnel lens shall be a Poly IR 4 based material to offer superior filtering capability of competing light sources, such as the sun and other visible light sources. Lens shall have grooves facing in to avoid dust and residue build-up which could affect IR reception. To assure detection at the desktop level uniformly across the space, sensor shall have a 2 level, 28 segment, multi-element Fresnel lens system. For protection against lens damage, sensor shall utilize a full radius lens brace.

F. Sensor shall have a coverage area of 900 sq. ft. for walking motion, with a field of view of 180 degrees.

G. Sensor shall operate at either 120 VAC or 277 VAC and shall be capable of switching 0 to 800 watt ballast or tungsten or 1/6 hp @ 120 volts, 60 Hz; 0 to 1200 watts for ballast or 1/3 hp @ 277 volts, 60 Hz.

H. Sensor shall have a built-in light level feature adjustable from 2 to 200 footcandles that holds lighting OFF when a desired footcandle level is present. Sensor shall have a time delay adjustable from 30 seconds to 30 minutes. Sensor shall have user-adjustable sensitivity setting. Adjustments and mounting hardware shall be concealed under a removable cover to prevent tampering of adjustments and hardware.

I. Sensor shall have two positions only: OFF and AUTO for normal operation.

J. The sensor shall utilize terminal style wiring. Sensor shall provide automatic equipment grounding to a metal junction box, and provide grounding to a metal cover plate.

K. Sensor shall have 100% off switch with no leakage current to load in OFF mode. In the event there is an open circuit in the AC line such as a ballast or lamp failure, the sensor shall automatically switch to OFF mode.

L. Manufacturer: Provide the following:

1. Leviton
2. Sensor Switch WSD
3. Watt Stopper WS-200

2.3 DUAL LEVEL WALL SWITCH OCCUPANCY SENSOR

A. The wall switch sensor shall be a completely self-contained passive infrared control system that replaces a standard toggle switch. Sensor shall have ground wire for safety. Switching mechanism shall be dual latching air gap relays, compatible with electronic ballasts, compact fluorescent, and inductive loads. Triac and other harmonic generating devices shall not be allowed.

B. Sensor shall be capable of detecting presence in the control area by detecting changes in the infrared energy. Small movements shall be detected, such as when a person is writing while seated at a desk.

C. To avoid false ON activations and to provide high sensitivity to minor motion, Pulse Count Processing and Detection Signature Analysis shall be used to examine the frequency, duration, and amplitude of the signal received by the sensor to respond only to those signals caused by human motion.

D. Sensor shall utilize signal technology to provide immunity to RFI and EMI.

E. Sensor shall utilize two isolated relays capable of simultaneously controlling independent lighting loads or circuits. Each relay shall simultaneously control a separate lighting load. Dual Auto-Off buttons, located on the front of the sensor, shall allow the user to manually turn on and off each of the loads. The primary relay shall utilize Zero Crossing Circuitry to increase the relay life, protect from the effects of inrush current, and increase the sensor’s longevity.

F. Sensor shall utilize a temperature compensated, dual element sensor and a multi-element Fresnel lens. Fresnel lens shall be a Poly IR 4 based material to offer superior filtering capability of competing light

sources, such as the sun and other visible light sources. Lens shall have grooves facing in to avoid dust and residue build-up which affects IR reception. To assure detection at desktop uniformly across the space, sensor shall use 41 segment multi-element lens with 4 layers vertically, at 0°, 5°, 12°, and 30° and up to 19 layers horizontally. Sensor shall have patented prism system which provides superior 180° coverage. Sensor lens shall be mounted on 8 posts within the lens cavity and be secured in place with a full frame backing retainer for additional strength and vandal resistance.

G. Sensor shall have a coverage area of 1,000 sq. ft. for walking motion, with a field of view of 180 degrees.

H. Sensor shall operate at 120 VAC or 277 VAC and each relay shall be capable of switching from 0 to 800 watts incandescent or fluorescent or 1/6 hp @ 120 VAC, 60 Hz; and 0 to 1200 watts fluorescent or 1/3 hp @ 277 VAC, 60 Hz.

I. Sensor shall have a built-in light level feature that affects only the secondary relay and is adjustable from 10 to 150 footcandles that holds lighting off when the desired footcandle level is present. Sensor shall have a time delay adjustable from 30 seconds to 30 minutes. Sensor shall have adjustable sensitivity settings. Adjustments and mounting hardware shall be concealed under a removable, tamperproof cover to prevent tampering of adjustments and hardware.

J. Sensor shall have a 100% off switch with no leakage current to the load. In the event there is an open circuit in the AC line such as a ballast or lamp failure, the sensor shall automatically switch to OFF mode.

K. Sensor shall have two positions only: OFF and AUTO for normal operation.

L. Manufacturer: Provide the following:

1. Leviton
2. Sensor Switch WSD-2P
3. Watt Stopper WI-300

2.4 ULTRASONIC OCCUPANCY SENSORS

A. The ultrasonic occupancy sensors shall be capable of detecting presence in the floor area to be controlled by detecting Doppler shifts in transmitted ultrasound.

B. Ultrasonic sensing shall be volumetric in coverage with a frequency of 32.768 kHz at ±0.002%. They shall utilize Advanced Signal Processing which automatically adjusts the detection threshold dynamically to compensate for constantly changing levels of activity and air flow throughout controlled areas.

C. Sensors of varying frequencies shall not be allowed so as to prevent sensors from interfering with each other and to assure compatibility in the event more sensors are added.

D. Sensors shall have temperature and humidity resistant, 32 kHz tuned ultrasonic receivers. Receivers shall have less than a 6dB shift in the humidity range of 10% to 90% and less than a 10dB shift in the temperature range of -20° to 60°C.

E. Detection shall be maintained when a person of average size and weight moves only within or a maximum distance of twelve inches either in a horizontal or vertical manner at the approximate speed of 12 inches per second. The sum of this distance, volume and speed represent the average condition ultrasonic sensors must meet in order for the lights to not go off when a person is reading or writing while seated at a desk.

F. Sensors shall have a DIP switch override-ON function for use in the event of failure. The LED is maintained ON so as to be visible from the floor as a constant reminder that the automatic function has been by-passed.

G. Sensors shall have a DIP switch controlled, digital time delay that shall be adjustable from 15 seconds to 30 minutes. Sensors shall have user-adjustable sensitivity setting. Sensors shall cover 360°. Sensitivity and timer controls shall be accessible from the front of the sensor and shall be concealed by a hinged cover.

H. Provide ceiling-mounted recessed ultrasonic occupancy sensors in the following spaces:

1. Toilet rooms.
2. Corridors.

I. Manufacturer: Provide the following:

1. Leviton
2. Sensor Switch CM Series
3. Watt Stopper WT Series

2.5 DUAL TECHNOLOGY OCCUPANCY SENSOR

A. The Dual Technology sensor shall be capable of detecting presence in the control area by detecting Doppler shifts in transmitted ultrasound and passive infrared (PIR) heat changes.

B. Sensor shall have a DIP switch controlled, digital time delay of 30 sec to 30 min. Sensor shall have a DIP switch override-ON function for use in the event of a failure. Each sensing technology shall have an independent sensitivity adjustment and LED indicator that remains active at all times in order to verify detection within the area to be controlled.

C. Sensor shall have an additional single-pole, double-throw isolated relay with normally open, normally closed, and common outputs. The isolated relay shall be used with HVAC control, data logging, and other control options.

D. Sensor shall incorporate field-selectable logic configurations which allows for space utilization changes and/or other special field conditions.

E. Sensors shall be field adjusted to operate as follows:

1. Manual on via wall switch when wall switch indicated.
2. Auto on when no wall switch is indicated.
3. Auto off with time delay set to 5 minutes.
4. Hold on when either technology detects occupancy.
5. Off when both technologies indicate no occupancy.

F. Provide ceiling-mounted recessed dual technology occupancy sensors in the following spaces:

1. Classrooms
2. Media Center
3. All instructional spaces
4. Open offices
5. Conference rooms

G. Manufacturer: Provide the following:

1. Leviton
2. Sensor Switch CM-PDT-10-R
3. Watt Stopper DT-300

H. Provide wall mounted dual technology occupancy sensors in the following spaces:

1. Classrooms.
2. Mechanical rooms.

I. Manufacturer: Provide the following:

1. Leviton
2. Sensor Switch WV-PDT-16-R-BR
3. Watt Stopper DT-200

2.6 POWER PACKS

A. Power pack shall be a self-contained transformer and relay module. Power pack shall have ½" snap-in nipple for ½" knockouts and mounting on outside of enclosure.

B. Power pack shall have dry contacts capable of switching 20 amp ballast and incandescent load @ 120 VAC, 60 Hz; 20 amp ballast @ 277 VAC, 60 Hz; 1 hp @ 120-250 VAC, 60 Hz. Power pack shall have primary dual-voltage inputs of 120/277 VAC. Power pack shall provide a 24 VDC, 150 mA output, with the relay connected.

C. Power pack shall be capable of parallel wiring without regard to AC phases on primary. Power pack can be used as a stand-alone, low voltage switch, or can be wired to sensor for auto control.

D. Power pack shall have hold-ON and hold-OFF inputs for integration with lighting control panels, building management systems, and other building systems.

E. Power pack shall have overcurrent protection if the low voltage current drawn exceeds 150 mA. In the event of an overcurrent, the low voltage output current shuts down and the LED will blink to indicate a fault condition. Power pack shall utilize Zero Crossing Circuitry to protect from the effects of inrush current and increase product longevity.

F. Power pack shall have an LED to indicate status of relay.

G. Power pack shall be UL 2043 plenum rated and shall have low voltage Teflon coated leads, rated for 300 volts.

H. Manufacturer: Provide the following:

1. Leviton
2. Sensor Switch MP-20
3. Watt Stopper B Series

2.7 UNIT EMERGENCY POWER TRANSFER DEVICE (PTD)

A. Device shall be UL 924 Listed and consist of a voltage sensor and automatic switching device, suitable for mounting in the ballast channel of a fixture. Device shall automatically switch lighting fixtures between normal and emergency power circuits depending on availability of source and be designed for fail-safe operation. Device shall consist of relay switching circuitry and fusing in one 8"x1.18"x1.18" galvanized steel case. Device shall be rated for ballast loads, suitable for connection to 20 amp circuits, rated 120 or 277 volts as required. Device shall control lighting in conjunction with occupancy sensors, photocells, time clocks and other control devices and shall be warranted for five (5) years.

B. Provide fixture mounted transfer devices in fixture channel of emergency lighting fixtures. Refer to drawings for exact quantity and locations.

C. Manufacturer: Provide products of one of the following:

1. Bodine Cat No. GTD
2. Iota Cat. No. ETS
3. LVS, Inc. Cat No. EPC-A
4. Nine 24, Inc. Cat No. BLTC-1

2.8 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: No. 12 AWG (minimum), complying with Division 26 Sections.

B. Power Wiring to Supply Side of Emergency Power Transfer Devices No. 12 AWG (minimum), complying with Division 26 Sections.

C. Control wiring between sensors and control units shall be Class II, 18-24 AWG, stranded U.L. Classified, PVC insulated and TEFLON jacketed cable suitable for use in plenums.

D. Minimum acceptable wire gauge from the circuit control hardware relays shall be #14 AWG.

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. It shall be the contractor's responsibility to locate and aim sensors in the correct location required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas per the manufacturer's recommendations. Rooms shall have one hundred (100) percent coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room(s). The locations and quantities of sensors shown on the Drawings are diagrammatic and indicate only the room which are to be provided with sensors. The contractor shall provide additional sensors if required to properly and completely cover the respective room.

B. It is the contractor's responsibility to arrange a pre-installation meeting with the manufacturer's factory authorized representative, at the owner's facility, to verify placement of sensors and installation criteria.

C. Proper judgment shall be exercised in executing the installation so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components. The contractor shall also provide, at the owner's facility, the training necessary to familiarize the owner's personnel with the operation, use, adjustment, and problem solving diagnosis of the occupancy sensing devices and systems.

D. Sensors or Power Pack shall have one spare contact in each room for HVAC control.

3.2 EMERGENCY POWER TRANSFER DEVICE INSTALLATION

A. For control of fixtures in one room or area with independent room lighting control, install device inside of the fixture ballast channel. Install caution labels indicating two power sources at the device and at each load or fixture supplied by the device. Do not install behind the wall switch. Extend independent emergency raceway and wiring to emergency fixtures.

3.3 WIRING INSTALLATION

A. Wiring Method: Comply with Division 16 Sections. All wiring shall be installed in conduit. Minimum conduit size shall be ¾ inch.

B. Wiring Within Enclosures: Bundle, lace, and train conductors to terminal points. 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.

E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Sections.

B. All emergency power systems junction box covers, conduit couplings and panels shall be painted orange.

3.5 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
2. Operational Test: Verify actuation of each sensor and adjust time delays.

B. Remove and replace lighting control devices where test results indicate that they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 FACTORY COMMISSIONING

A. Upon completion of the installation, the system shall be completely commissioned by the manufacturer's factory authorized technician who will verify all adjustment and sensor placement to ensure a trouble-free occupancy-based lighting control system. This service shall be provided with the base bid contract.

B. The electrical contractor shall provide both the manufacturer and the electrical engineer with ten (10) working days written notice of the scheduled commissioning date.

3.7 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two (2) visits to site outside normal occupancy hours (4 hour minimum duration each) for this purpose.

3.8 TRAINING

A. The Contractor shall provide a training session for the Owner's Representative for one (1) four (4) hour period (minimum) at a jobsite location determined by the Owner.

B. The training session shall be conducted by a manufacturer's qualified representative. The training program shall consist of instruction on the operation, adjustment, and maintenance of the lighting control devices.

END OF SECTION 26 0923

SECTION 26 2726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Lighting control and receptacle services as required, and all materials and equipment, including switches, receptacles, device plates, multi-outlet assemblies, photoelectric controllers, time switches, lighting contactors and low voltage control systems, as indicated or specified.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.

B. Product Data: Submit product data on each item. Coordinate the items, as they relate to the work, prior to submittal. Include the following:

1. Wall switches and plates
2. All receptacles and clock outlets including device plates.
3. Multi-outlet assemblies
4. Photoelectric controllers
5. Time switches
6. Lighting contactors

PART 2 - PRODUCTS

2.1 WALL SWITCHES

A. Switches for Controlling Lighting Directly on AC Systems in General: Toggle-operated, brown, specification grade, composition base, heavy duty, flush, quiet type, with provision for back and side wiring, and rated 20 amperes, 120/277 volts AC.

1. Manufacturer: Provide one of the following:

a. Arrow-Hart 1990 Series
b. Bryant 4900 Series
c. General Electric GE5950 Series
d. Hubbell 1220 Series
e. Pass & Seymour 20AC Series

2.2 CONVENIENCE RECEPTACLES

A. 20 Ampere Duplex Convenience Receptacles for 120 Volt, Single Phase Service: Two straight blade, 2 pole, 3 wire, NEMA configuration 5-20R receptacles rated 20 amperes, 125 volts, NEMA performance standard, specification grade, for back and side wiring, brown color.

1. Manufacturer: Provide one of the following:

a. Arrow-Hart 5362
b. Bryant 5362
c. General Electric GE4108-1
d. Hubbell 5362
e. Pass & Seymour 5362

B. 20 Ampere Duplex Ground Fault Circuit Interrupter (GFCI) Convenience Receptacles for 120 Volt, Single Phase Service: Two straight blade, 2 pole, 3 wire grounding, NEMA configuration 5-20R receptacles rated 20 amperes, 125 volts, NEMA performance standard, specification grade, with provisions for back and side wiring, brown color.

1. Units shall have a test and reset button on the face of the receptacles and visible indication of a tripped condition.
2. Units shall have line and load terminal screws such that connection to load terminals shall provide feed through ground fault protection for “downstream” receptacles and/or loads connected to these terminals.
3. All receptacles shall be Underwriters’ Laboratories, Listed under 498 Receptacle requirements and 943 Class A requirements.

a. Manufacturer: Provide one of the following:

1) Arrow-Hart GF5342
2) Bryant GFR53FT
3) Hubbell GF5362
4) Pass & Seymour 2091-S

2.3 DEVICE PLATES

A. Device Plates in Offices and Other Finished Areas: Stainless steel No. 302 finish.

B. Device Plates in Factory, Utility and Similar Areas: Zinc or cadmium plated steel.

C. Device Plates in Wet or Damp Areas and Outdoors: Weatherproof type. Provide spring-hinged gasketed covers on outdoor receptacles suitable for wet locations as defined in NEC Article 406.8.

D. Screws: Provide screws having a finish matching the plate.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount equipment at locations indicated.

B. Install receptacles and switches in outlet boxes as specified in Section 26 0533 "Raceways and Boxes for Electrical Systems" unless otherwise specified in this Section. Mount receptacles and switches at uniform heights above the floor for various areas as indicated.

C. Install plates on flush mounted outlets with all four edges in continuous contact with finished wall surfaces without the use of plaster mats or similar devices. Do not use plaster or similar fillings. Install plates vertically, unless otherwise noted, with an alignment tolerance of 1/16 inch.

END OF SECTION 26 2726

SECTION 26 5119 - LED INTERIOR LIGHTING

PART 1 - 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. Interior solid-state luminaires that use LED technology.
2. Materials.
3. Finishes.
4. Lighting fixture supports.

B. Related Requirements:

1. Section 26 0529 “Hangers and Supports for Electrical Systems.”
2. Section 26 0553 “Identification for Electrical Systems.”
3. Section 26 0923 “Lighting Control Devices.”
4. Section 26 0943 "Relay Based Lighting Controls" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multiple lighting relays and contactors.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

H. L70: Point in time where light fixture output is 70% of initial light output.

I. MacAdam Ellipse: Color consistency of LEDs from chip to chip.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of lighting fixture indicated.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, finishes and listings.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (delivered lumens, CCT, and CRI), and energy efficiency data.
6. Provide finish samples for all finishes specified with custom or non-standard colors.

7. Photometric data, including IES file, and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project, IES LM-79 and IES LM-80.

   a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
   b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

8. LED drivers. Original manufacturer’s cut sheet for specific driver used for each lighting fixture type.

B. Shop Drawings: For custom luminaires.

1. Include plans, elevations, sections and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing laboratory providing photometric data for luminaires.

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

C. Product Certificates: For each type of luminaire.

D. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency or by a qualified testing agency.

E. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. A complete submittal package of all lighting products provided as part of this project. This includes, but is not limited to, lighting fixtures and all installed components (drivers, emergency battery packs, etc.).

1.7 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. Complete Fixtures: One for every 50 of each type. Furnish at least one of each type.
2. LED Drivers: One for every 50 of each type provided within each fixture type.
3. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
4. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

D. Each luminaire type shall be within a three-step MacAdam Ellipse centered on the black body curve to ensure color consistency among luminaires.

E. Comply with NFPA 70.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

A. Manufacturer and installer agree to provide and install replacement fixtures for any components or fixtures (drivers, LED modules, etc.) that fail prior to Substantial Completion and project commissioning.

B. Warranty: Manufacturer and Installer agree to repair or replace components, including driver/power supplies and thermal management, of luminaires that fail in materials or workmanship within specified warranty period.

C. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.2 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Recessed Fixtures: Comply with NEMA LE 4.

C. CRI of minimum 80. CCT of 3500K or as indicated in the Lighting Fixture Schedule.

D. Lamps dimmable from 100 percent to 0 percent of maximum light output or as indicated in the Lighting Fixture Schedule.

E. Internal Driver: Driver shall be individually fused with fuses accessible from outside of the fixture chassis.

F. LED (Light Engine): Complies with IEC and FCC Standards with ratings and compliances as stated below, or as indicated in Lighting Fixture Schedule.

1. LED Color Temperature: 3500°K.
2. Minimum rated lifetime of L70 @ 50,000 hours based on IES LM-80 testing.
3. Operating Temperature: -40°C to +50°C (-40°F to 122°F).
4. Operating Hours: Designed for 60,000+ hours of maintenance free operation.
5. Warranty: Minimum 5-year warranty. If 15% or more of light emitting diodes fail to illuminate within the 5-year warranty period the manufacturer shall replace the light fixture. 5-year no color shift warranty.
6. IP66 rated.
7. Tested in compliance with IES LM-79, LM-80 and TM-21.
8. Minimum ETL listed.

G. Driver: Complies with IEC and FCC standards with ratings and compliances as stated below, or as indicated in Lighting Fixture Schedule.

1. Driver: Components are fully encased in potting material for moisture resistance.
2. Operating Temperature: -40°C to +50°C (-40°F to 122°F).
3. Operating Hours: Designed for 60,000+ hours of maintenance free operation.
4. Provides transient voltage protection in accordance with IEEE/ANSI C62.41.2 guidelines.
5. Warranty: 5-year warranty.
6. Minimum ETL listed.

2.3 FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.4 LUMINAIRE FIXTURE SUPPORT COMPONENTS

A. Comply with requirements in Section 26 0529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gauge.

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

F. All fixture support hardware shall be finished to match luminaire in finished spaces. This includes, but is not limited to, surface mounted junction boxes used as final connection point to fixture mounted, stem hangers, conduit stems and threaded rod.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls, and secure according to manufacturer's written instructions and approved submittal materials, unless otherwise indicated. There shall be no gaps between adjacent fixtures or between luminaires and surrounding surfaces. Lenses, reflectors and trims of luminaires shall be properly and uniformly aligned.

C. Supports:

1. Sized and rated for luminaire weight.
2. Provide support for luminaire without causing deflection of ceiling or wall.
3. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

D. Flush-Mounted Luminaire Support:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

E. Wall-Mounted Luminaire Support:

1. Attached to a minimum 20 gauge backing plate attached to electrical box.
2. Do not attach luminaires directly to gypsum board.

F. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.
4. Continuous Rows of Luminaires: Suspend from cable installed according to fixture manufacturer's written instructions and details on drawings.
5. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

G. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation and that luminaires are switched according to the Drawings.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
3. A visual inspection shall be performed to verify cleanliness and alignment of the fixtures. Misalignment and light leaks shall be corrected and rattles due to ventilation system vibration shall be eliminated.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.6 STARTUP SERVICE

A. Comply with requirements for startup specified in Section 26 0943 "Relay-Based Lighting Controls."

3.7 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 26 5119

SECTION 31 2000 – EARTH MOVING

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. Subbase course for concrete slabs-on-grade.

1.3 DEFINITIONS

A. MDOT: Michigan Department of Transportation.

B. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement.

C. 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.

1.4 INFORMATIONAL SUBMITTALS

A. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D2487.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D2487, or a combination of these groups; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

1. Generally either an MDOT Class II sand or 21AA gravel will meet this requirement.

PART 3 - EXECUTION

3.1 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.2 SUBBASE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place subbase course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact subbase course under cast-in-place concrete slabs-on-grade as follows:

1. Place subbase course 6 inches or less in compacted thickness in a single layer.
2. Place subbase course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
3. Compact each layer of subbase course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D698.

3.3 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

3.4 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 2000