P R O J E C T M A N U A L

191 Marginal Way Retail Center

Portland, Maine

Architect's Project No. 15063

ISSUED: BUIDLING CONSTRUCTION - February 10, 2017

Development Team

Earl W. Noyes & Sons
c/o **Paul Ureneck**
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Waterville, ME 04901

Owner
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CWS ARCHITECTS
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Box 6, Suite 100-2A
Scarborough, ME 04074

Architect
Phone: 207.774.4441

Civil Engineer Landscape Architect	**Stantec Consulting Services, Inc.** 22 Free Street, Suite 205 Portland, ME 04101	Phone: 207.775.3211
Structural Engineer	**Becker Structural Engineers** 75 York Street Portland, Maine 04101	Phone: 207.879.1838
Mechanical, Electrical & Plumbing Engineer	**Bennett Engineering** P.O. Box 297 Freeport ME 04032	Phone: 207.865.9475

Landry French Construction
160 Pleasant Hill Rd
Scarborough, ME 04074

Construction Manager
Phone: 207.303.3120

DOCUMENT 00 01 10

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NOTICE OF SOLICITATION OF SUBCONTRACTOR BIDS

September 16, 2013

TO: BUILDING TRADE SUBCONTRACTORS

Earl W. Noyes & Sons (Owner) announces the commencement of the solicitation of subcontractor bids for the construction of the above referenced project and has authorized **Landry French Construction** to act as Construction Manager (CM). **191 Marginal Way Retail Center** is a renovated and new retail building that will be constructed on a site on Marginal Way in Portland, Maine. Subcontractors interested in submitting a bid shall contact Landry French Construction and refer to additional bidding instructions as may be provided by Landry French Construction at the following address:

Landry French Construction
160 Pleasant Hill Road, Scarborough, ME 04074
(207) 303-3120 (office)
(207) 400.6500 (cell)

Attention: Ian McCracken
imccracken@landryfrenchconstruction.com

PHASED BIDDING AND CONSTRUCTION: The work for this project generally consists of the partial demolition of an existing building and site, site redevelopment and building construction with a comprehensive work scope identified in the plans and specifications. The work is broken into two bidding phases as follows:

1. Work of the Project included in the SITE DEMOLITION AND SITE WORK scope issued herein includes a) site and building demolition, b) select building demotion, c) site demolition and d) site work for the redevelopment of the property known as 191 Marginal Way Retail Center, Portland, Maine.

2. Work of the Project for BUILDING CONSTRUCITON that will include a) selective building demolition of portions of the building shell to remain, and b) all new building construction components will be issued separately.

INSTRUCTIONS: Fore each of the two (2) bidding phases, refer to a) DOCUMENT 00 11 00 - INSTRUCTIONS TO CONSTRUCTION MANAGER (CM) AND BIDDING SUB-CONTRACTORS in the Project Manual; and b) REQUEST FOR SUBCONTRACTOR PROPOSALS for 191 Marginal Way in Portland, Maine issued under separate cover by Landry French Construction for additional bidding instructions.

Please note the following:

- The Construction Manager is directed to solicit three (3) or more bids for each trade and to prepare a summary of bids for review, selection and approval by Owner, Architect and vested interests.

- Subcontractors bids shall be based the Contract Documents published by the Architect and provide by the Construction Manager as may be amended prior to the bid date by addenda issued by the Architect.

- For subcontractors interested in visiting the site prior to bidding, the Construction Manager will establish a schedule of pre-bid site walk opportunities as part of separate CM issued instructions.

- Subcontractor bids will be solicited by the Construction Manager who will establish the date and time for the receipt of bids as part of separate CM issued instructions.

- This notice to solicit subcontractor bids by the Construction Manager is not to be construed as an offer which can be accepted by submitting a bid. The Owner reserves the right to reject any and all subcontractor bids, to negotiate with any person both before and after bids are submitted, to modify its specifications at any time, and to investigate any bids as necessary to determine bidder qualifications.

- In addition to the subcontractor bids, bids for allowances, unit prices and alternates may be required to be included with your bid. Refer to Basic Requirements (all Sections in Division 1) for additional information.

- The bidding process will be administrated under AIA A133 2009 (Standard Form of Agreement between Owner and Construction Manager where the Construction Manager is also the Constructor). The Construction Manager and all subcontractors shall consider this in their bids. For the sake of clarity, all references to either the Construction Manager (CM) or Contractor or General Contractor shall be the same. Refer to the Contract Documents for additional information.

DOCUMENT 00 11 00

INSTRUCTIONS TO CONSTRUCTION MANAGER (CM)
AND BIDDING SUB-CONTRACTORS

1. RECEIPT AND OPENINGS OF BIDS

A. Subcontractor bids for construction of the **191 Marginal Way Retail Center** will be solicited and delivered to the offices of the Construction Manager:

Landry French Construction
160 Pleasant Hill Road, Scarborough, ME 04074
(207) 303-3120 (office)
(207) 400.6500 (cell)

Attention: Ian McCracken
imccracken@landryfrenchconstruction.com

where they will be reviewed and compiled by the Construction Manager on behalf of the Owner. The Construction Manager will establish the date and time for the receipt of bids as part of separate CM issued instructions.

2. PREPARATION OF CONSTRUCTION MANAGER AND SUBCONTRACTOR PROPOSALS

A. Subcontractors interested in submitting a bid shall contact and refer to additional bidding instructions provided by the Construction Manager.

B. In reviewing bids, the Construction Manager has been authorized to secure subcontractor information that may include, but not limited to, such items as previous relative experience, work load and availability, crew size, references, stipulated insurances, and/or financial capacity to complete the work, etc. This information will be reviewed by the CM, Owner, Architect and other vested interests to qualify submitted bids. The owner reserves the right to accept or reject any or all bids. The owner reserves the right to accept or reject any or all bids, regardless of price and regardless of whether a bid complies with the terms of the bid request or instructions. The notice of solicitation for bids shall not be construed as an offer that can be accepted by submission of a bid.

C. Upon receipt of subcontractor bids, the Construction Manager will provide to the Owner, Architect and other vested interests a summary of subcontractor bids for review and, following said review and selection, enter into an AIA A133 - 2009 (Standard Form of Agreement between Owner and Construction Manager where the Construction Manager is also the Constructor) with the Owner. Selected subcontractors will be bound to the terms of Construction Documents via the Construction Manager's standard subcontractor agreement (available from the CM upon request).

3. BID DOCUMENTS

A. Full and complete sets of drawings and specifications, in a combination of paper and/or electronic (PDF) format will be available from and distributed by the Construction Manager. A log of plan holders will be maintained by the Construction Manager, upon distribution of all plans and specifications. Bidders will be notified by the Construction Manager of all future communications, including addenda issued by the Architect, which will be distributed by the Construction Manager. It is the subcontractors' responsibility to coordinate inclusion on the plan holder log.

4. ADDENDA AND INTERPRETATION

A. No interpretation of the meaning of the plans, specifications, or other contract documents will be made orally to any bidder. Each request for information or interpretation is suggested to be in writing on an attached RFI Form and sent to the Construction Manager, who will in turn forward appropriate RFIs to the Architect for interpretation. Responses will be provided by the Architect to the Construction Manager in the form of either a) an RFI response if for clarification only, or b) an Addendum if the response results in a change of scope. Requests should be made in writing**,** via FAX or EMAIL to the Construction Manager (contact information above).

and to be given consideration must be received at least three (3) business days prior to the date fixed for the opening bids. Any and all responses that change the scope of work will be in the form of written addenda to the plans and specifications prepared by the Architect which, if issued, will be made available to all registered bidders on the plan holder log by means of a NOTICE by the Construction Manager no later than two (2) days prior to the date fixed for submission of bids. Failure of any bidder to receive any such addenda or interpretation shall not relieve any bidder from any obligation under his bid as submitted. All addenda so issued shall become part of the contract documents. It is the responsibility of the bidder to verify extent of all Addenda from the Construction Manager.

These instructions or the notice to solicit subcontractor bids by the Construction Manager is not to be construed as an offer which can be accepted by submitting a bid. The Owner, **CEI Inc.**, reserves the right to reject any and all bids, with or without cause, to negotiate with any person both before and after bids are submitted, to modify its specifications at any time, to accept any bid regardless of price and regardless of whether a bid complies with the terms of the bid request or instructions contained in this letter or in the instructions to bidders in the project manual, to disclose the bids and other information concerning bids to any person at any time to use bid information submitted to it for any purpose.

5. CONSTRUCTION BONDS

A. Construction Manager: 100% Performance Bond and Payment Bond

6. DAYS AND HOURS OF WORK

A. The CM shall coordinate with the Owner and the local municipality regarding the hours of work and shall make such arrangements with his employees as not to conflict with the Wage and House Laws of the State and the United States of America. Be it further understood that, if in the opinion of the Owner and Architect, the work is not progressing fast enough to insure completion by the date set, the Contractor will be required to work such additional shifts and overtime as, in the opinion of the Owner and the Architect, is necessary to complete the work on the required date without extra cost to the Owner.

7. OBLIGATION OF BIDDERS

A At the time of submitting subcontractor bids, each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the Plans, Specifications and Contract Documents (including all addenda). The failure or omission of any bidder to receive or examine any form, instrument, or documents shall in no way relieve any bidder from any obligation in respect to his bid. The bidder also is assumed to have reviewed the various installation requirements.

8. TIME OF COMPLETION

A. The Construction Manager shall prosecute the work continuously until completion. The rate of

progress shall be at least that shown on the Schedule of Progress which shall not be less that that indicated below.

B. Schedule for Construction: Refer to proposed Project Construction Schedule published and made available to bidding subcontractors by the Construction Manager.

9. LIQUIDATED DAMAGES

A. The Owner anticipates a construction start date and a substantial completion date as indicate on the Construction Manager's Proposed Project Construction Schedule (plus or minus a few weeks) following a commencement date stipulated in a notice to proceed. Liquidated Damages may be charged if construction is not complete by the contractually stipulated completion date. Winter conditions should be assumed based on this construction schedule and bidding subcontractors should coordinate this schedule with the Construction Manager.

10. SPECIAL CONSIDERATIONS

A. PHASED BIDDING AND CONSTRUCTION: The work for this project generally consists of the wholesale demolition, site development and building construction with a comprehensive work scope identified in the plans and specifications. The work is broken into two bidding phases: 1) demolition; and 2) construction.

B. WAGE RATES – The construction of this project WILL NOT be governed by any Federal or State of Maine Wage Rates.

C. SALES TAX INCLUSION: CEI, Inc. in NOT a tax exempt organization. All bids shall **INCLUDE** applicable sales tax.

D. BUILDERS' RISK INSURANCE – The Construction Manager shall exclude the cost of Builders' Risk insurance in the Guaranteed Maximum Price and, if requested, provide a separate itemized cost for consideration of value by the Owner. The owner reserves the right to purchase Builder's Risk insurance from the contractor in place of that carried by the by the Owner and increase the contract sum accordingly.

E. VALUE ENGINEERING AND REQUESTS FOR SUBSTITUTION - The Owner will NOT entertain REQUESTS FOR SUBSTITUTIONS in the initial bid process. Should additional cost savings and value engineering be required after bids are received, the Owner may entertain or solicit Requests for Substitutions with apparent low bidders with the intent of arriving at an acceptable contract sum and execution of a construction contract.

F. ITEMIZED ACCOUNTING REQUIREMENT - CEI Inc. has entered into a construction management agreement with the Construction Manager. The Construction Manager will be required to submit monthly itemized Transaction Reports, in lieu of submitting monthly itemized paper invoices, so as to support Construction Manager's monthly requisitions with the understanding that all monthly invoices be maintained by the Construction Manager and be made available in whole or in part upon request. The construction contract will include a retainage equal to 10% of the construction contract cost and may be reduced at the owner's discretion when the amount of retainage equals 5% of the phase's contract value, including any subsequent change orders. The retainage will be reduced to 0% upon the completion of the project as determined by the owner and architect.

END OF SECTION

00 12 00

BIDDING SUB-CONTRACTOR REQUEST FOR INFORMATION FORM

1.1 Each request for information or interpretation is suggested to be in writing on the Construction Manager's RFI Form and sent to the Construction Manager, who will in turn compile and forward subcontractor RFIs to the Architect for interpretation and response. Responses will be provided by the Architect to the CM in the form of either a) an RFI response if for non-pertinent clarification only, or b) an Addendum if the response results in a change of scope or pertinent clarification. Requests should be made in writing**,** via FAX or EMAIL to:

Landry French Construction
160 Pleasant Hill Road, Scarborough, ME 04074
(207) 303-3120 (office)
(207) 400.6500 (cell)

Attention: Ian McCracken
imccracken@landryfrenchconstruction.com

1.2 Construction Manager's Request for Information (RFI) form, (provided under separate cover from Construction Manager).

END OF SECTION

DOCUMENT 00 31 00

AVAILABLE PROJECT INFORMATION

1.1 Miscellaneous Documents

A. Boundary and Topographic Survey (published under separate cover)

B. Code Studies

1.2 By reference, available via internet web link:

A. Applicable Accessibility Codes (apply to All Common Areas and Units):

a. ANSI A117.1 2009 (Maine Human Rights
https://docs.google.com/open?id=0B7wiBltD4L-OQkFyRjFSM01hZzQ
b. Americans with Disabilities Act (ADA) Standards for Accessible Design 2010 (references ADA, below)
http://www.ada.gov/regs2010/2010ADAStandards/2010ADAstandards.htm
c. 2004 ADA/ABA Accessibility Guidelines (ADA)
https://www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-ada-standards/background/ada-aba-accessibility-guidelines-2004

END OF DOCUMENT

SECTION 01 10 00

SUMMARY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Contract description.
B. Work by Owner.
C. Owner occupancy.
D. Specification Conventions.

1.2 CONTRACT DESCRIPTION

A. Work of the Project included in the SITE DEMOLITION AND SITE WORK scope issued herein includes a) site and building demolition, b) select building demotion, c) site demolition and d) site work for the redevelopment of the property known as **191 Marginal Way Retail Center**, Portland, Maine. Work of the Project for BUILDING CONSTRUCITON that will include a) selective building demolition of portions of the building shell to remain, and b) all new building construction components will be issued separately.

B. Perform Work in conformance with the Contract for Construction.

1.3 WORK BY OWNER

A. The Owner has or will award a contract for Hazardous Material Remediation separately to be completed prior to commencement of Work by the Contractor, which will be completed in two phases: 1) Demolition; and 2) Construction.

B. Items noted NIC (Not in Contract), will be furnished and installed by Owner in coordination with the Contractor's schedule.

1.4 OWNER OCCUPANCY

A. The Owner intends to occupy the full portion of the Project by completion date stipulated by Owner.

B. Schedule the Work to accommodate Owner occupancy.

1.5 SPECIFICATION CONVENTIONS

A. These specifications are written in imperative mood and streamlined form. This imperative language is directed to the Contractor, unless specifically noted otherwise. The words "shall be" are included by inference where a colon (:) is used within sentences or phrases.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Correlation and Intent
B. Cash allowances.
C. CM Contingency.
D. Schedule of values.
E. Applications for payment.
F. Change procedures.
G. Defect assessment.
H. Unit prices.
I. Alternates.

1.2 CORRELATION AND INTENT

A. Contract Documents are complementary, and elements of the Work required by one shall be as binding as if required by all. The intent of the Documents is to include all items necessary for the proper execution and completion of the Work.

B. Where discrepancies or conflicting requirements exist among the Contract Documents and/or applicable reference standards, the Subcontractor shall reasonably assume, to the greatest degree practical, the greater quantity or quality level. Refer conflicting requirements to the Architect for interpretation prior to bidding and before proceeding with work.

1.3 CASH ALLOWANCES

A. Costs Included in Cash Allowances: Cost of product to Contractor or Subcontractor, less applicable trade discounts; and labor for installation and finishing if applicable, delivery to site and applicable taxes.

B. Costs Not Included in Cash Allowances but Included in Contract Sum/Price: Product delivery to site and handling at site, including unloading, uncrating, and storage; protection of products from elements and from damage.

C. Architect/Engineer Responsibilities:

1. Consult with Contractor for consideration and selection of products.
2. Select products in consultation with Owner and transmit decision to Contractor.
3. Prepare Change Order.

D. Contractor Responsibilities:

1. Assist Architect/Engineer in selection of products, suppliers.

2. Obtain proposals from suppliers and installers and offer recommendations.

3. On notification of selection by Architect, Owner, execute purchase agreement with designated supplier and installer.

4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.

5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.

6. Conduct the work.

E. Differences in costs will be adjusted by Change Order.

F. Allowances Schedule:

1. As agreed upon by Owner and Contractor, if applicable.
2. Open Excavation Rock Removal 0 cubic yards (a)
3. Trench Excavation Rock Removal 0 cubic yards (a)

Note (a) at respective cubic yard rates as defined and provided in section 1.10.H.1.c , Schedule C, items 1 and 2 in Unit Prices below.

1.4 CM CONTINGENCY

A. Include in the Contract, a stipulated sum/price for use by the CM, the amount of which and terms to be derived by agreement with the owner per the terms of the AIA 131 CM, to cover unexpected costs to the CM that are not qualified as changes to the Scope of Work.

B. Funds will be drawn from CM Contingency with agreement by Owner.

1.5 SCHEDULE OF VALUES

A. Submit printed schedule on AIA Form G703 - Continuation Sheet for G702 in duplicate for approval by Owner, Architect and permanent financing authority prior to proceeding with work and issuance of Notice to Proceed. Contractor's standard form printout will be considered.

B. Format: At a minimum, Utilize Table of Contents of the Specification in this Project Manual. Identify each line item with number and title of major specification Section. Identify site mobilization, bonds and insurance. Additional breakdown of line items is encouraged.

C. Include in each line item, amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by unit cost to achieve total for each item.

D. Include separately from each line item, direct proportional amount of Contractor's overhead and profit as a separate line item.

E. Revise schedule to list approved Change Orders, with each Application For Payment.

1.6 APPLICATIONS FOR PAYMENT

A. Submit three (3) printed copies (one original plus two copies) of each application on AIA Form G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheet for G702 plus Change Orders/Change Proposals incorporated in the requisition and contractor/supplier invoices with each requisition.

B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.

C. Submit updated construction schedule with each Application for Payment.

D. Payment Period: Submit at intervals stipulated in the Agreement.

E. Submit with transmittal letter as specified for Submittals in Section 01 33 00 - Submittal Procedures.

F. Submit lien waivers as required by funding authorities.

G. Substantiating Data: When Architect requires substantiating information, submit data justifying dollar amounts in question. Include the following with Application for Payment:

1. Partial release of liens from major subcontractors and vendors or as required by funding authorities.

2. If and only if permitted by all funding sources as delineated in the A201 General Conditions as amended, affidavits, insurance certificates and rights of entry to facilities storing materials attesting to off-site stored products.

3. Construction progress schedules, revised and current.

4. Whereas the Contract is based on the cost of the work plus a fee, the progress payments shall be based on the cost expended plus a fee. The cost shall be substantiated by a cost summary acceptable to the owner and the permanent financing authority submitted on a monthly basis. An Excel spreadsheet summarizing all costs including all subcontractors and material suppliers shall be submitted with the application for payment as basis for the application. A detailed accounting shall be made available to the owner and/or owner’s representative at the office of the Construction Manager.

H. Payment Period: Monthly. Pencil (draft) Requisition to be submitted for review by Owner, Architect and funding authority a minimum of five (5) working days prior to on-site requisition

meeting. Specific requisition dates and payment time frame to be determined at preconstruction meeting.

I. Approvals: Requisition forms must be approved and signed by Contractor, Owner, Architect and funding authority.

1.7 CHANGE PROCEDURES

A. Submittals: Submit name of individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.

B. The Architect will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions on AIA Form G710.

C. The Architect/Engineer may issue a Proposal Request including a detailed description of proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change with possible stipulation of overtime work required and the period of time during which the requested price will be considered valid. Contractor will prepare and submit estimate within 14 calendar days or as stipulated in the proposal.

D. Contractor may submit Change Proposal of propose changes by submitting a request for change to Architect, describing proposed change and its full effect on the Work. Include a statement describing reason for the change, and effect on Contract Sum/Price and Contract Time with full documentation and a statement describing effect on Work by separate or other Contractors. Document requested substitutions in accordance with Section 01 60 00 - Product Requirements. Change Proposals may be accepted by the Owner and financing authorities (TBD) to authorize progress on proposed changes prior to execution of Change Orders.

E. Stipulated Sum/Price Change Order: Based on Proposal Request and Contractor's fixed price quotation or Contractor's request for Change Order as approved by Architect/Engineer.

F. Unit Price Change Order: For contract unit prices and quantities, the Change Order will be executed on fixed unit price basis. For unit costs or quantities of units of work which are not pre-determined, execute Work under Construction Change Directive. Changes in Contract Sum/Price or Contract Time will be computed as specified for Time and Material Change Order.

G. Construction Change Directive: Architect may issue directive, on AIA Form G713 Construction Change Directive signed by Owner, instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute change.

H. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in Conditions of the Contract. Architect will determine change allowable in Contract Sum and Contract Time as provided in Contract Documents.

I. Maintain detailed records of work done on Time and Material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.

J. Document each quotation for change in cost or time with sufficient data to allow evaluation of quotation.

K. Change Order Forms: AIA G701/CM Change Order.

L. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in Conditions of the Contract.

M. Approvals: Change Order forms must be approved and signed by Contractor, Owner, Architect and funding authority.

N. Correlation Of Contractor Submittals:

1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum/Price.

2. Promptly revise progress schedules to reflect change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

3. Promptly enter changes in Project Record Documents.

1.8 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of the Architect, it is not practical to remove and replace the Work, the Architect will direct appropriate remedy or adjust payment.

C. The defective Work may remain, but unit sum/price will reduced at discretion of Architect and Owner.

D. Defective Work will be partially repaired to instructions of Architect, and unit sum/price will be reduced at discretion of Architect and Owner.

E. Individual specification sections may modify these options or may identify specific formula or percentage sum/price reduction.

F. Authority of Architect and Owner to assess defects and identify payment adjustments is final.

G. Non-Payment For Rejected Products: Payment will not be made for rejected products for any of the following:

1. Products wasted or disposed of in a manner that is not acceptable.

2. Products determined as unacceptable before or after placement.

3. Products not completely unloaded from transporting vehicle.

4. Products placed beyond lines and levels of required Work.

5. Products remaining on hand after completion of the Work.

6. Loading, hauling, and disposing of rejected products.

1.9 UNIT PRICES

A. Authority: Measurement methods are delineated in individual specification sections.

B. Measurement methods delineated in individual specification sections complement criteria of this section. In event of conflict, requirements of individual specification section govern.

C. Take measurements and compute quantities. Owner will verify measurements and quantities.

D. Unit Quantities: Quantities and measurements indicated in Construction Documents are for contract purposes only. Quantities and measurements supplied or placed in the Work shall determine payment. Actual quantities provided shall determine payment.

1. When actual Work requires more or fewer quantities than those quantities indicated, provide required quantities at unit prices contracted.

E. Payment Includes: Full compensation for required labor, products, tools, equipment, plant and facilities, transportation, services and incidentals; erection, application or installation of item of the Work; overhead and profit.

F. Final payment for Work governed by unit prices will be made on basis of actual measurements and quantities accepted by Architect multiplied by unit sum/price for Work incorporated in or made necessary by the Work.

G. Measurement Of Quantities:

1. Weigh Scales: Inspected, tested and certified by applicable state Weights and Measures department within past year.

2. Platform Scales: Of sufficient size and capacity to accommodate conveying vehicle.

3. Metering Devices: Inspected, tested and certified by applicable State department within past year.

4. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.

5. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness of in-place application.

6. Measurement by Area: Measured by square dimension using mean length and width or radius.

7. Linear Measurement: Measured by linear dimension, at item centerline or mean chord.

8. Stipulated Sum/Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as completed item or unit of the Work.

H. Unit Price Schedule:

1. Provide Unit Prices based on the following schedules:

a. Removal/Replacement of Unsuitable Soils - A Testing Agency contracted separately by the owner will take measurements and compute quantities accordingly. General Contractor shall provide and assist in taking of measurements.

Unit Price Schedule A:

1) Removal/Replacement of Unsuitable Soils – above and beyond those required by the scope of work – and deemed unsuitable to the geotechnical engineer, replacement and compaction of structural fill. Unit Price: Cubic Yard, in place.

b. Provision of various materials as requested, above and beyond those required by the scope of work. – A Testing Agency contracted separately by the owner will take measurements and compute quantities accordingly. General Contractor shall provide and assist in taking of measurements. Unit Price: Shall include placement and exclude excavation.

Unit Price Schedule B:

1) Geotextile Fabric – Mirafi 600x, or approved equal. Unit Price: Square Yard, in place.
2) Structural Fill – Compacted. Unit Price: Cubic Yard, in place.
3) Gravel Borrow – Compacted. Unit Price: Cubic Yard, in place.
4) Drainage Stone – Compacted. Unit Price: Cubic Yard, in place.

c. Ledge blasting, removal, disposal and replacement of backfill -

1) Method of Measurement: The quantity of ledge excavation to be paid for shall be the actual number of cubic yards of ledge removed within the limits of normal excavation. For pipelines, the limits are defined by the vertical

planes at a distance three feet apart and from the ledge surface at pipe centerline to a depth of eight inches below the bottom of the pipe. Field measurements for computing ledge volumes shall be determined by one of the following methods as selected by the owner's representative.

i. From ledge profile of exposed surface.

ii. By field measurements of the length of the trench ledge excavated and the average depth of ledge excavation as determined by the field representative.

iii. The volume of rocks shall be determined from their average length, width, and depth as measured by the field representative.

1) Basis of Payment: Ledge blasting and disposal shall be paid for at the unit price per cubic yard as stated in the Bid Schedule. Said unit price shall be full compensation for furnishing all materials, labor, tools, and equipment; for insurance and permits; for disposal of ledge; for furnishing and placing replacement granular borrow material; for conducting all preblast surveys and investigations; for repairing all overblast; for repairing all pavement damage outside the payment widths for paving; for protection of existing features or private property; for repairs or restoration due to or related to this work; and for all other work and expenses incidental thereto.

Unit Price Schedule C:

1) Open Excavation Ledge Removal - Unit Price: Cubic Yard in place as defined in item 1.9.H.1.c above.

2) Trench Excavation Ledge Removal - Unit Price: Cubic Yard in place as defined in item 1.9.H.1.c above.

d. Repointing of existing exterior brick masonry per 04 01 00 Maintenance of Masonry and drawings, unit price based on deviation above or below the scope indicated on the drawings.

Unit Price Schedule D:

1) Repoint of Existing Masonry Wall Area. Unit Price: Square Foot, in place, above or below the repointing scope indicated on the drawings.

1.10 ALTERNATES

A. Alternates will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work.

C. Schedule of Alternates:

1. No Alternates Currently Considered.

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

END OF SECTION

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Coordination and project conditions.
B. Field engineering.
C. Preconstruction meeting.
D. Site mobilization meeting.
E. Progress meetings.
F. Pre-installation meetings.
G. Cutting and patching.
H. Special procedures.

1.2 COORDINATION AND PROJECT CONDITIONS

A. Coordinate scheduling, submittals, and Work of various sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, operating equipment.

C. Coordinate space requirements, supports, and installation of mechanical and electrical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.

E. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owner's partial occupancy.

F. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

G. Maintain a smoke-free construction site from project start through completion.

1.3 FIELD ENGINEERING

A. Employ Land Surveyor registered at Project location in State of project location and acceptable to Architect.

B. Locate and protect survey control and reference points. Promptly notify Architect of discrepancies discovered.

C. Control datum for survey is that established by Owner provided survey.

D. Verify set-backs and easements; confirm drawing dimensions and elevations.

E. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

F. Submit copy of certificate signed by Land Surveyor certifying elevations and locations of the Work are in conformance with Contract Documents.

G. Maintain complete and accurate log of control and survey work as Work progresses.

H. On completion of foundation walls and major site improvements, prepare certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

I. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

J. Promptly report to Architect loss or destruction of reference point or relocation required because of changes in grades or other reasons.

K. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect/Engineer.

1.4 PRECONSTRUCTION MEETING

A. Owner will schedule meeting prior to Notice Proceed.

B. Attendance Required: Owner, Architect/Engineer, financing authority and Contractor.

C. Agenda:

1. Review of executed Owner-Contractor Agreement.

2. Submission of executed bonds and insurance certificates.

3. Distribution of Contract Documents.

4. Submission of list of Subcontractors, list of products, schedule of values, and progress schedule.

5. Designation of personnel representing parties in Contract, financing authority, and Architect.

6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.

7. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, financing authority and those affected by decisions made.

1.5 SITE MOBILIZATION MEETING

A. Owner will schedule meeting at Project site prior to Contractor occupancy.

B. Attendance Required: Owner, Architect, Architect's Consultants, and, Contractor, Contractor's Superintendent, and major Subcontractors.

C. Agenda:

1. Review preconstruction agenda conducted by MaineHousing.
2. Use of premises by Owner and Contractor.
3. Owner's requirements and partial occupancy.
4. Construction facilities and controls provided by Owner.
5. Temporary utilities provided by Owner.
6. Survey and building layout.
7. Security and housekeeping procedures.
8. Schedules.
9. Application for payment procedures.
10. Procedures for testing.
11. Procedures for maintaining record documents.
12. Requirements for start-up of equipment.
13. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, financing authority and those affected by decisions made.

1.6 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at maximum interval of twice a month, one as a requisition meeting and one as a coordination meeting.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required: Job superintendent, major subcontractors and suppliers, Owner, Architect and financing authority as appropriate to agenda topics for each meeting.

D. Agenda:

1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems impeding planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to Work.

E. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect/Engineer, Owner, financing authority and those affected by decisions made.

1.7 PRE-INSTALLATION MEETINGS

A. When required in individual specification sections, convene pre-installation meetings at Project site prior to commencing work of specific section.

B. Require attendance of parties directly affecting, or affected by, Work of specific section.

C. Notify Architect five days in advance to coordinate meeting date and time.

D. Prepare agenda and preside at meeting:

1. Review conditions of installation, preparation and installation procedures.
2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, financing authority and those affected by decisions made.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 CUTTING AND PATCHING

A. Employ skilled and experienced installer to perform cutting and patching.

B. Submit written request in advance of cutting or altering elements affecting:

1. Structural integrity of element.
2. Integrity of weather-exposed or moisture-resistant elements.
3. Efficiency, maintenance, or safety of element.
4. Visual qualities of sight exposed elements.
5. Work of Owner or separate contractor.

C. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:

1. Fit the several parts together, to integrate with other Work.
2. Uncover Work to install or correct ill-timed Work.
3. Remove and replace defective and non-conforming Work.
4. Remove samples of installed Work for testing.
5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

D. Execute work by methods to avoid damage to other Work, and to provide proper surfaces to receive patching and finishing.

E. Cut masonry and concrete materials using masonry saw or core drill.

F. Restore Work with new products in accordance with requirements of Contract Documents.

G. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated or fire resistant material, as stipulated, in accordance with Section 07 84 00, to full thickness of penetrated element.

J. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.

K. Identify hazardous substances or conditions exposed during the Work to Architect/Engineer for decision or remedy.

3.2 SPECIAL PROCEDURES

A. Materials: As specified in product sections; match existing with new products and/or salvaged products for patching and extending work.

B. Employ skilled and experienced installer to perform alteration work.

C. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.

D. Remove unsuitable material not marked for salvage, including rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.

E. Remove debris and abandoned items from area and from concealed spaces.

F. Prepare surface and remove surface finishes to permit installation of new work and finishes.

G. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.

H. Remove, cut, and patch Work in manner to minimize damage and to permit restoring products and finishes to original or specified condition.

I. Refinish existing visible surfaces to remain in renovated rooms and spaces, to specified or renewed condition for each material, with neat transition to adjacent finishes.

J. Where new Work abuts or aligns with existing, provide smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.

K. When finished surfaces are cut so that smooth transition with new Work is not possible, terminate existing surface along straight line at natural line of division and submit recommendation to Architect/Engineer for review.

L. Where change of plane of 1/4 inch or more occurs, submit recommendation for providing smooth transition; to Architect/Engineer for review.

M. Trim existing doors to clear new floor finish. Refinish trim to original or specified condition.

N. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.

O. Finish surfaces as specified in individual product sections.

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittal procedures.
B. Construction progress schedules.
C. Proposed products list.
D. Product data.
E. Shop drawings.
F. Samples.
G. Design data.
H. Test reports.
I. Certificates.
J. Manufacturer's instructions.
K. Manufacturer's field reports.
L. Erection drawings.

1.2 SUBMITTAL PROCEDURES

A. Transmit each submittal with Architect accepted form.

B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.

C. Identify Project, Contractor, subcontractor and supplier; pertinent drawing and detail number, and specification section number, appropriate to submittal.

D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of the Work and Contract Documents.

E. Schedule submittals to expedite Project, and deliver to CWS Architects in electronic format via a web based viewing and tracking system to be determined.. Coordinate submission of related items.

F. For each submittal for review, allow 15 days excluding delivery time to and from Contractor.

G. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of completed Work. Submittals that fail to identify variations from Contract Documents shall be considered rejected by Architect regardless of markings on the Architect’s action stamp.

H. Allow space on submittals for Contractor and Architect’s and Architect’s consultant’s review stamps.

I. When revised for resubmission, identify changes made since previous submission in the form of a list of previously marked deficiencies with corresponding corrections made.

J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.

K. Submittals not requested will not be recognized or processed.

L. Architect's review is only for conformance with design intent. Architect's action stamp is self-explanatory and reads as follows:

> "Submittals are not Contract Documents. Review of the Contractor's Submittals by CWS Architects (CWS) and its Consultants is for the limited purpose of checking for general conformance with the intent of the Contract Documents. Review is not conducted for the purpose of determining accuracy and completeness of other details such as dimensions, quantities, etc. Review does not constitute approval of assembly in which the submittal serves or imply approval of the contractor's means, methods, duties and coordination responsibilities. Approval does not authorize changes to Contract Sum or Contract Time.
>
> The Contractor, in so providing CWS with the attached Submittal and upon accepting its return, represents and certifies that the Submittal conforms to the Contract Documents and acknowledges that CWS relies on said certification in reviewing the Submittal. Submittals that do not conform to the Contract Documents but have been represented by the Contractor to be in conformance shall be considered rejected by CWS regardless of markings below and shall be resubmitted as a Substitution Request or with a conforming Submittal.
>
> ❑ APPROVED – No Exceptions Taken
> ❑ APPROVED AS NOTED – Make Corrections
> ❑ REVISE AND RESUBMIT – Identify Changes Made
> ❑ NOT APPROVED – Rejected
> ❑ Reviewed by Consultant:_____"

1.3 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial schedules within 15 days after date of Owner-Contractor Agreement established in Notice to Proceed. After review, resubmit required revised data within ten days.

B. Submit revised Progress Schedules with every second Application for Payment.

C. Distribute copies of reviewed schedules to Project site file, subcontractors, suppliers, and other concerned parties.

D. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

E. Submit computer generated horizontal bar chart with separate line for each major portion of Work or operation section of Work, identifying first work day of each week.

F. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate early and late start, early and late finish, float dates, and duration.

G. Indicate estimated percentage of completion for each item of Work at each submission.

H. Submit separate schedule of submittal dates for shop drawings, product data, and samples, including Owner furnished products and products identified under Allowances, and dates reviewed submittals will be required from Architect/Engineer. Indicate decision dates for selection of finishes.

I. Indicate delivery dates for Owner furnished products and products identified under Allowances.

J. Revisions To Schedules:

1. Indicate progress of each activity to date of submittal, and projected completion date of each activity.

2. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.

3. Prepare narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect including effect of changes on schedules of separate contractors.

1.4 PROPOSED PRODUCTS LIST

A. Within 15 days after date of Owner-Contractor Agreement Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.5 PRODUCT DATA

A. Product Data: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. Submit number of copies Contractor requires, plus two copies Architect will retain.

C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

E. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.6 SHOP DRAWINGS

A. Shop Drawings: Submit to Architect for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. When required by individual specification sections, provide shop drawings signed and sealed by professional engineer responsible for designing components shown on shop drawings.

1. Include signed and sealed calculations to support design.

2. Submit drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.

3. Make revisions and provide additional information when required by authorities having jurisdiction.

D. Submit number of opaque reproductions Contractor requires, plus two copies Architect/Engineer will retain.

E. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.7 SAMPLES

A. Samples: Submit to Architect for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. Samples For Selection as Specified in Product Sections:

1. Submit to Architect/Engineer for aesthetic, color, or finish selection.

2. Submit samples of finishes from full range of manufacturers' standard colors, in custom colors selected, textures, and patterns for Architect/Engineer selection.

C. Submit samples to illustrate functional and aesthetic characteristics of Products, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

D. Include identification on each sample, with full Project information.

E. Submit number of samples specified in individual specification sections; Architect may retain one sample or return the sample to the Contractor at project completion.

F. Reviewed samples which may be used in the Work are indicated in individual specification sections.

G. Samples will not be used for testing purposes unless specifically stated in specification section.

H. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents purposes described in Section 01 70 00 - Execution and Closeout Requirements.

1.8 DESIGN DATA

A. Submit for Architect's knowledge as contract administrator or for Owner.

B. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.9 TEST REPORTS

A. Submit for Architect's knowledge as contract administrator or for Owner.

B. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.10 CERTIFICATES

A. When specified in individual specification sections, submit certification by manufacturer, installation/application subcontractor, or Contractor to Architect, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect/Engineer.

1.11 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Architect for delivery to Owner in quantities specified for Product Data.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.12 MANUFACTURER'S FIELD REPORTS

A. Submit reports for Architect/Engineer's benefit as contract administrator or for Owner.

B. Submit report in duplicate within 5 days hours of observation to Architect/Engineer for information.

C. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.13 ERECTION DRAWINGS

A. Submit drawings for Architect's benefit as contract administrator or for Owner.

B. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

C. Data indicating inappropriate or unacceptable Work may be subject to action by Architect/Engineer or Owner.

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

END OF SECTION

SECTION 01 35 43

ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.1 DEFINITIONS OF CONTAMINANTS

A. Sediment: Soil and other debris that has been eroded and transported by runoff water.

B. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from construction activity.

C. Chemical Wastes: Includes salts, acids, alkalis, herbicides, pesticides, and organic chemicals.

D. Sanitary Wastes: Wastes characterized as domestic sanitary sewage.

1.2 ENVIRONMENTAL PROTECTION REQUIREMENTS

A. Contractor is advised that the project is subject to the conditions of approval of the Maine Department of Environmental Protection basic stabilization standards outlined in chapter 500 of the Stormwater Law (MRSA 420-D). Provide and maintain during the life of the Contract, environmental protection as defined herein. Provide environmental protective measures as required to prevent or control pollution that develops during normal construction practice. Provide environmental protection measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Comply with all federal, state, and local regulations pertaining to water, air, and noise pollution.

PART 2 – PRODUCTS - Not Used.

PART 3 – EXECUTION

3.1 PROTECTION OF NATURAL RESOURCES

A. The natural resources within the project boundaries and outside the limits of permanent work performed under this contract shall be preserved in their existing condition or restored to an equivalent or improved condition upon completion of the work. Confine construction activities to areas defined by the work schedule, drawings, and specifications.

B. Land Resources: Except in areas indicated to be cleared, do not remove, cut, deface, injure, or destroy trees or shrubs without special approval of the owner's representative. Do not fasten or attach ropes, cables, or guys to any existing nearby trees for anchorages unless specifically authorized. Where such special emergency use is authorized, the Contractor shall be responsible for any resultant damage.

1. Protection: Protect existing trees that are to remain and which may be injured, bruised, defaced, or otherwise damaged by construction operators. Remove displaced rocks from uncleared areas. Protect monuments and markers.

2. Repair and Restoration: Repair or restore to their original condition all trees or other landscape features scarred or damaged by the equipment operations. Obtain approval of the repair or restoration from the Engineer prior to its initiation.

3. Temporary Construction: Remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, and all other vestiges of construction. Temporary roads, parking areas, and similar temporary use areas shall be graded in conformance with surrounding areas and revegetated, seeded, or sodded as required by the plans.

C. Water Resources: Perform all work in such a manner that any adverse environmental impact on water resources is avoided. Storage of hydraulic fluid is not permitted on-site. Quantities of bulk materials shall be reduced to a level acceptable to the owner's representative.

3.2 EROSION AND SEDIMENT CONTROL MEASURES

A. Burn-off: Burn-off of ground cover is not permitted.

B. Protection of Erodible Soils: All earthwork brought to final grade shall be immediately finished as indicated or specified. Protect immediately side slopes and backslopes upon completion of rough grading. Plan and conduct all earthwork in such a manner as to minimize the duration of exposure of unprotected soils, and in no case shall exposure exceed 7 days. Consult weather forecasts prior to exposing large areas of soil. Check erosion control measures before forecasted major storm events.

C. Temporary Protection to Erodible Soils: Utilize the following methods to prevent erosion and control sedimentation.

1. Vegetation and Mulch: Provide temporary protection on all side and back slopes as soon as rough grading is completed or sufficient soil is exposed to require protection to prevent erosion. Such protection shall be by accelerated growth of permanent vegetation, temporary vegetation, mulching, or netting. Stabilize slopes by hydroseeding, anchoring mulch in place, covering with anchored netting, sodding, or such combination of these and other methods necessary for effective erosion control.

3.3 CONTROL AND DISPOSAL OF SOLID, CHEMICAL AND SANITARY WASTES

A. Pick up solid wastes and place in containers that are emptied on a regular schedule. The preparation, cooking and disposing of food is strictly prohibited on the project site. Conduct handling and disposal of wastes to prevent contamination of the site and other areas. On completion, leave areas clean and natural looking. Remove signs of temporary construction and activities incidental to construction of permanent work in place

B. Disposal of Rubbish, Garbage, and Debris: Dispose of rubbish, garbage and debris in accordance with the requirements specified herein.

C. Sewage, Odor, and Pest Control: Dispose of sewage through chemical toilets or comparable effective units and periodically empty wastes. Include provisions for pest control and elimination of odors.

D. Petroleum Products: Conduct fueling and lubricating of equipment and motor vehicles in a manner that affords the maximum protection against spills and evaporation. Dispose of lubricants to be discarded and excess oil in accordance with approved procedures meeting federal, state and local regulations.

3.4 DUST CONTROL

A. Keep dust down at all times, including nonworking hours, weekends, and holidays. Sprinkle or treat with dust suppressers, the soil at the site, haul roads, and other areas disturbed by operations. Petroleum products will not be used as suppressers. No dry power brooming is permitted. Instead use vacuuming, wet mopping, wet sweeping, or wet power brooming.

3.5 NOISE

A. No blasting or use of explosives is permitted without written permission of the owner's representative and then only during designated times.

END OF SECTION

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quality control and control of installation.
B. Tolerances.
C. References.
D. Labeling.
E. Mock-up requirements.
F. Testing and inspection services.
G. Manufacturers' field services.
H. Examination.
I. Preparation.

1.2 QUALITY CONTROL AND CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. When manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform Work by persons qualified to produce required and specified quality.

F. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.3 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 REFERENCES

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date of Contract Documents, except where specific date is established by code.

C. Obtain copies of standards where required by product specification sections or listed below.

D. When specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

E. Neither contractual relationships, duties, nor responsibilities of parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in reference documents.

F. Reference Standards have the same force and effect as if bound herein and include publications of the following:

1. American National Standards Institute (ANSI).
2. American Concrete Institute (ACI).
3. American Institute of Steel Construction (AISC).
4. American Plywood Association (APA).
5. American Society for Testing and Materials (ASTM).
6. American Society of Civil Engineers (ASCE).
7. American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc. (ASHRAE).
8. American Society of Mechanical Engineers (ASME).
9. Americans with Disabilities Act (ADA).
10. American Water Works Association (AWWA).
11. American Welding Society (AWS).
12. Consumer Product Safety Commission (CSPC).
13. Factory Mutual (FM).
14. International Building Code (IBC).
15. International Code Council (ICC).
16. National Electric Manufacturers Association (NEMA).
17. National Fire Protection Association (NFPA).
18. Underwriters Laboratories, Inc. (UL).
19. US Department of Commerce, National Bureau of Standards (NBS).
20. Federal, State and local codes and regulations.

1.5 LABELING

A. Attach label from agency approved by authority having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.

B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label.

1. Model number.
2. Serial number.
3. Performance characteristics.

1.6 MOCK-UP REQUIREMENTS

A. Tests will be performed under provisions identified in this section and identified in respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups shall be comparison standard for remaining Work.

D. Where mock-up has been accepted by Architect/Engineer and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so by Architect/Engineer.

1.7 TESTING AND INSPECTION SERVICES

A. Owner will employ and pay for the services of an independent firm to perform testing and inspection or as otherwise indicated in the relevant specification sections. Construction Manager shall Coordinate testing requirements and scheduling with the independent testing firm.

B. The independent firm will perform tests, inspections and other services specified in individual specification sections and as required by Architect, Owner, financing authority or Authority having jurisdiction.

1. Laboratory: Authorized to operate at Project location. in State of project location.

2. Laboratory Staff: Maintain full time registered Engineer or specialist on staff to review services.

3. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to National Bureau of Standards or accepted values of natural physical constants.

C. Testing, inspections and source quality control may occur on or off project site. Perform off-site testing as required by Architect/Engineer or Owner.

D. Reports will be submitted by independent firm to Architect/Engineer, Contractor, and authority having jurisdiction, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

1. Submit final report indicating correction of Work previously reported as non-compliant.

E. Provide independent firm with testing schedule based on Contractor’s Work Schedule and coordinate testing schedule with independent firm.

F. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.

1. Notify Architect/Engineer and independent firm 24 hours prior to expected time for operations requiring services.

2. Make arrangements with independent firm and coordinate additional samples and tests required for Contractor's use.

G. Testing and employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

H. Re-testing or re-inspection required because of non-conformance to specified requirements shall be performed by same independent firm on instructions by Architect/Engineer. Payment for re-testing or re-inspection will be charged to Contractor by deducting testing charges from Contract Sum/Price.

I. Agency Responsibilities:

1. Test samples of mixes submitted by Contractor.

2. Provide qualified personnel at site. Cooperate with Architect/Engineer and Contractor in performance of services.

3. Perform specified sampling and testing of products in accordance with specified standards.

4. Ascertain compliance of materials and mixes with requirements of Contract Documents.

5. Promptly notify Architect/Engineer and Contractor of observed irregularities or non-conformance of Work or products.

6. Perform additional tests required by Architect/Engineer.

7. Attend preconstruction meetings and progress meetings.

J. Agency Reports: After each test, promptly submit two copies of report to Architect/Engineer, Contractor, and authority having jurisdiction. When requested by Architect/Engineer, provide interpretation of test results. Include the following:

1. Date issued.
2. Project title and number.
3. Name of inspector.
4. Date and time of sampling or inspection.
5. Identification of product and specifications section.
6. Location in Project.
7. Type of inspection or test.
8. Date of test.
9. Results of tests.
10. Conformance with Contract Documents.

K. Limits On Testing Authority:

1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency or laboratory may not approve or accept any portion of the Work.
3. Agency or laboratory may not assume duties of Contractor.
4. Agency or laboratory has no authority to stop the Work.

1.8 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Architect/Engineer 30 days in advance of required observations. Observer subject to approval of Architect, Owner and financing authority.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

D. Refer to Section 01 33 00 - Submittal Procedures, MANUFACTURERS' FIELD REPORTS article.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Verify utility services are available, of correct characteristics, and in correct locations.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

END OF SECTION

SECTION 01 42 13

ABBREVIATIONS AND DEFINITIONS

PART 1 GENERAL

1.1 INTERPRETATIONS

A. This section is not intended to cover all definitions, which may be required, nor all the abbreviations, which may be used on the Contract Documents.

B. Questions regarding definition of terms, or meaning of abbreviations should be directed to the Architect.

1.2 DEFINITIONS

A. The following definitions shall apply to the Specifications:

1. The words "Furnish" or "Supply" means purchase and delivery of items or materials to the project site, including proper storage without installation.

2. The word "Install" means applications, connection or erection of items or materials that have been furnished.

3. The word "Provide" means both furnishing and supplying and installing of items or materials.

4. The term "Work" as used herein refers to work at site of project and includes all labor and materials to be incorporated in the construction.

5. The word "Concealed" means work within or behind various construction elements, or in crawl spaces or trenches, which is not exposed to view when the project is complete.

6. The word "Exposed" means anything exposed to view when the project is complete, as opposed to being "concealed."

1.3 ABBREVIATIONS

A. The following list of abbreviations shall apply to the Drawings and Specifications. This list is not all inclusive. Other abbreviations may exist on the drawings. If any questions arise regarding abbreviations, contact the Architect for interpretation.

A/B	Acid, Bicarb Tubing
A/C	Air Conditioning
ABV	Above
AC	Acoustical Plaster
ACT	Acoustical Tile
ADD	Addendum
ADJ	Adjacent
ADJT	Adjustable
AFF	Above Finished Floor
AHJ	Authorities Have Jurisdiction
ALT	Alternate
ALUM	Aluminum

AP	Access Panel
APPROX	Approximate
APX	Approximate
ARCH	Architect(ural)
AUTO	Automatic
BCE	Bottom Chord Extension
BD	Board
BEL	Below
BET	Between
BIT	Bituminous
BK	Brick
BLK	Block
BLKG	Blocking
BLP	Borrowed Light Panel
BO	Bottom Of
BOF	Bottom of Footing
BOS	Bottom of Steel
BOT	Bottom
BPW	Bed Pan Washer
BRG	Bearing
BRK	Brick
BS	Both Sides
BSE	Brick Shelf Extension
BSMT	Basement
C	Channel
CAB	Cabinet
CB	Catch Basin, Chalkboard
CEN	Centrifuge
CFM	Cubit Foot per Minute
CG	Corner Guard
CH	Coat Hook
CIPC	Cast-in-Place Concrete
CJ	Control Joint
CL (℄)	Center Line
CLR	Clear
CLG	Ceiling
CMU	Concrete Masonry Unit
CO	Cased Opening
COL	Column
CONC	Concrete
CPT	Carpet
CRS	Course
CSC	Concealed Spline Ceiling
CT	Ceramic Tile
CTSK	Countersunk Screw
CUH	Cabinet Unit Heater
CW	City Water
DAPFW	Dens Armor Plus Fireguard Wallboard
DET	Detail
DF	Drinking Fountain

DFP	Dry Fog Paint
DI	DeIonized Water
DIM	Dimension
DISP	Disposal
DISPEN	Dispenser
DO	Door Opening
DPL	Disposal
DPR	Dispenser
DR	Door
DW	Dishwasher
DWG	Drawing
DWR	Drawer
EF	Exhaust Fan; Fan Face
EGG	Eggshell
EJ	Expansion Joint
ELEC	Electrical
EMER	Emergency
EMR	Existing Material to Remove
EP	Epoxy Paint
EPDM	Ethylene Propylene Diene Monomer
EQ	Equal
EQUIP	Equipment
EW	Each Way
EX	Existing
EXG	Existing
EXIST	Existing
EXT	Exterior
FACP	Fire Alarm Control Panel
FB	Flat Bar
FBO	Furnished By Others
FCO	Floor Clean Out
FD	Floor Drain
FE	Fire Extinguisher
FEC	Fire Extinguisher Cabinet
FF	Finished Floor; Far Face
FIN	Finish(ed)
FIXT	Fixture
FL	Floor
FLR	Floor(ing)
FLUR	Fluorescent
FO	Framed Opening
FOF	Face of Finish
FP	Fixed Panel
FS	Floor Sink
FRP	Fiberglass Reinforced Polyester
GA	Gage, Gauge
GB	Grab Bar
GC	General Contractor
GDT	Gypsum Drop-In Tile
GL	Glass
GV	Galvanized

GWB	Gypsum Wall Board
H	High
H&V	Heating and Ventilating
H/C	Handicapped; Hollow Core
HDO	High Density Overlay
HM	Hollow Metal
HOR	Horizontal
HP	Handicapped
HR	Hour
HRU	Heat Recovery Unit
HT	Height
HVAC	Heating, Ventilating, Air, Conditioning
HW	Hot Water
HWH	Hot Water Heater
HWR	Hot Water Return
ID	Inside Diameter
IF	Inside Face
IJ	Isolation Joint
INS	Insulate, Insulated, Insulation
INT	Interior
INTR	Interior
INV	Invert
IW	Indirect Waste
IWV	Indirect Waste Vent
JNT	Joint
KW	Kilowatt
L	Angle
LAM	Laminate
LAV	Lavatory
LEED	Leadership in Energy and Environmental Design
LLH	Long Leg Horizontal
LLV	Long Leg Vertical
LP	Lighting Panel
LT	Light
MAS	Masonry
MAX	Maximum
MDO	Medium Density Overlay
MECH	Mechanical
MIN	Minimum
MISC	Miscellaneous
MO	Masonry Opening
MOV	Moveable
MR	Moisture Resistant
MRGB	Moisture Resistant Gypsum Wallboard
MT	Metal
MUA	Make-Up Air
NC	Nurse Call

NCL	Nurse Call Light
NIC	Not in Contract
NO	Number
NS	Nurses Station
NTS	Not to Scale
OA	Overall
OC	On Center
OF	Outside Face; Owner Furnished
OFI	Owner Furnished and Installed
OFIC	Owner Finished and Installed by Contractor
OH	Overhead
OPG	Opening
OPNG	Opening
OPP	Opposite
OTS	Open to Structure
PA	Public Address
PAF	Powder-Actuated Fastener
PAT	Patient
PL	Plate
PLAM	Plastic Laminate
PLAS	Plaster
PLF	Pounds per Linear Foot
PLYWD	Plywood
PNL	Panel
PP	Power Panel
PSF	Pounds Per Square Foot
PSI	Pounds Per Square Inch
PSTA	Patient Station
PTD	Paper Towel Dispenser
PTN	Partition
PVC	Poly. Vinyl Chloride
PVT	Paver Tile
PWD	Plywood
R	Riser; Radius
RA	Return Air
RB	Rubber Base
RD	Roof Drain
REF	Refrigerator
REFR	Refrigerator
REFRIG	Refrigerator
RM	Room
REMOV	Removable
RO	Roof Drain
RP	Removable Panel
RR	Rub-Rail
SC	Solid Core
SDS	Solution Delivery System
SF	Square Foot; Supply Fan
SG	Semi-Gloss
SHT	Sheet

SIM	Similar
SK	Shear Key
SL	Sliding
SQ	Square
SR	Sheet Rubber
SS	Stainless Steel
ST	Steel
STA	Station
STD	Standard
STL	Steel
STR	Structural
STRUCT	Structural
STUC	Stucco
SUS	Suspended
SV	Sheet Vinyl
T	Tread
T&B	Top and Bottom
TBM	Temporary Benchmark
TC	Time Clock
TCE	Top Chord Extension
THK	Thick(ness)
TJ	Tie Joist
TKBD	Tackboard
TO	Top Of
TOC	Top of Concrete
TOF	Top of Footing
TOM	Top of Masonry
TOP	Top of Pier
TOS	Top of Steel; Top of Slab
TOW	Top of Wall
TPD	Toilet Paper Dispenser
TPH	Toilet Paper Holder
TYP	Typical
UCR	Under Counter Refrigerator
UH	Unit Heater
UNO	Unless Noted Otherwise
USGBC	US Green Building Council
V	Vinyl
VACT	Vinyl Acoustical Ceiling Tile (washable)
VB	Vapor Barrier
VCT	Vinyl Composition Tile
VERT	Vertical
VIF	Verify In Field
VP	Vision Panel
VTR	Vent Through the Roof
VWC	Vinyl Wall Covering
W/	With
W/O	Without
WC	Water Closer
WCO	Wall Clean Out

WD	Wood
WDP	Wood Panel on Gypsum Wallboard
WF	Wide Flange
WH	Water Heater
WIN	Window
WLBD	Wallboard, Typical GWB
WO	Window Opening
WP	Working Point
WS	Wall Sconce
WWF	Welding Wire Fabric

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities:

1. Temporary electricity.
2. Temporary lighting for construction purposes.
3. Temporary heating.
4. Temporary cooling.
5. Temporary ventilation.
6. Telephone service.
7. Facsimile service.
8. Temporary water service.
9. Temporary sanitary facilities.

B. Construction Facilities:

1. Field offices and sheds.
2. Vehicular access.
3. Parking.
4. Progress cleaning and waste removal.
5. Project identification.
6. Traffic regulation.
7. Fire prevention facilities.

C. Temporary Controls:

1. Barriers.
2. Enclosures and fencing.
3. Security.
4. Water control.
5. Dust control.
6. Erosion and sediment control.
7. Noise control.
8. Pest control.
9. Pollution control.
10. Rodent control.

D. Removal of utilities, facilities, and controls.

1.2 TEMPORARY ELECTRICITY

A. Provide and pay for power service required from utility source as needed for construction operation.

B. Provide temporary electric feeder from existing building electrical service at location as agreed by utility. Do not disrupt Owner's use of service.

C. Complement existing power service capacity and characteristics as required for construction operations.

D. Provide power outlets, with branch wiring and distribution boxes located at each floor as required for construction operations. Provide flexible power cords as required for portable construction tools and equipment.

E. Provide main service disconnect and over-current protection at convenient location feeder switch at source distribution equipment meter.

F. Permanent convenience receptacles may not be utilized during construction.

1.3 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain lighting for construction operations to achieve minimum lighting level of 2 watt/sq ft.

B. Provide and maintain 1 watt/sq ft lighting to exterior staging and storage areas entire site after dark for security purposes.

C. Provide and maintain 0.25 watt/sq ft lighting to interior work areas after dark for security purposes.

D. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps for specified lighting levels.

E. Maintain lighting and provide routine repairs.

F. Permanent building lighting may not be utilized during construction.

1.4 TEMPORARY HEATING

A. Existing facilities may be used.

B. Provide and pay for heating devices and heat as needed to maintain specified conditions for construction operations.

C. Prior to operation of permanent equipment for temporary heating purposes, verify installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts prior to obtaining certificate of occupancy.

D. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in product sections.

1.5 TEMPORARY COOLING

A. Provide and pay for cooling devices and cooling as needed to maintain specified conditions for construction operations.

B. Prior to operation of permanent equipment for temporary cooling purposes, verify installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts prior to obtaining certificate of occupancy.

C. Maintain maximum ambient temperature required to maintain construction quality where construction is in progress, unless indicated otherwise in specifications.

1.6 TEMPORARY VENTILATION

A. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

B. Existing ventilation equipment may be used in accordance with IAQ requirements. Extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.

1.7 TELEPHONE SERVICE

A. Provide, maintain, and pay for telephone service to field office at time of project mobilization.

1.8 FACSIMILE SERVICE

A. Provide, maintain and pay for facsimile service and dedicated telephone line to field office at time of project mobilization.

B. A dedicated internet connection providing for ready file transfer may be substituted for facsimile service if approved by Owner and Architect.

1.9 TEMPORARY WATER SERVICE

A. Provide and pay for suitable quality water service as needed to maintain specified conditions for construction operations. Connect to existing water source.

B. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.

1.10 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide facilities at time of project mobilization.

1.11 FIELD OFFICES AND SHEDS

A. Designated existing spaces may be used for field offices and for storage:

1. Portions of existing facility, if available, maybe used as agreed by owner, and/or provide as per item 1.11.B below.

B. Office: Weather tight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.

C. Provide space for Project meetings, with table and chairs to accommodate 8 persons.

D. Locate offices and sheds minimum distance of 30 feet from existing and new structures unless by specific Owner and Architect approval.

E. When permanent facilities are enclosed with operable utilities, offices and storage may be relocated into building with written agreement of Owner; and temporary buildings removed.

F. Construction: Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations with steps and landings at entrance doors.

1. Construction: Structurally sound, secure, weather tight enclosures for office and storage spaces. Maintain during progress of Work; remove when no longer needed at completion of Work.

2. Temperature Transmission Resistance of Floors, Walls, and Ceilings: Compatible with occupancy and storage requirements.

3. Exterior Materials: Weather resistant, finished in one color acceptable to Architect/Engineer.

4. Interior Materials in Offices: Sheet type materials for walls and ceilings, pre-finished or painted; resilient floors and bases.

5. Lighting for Offices: 50 ft C at desk top height, exterior lighting at entrance doors.

6. Interior Materials in Storage Sheds: As required to provide specified conditions for storage of products.

G. Environmental Control:

1. Heating, Cooling, and Ventilating for Offices: Automatic equipment to maintain comfort conditions 68 degrees F heating and 76 degrees F cooling.

2. Storage Spaces: Heating and ventilation as needed to maintain products in accordance with Contract Documents; lighting for maintenance and inspection of products.

H. Storage Areas And Sheds: Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and for inspection of products to requirements of Section 01 60 00 - Product Requirements.

I. Preparation: Fill and grade sites for temporary structures sloped for drainage away from buildings.

J. Installation:

1. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.

2. Employee Residential Occupancy: Not allowed on Owner's property.

K. Maintenance And Cleaning:

1. Regular janitorial services for offices; periodic cleaning and maintenance for office and storage areas.

2. Maintain approach walks free of mud, water, and snow.

L. Removal: At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

1.12 VEHICULAR ACCESS

A. Construct temporary all-weather access roads from public thoroughfares to serve construction area, of width and load bearing capacity to accommodate unimpeded traffic for construction purposes.

B. Construct temporary bridges and culverts to span low areas and allow unimpeded drainage.

C. Extend and relocate vehicular access as Work progress requires, provide detours as necessary for unimpeded traffic flow.

D. Location approved by Owner.

E. Provide unimpeded access for emergency vehicles. Maintain 20 feet wide driveways with turning space between and around combustible materials.

F. Provide and maintain access to fire hydrants and control valves free of obstructions.

G. Provide means of removing mud from vehicle wheels before entering streets.

1.13 PARKING

A. Arrange for temporary surface parking areas to accommodate construction personnel.

B. Locate as approved by Owner.

C. When site space is not adequate, provide additional off-site parking.

D. Use of designated existing on-site streets and driveways used for construction traffic is not permitted. Tracked vehicles not allowed on paved areas.

E. Use of designated areas of existing parking facilities used by construction personnel is not permitted.

F. Do not allow heavy vehicles or construction equipment in parking areas.

G. Do not allow vehicle parking on existing pavement.

H. Permanent Pavements And Parking Facilities:

1. Prior to Substantial Completion, bases for permanent roads and parking areas may be used for construction traffic.

2. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.

3. Use of permanent parking structures is permitted not permitted.

I. Maintenance:

1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, and ice.

2. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

J. Removal, Repair:

1. Remove temporary materials and construction before Substantial Completion.

2. Remove underground work and compacted materials to depth of 2 feet; fill and grade site as specified.

3. Repair existing and permanent facilities damaged by use, to original or specified condition.

K. Mud From Site Vehicles: Provide means of removing mud from vehicle wheels before entering streets.

1.14 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing spaces.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and rubbish from site periodically and dispose off-site.

E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.15 PROJECT IDENTIFICATION

A. Project Identification Sign:

1. One painted sign, 32 sq ft area (48x96), bottom 6 feet above ground.

2. Content:
   a. Project number, title, logo and name of Owner as indicated on Contract Documents.
   b. Names and titles of authorities.
   c. Names and titles of Architect/Engineer and Consultants.
   d. Name of Prime Contractor and major Subcontractors.

3. Graphic Design, Colors, Style of Lettering: Designated by Architect.

B. Design sign and structure to withstand 60 miles/hr wind velocity.

C. Sign Painter: Experienced as professional sign painter.

D. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

E. Show content, layout, lettering, color, foundation, structure, sizes, and grades of members.

F. Sign Materials:

1. Structure and Framing: New wood, structurally adequate.

2. Sign Surfaces: Exterior grade laminated metal faced plastic core ¼" "Luster Board" or equal.

3. Rough Hardware: Galvanized aluminum or brass.

4. Graphics: Pre-cut vinyl self-adhesive products, color and design as indicted.

G. Installation:

1. Install project identification sign within 15 days after date fixed by Notice to Proceed.

2. Erect at location of high public visibility as agreed by owner.

3. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.

4. Install sign surface plumb and level, with butt joints. Anchor securely.

5. Paint exposed surfaces of sign, supports, and framing.

H. Maintenance: Maintain signs and supports clean, repair deterioration and damage.

I. Removal: Remove signs, framing, supports, and foundations at completion of Project and restore area.

1.16 TRAFFIC REGULATION

A. Signs, Signals, And Devices:

1. Post Mounted and Wall Mounted Traffic Control and Informational Signs: As approved by authority having jurisdiction.

2. Automatic Traffic Control Signals: As approved by local jurisdictions.

3. Traffic Cones and Drums, Flares and Lights: As approved by authority having jurisdiction.

4. Flag Person Equipment: As required by authority having jurisdiction.

B. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

C. Flares And Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

D. Haul Routes:

1. Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.

2. Confine construction traffic to designated haul routes.

3. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

E. Traffic Signs And Signals:

1. Provide signs at approaches to site and on site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.

2. Provide, operate, and maintain traffic controls as needed to direct and maintain orderly flow of traffic in areas under Contractor's control, and areas affected by Contractor's operations.

3. Relocate as Work progresses, to maintain effective traffic control.

F. Removal:

1. Remove equipment and devices when no longer required at Substantial Completion.
2. Repair damage caused by installation.
3. Remove post settings to depth of 2 feet.

1.17 FIRE PREVENTION FACILITIES

A. Prohibit smoking with buildings under construction and demolition. Maintain a non-smoking work site.

B. Establish fire watch for cutting and welding and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.

C. Standpipes: Install minimum one permanent (if specified) or maintain existing standpipe for use during construction before building reaches 40 feet in height.

D. Portable Fire Extinguishers: NFPA 10; 10 pound capacity, 4A-60B: C UL rating.

1. Provide one fire extinguisher at each stair on each floor of buildings under construction and demolition.

2. Provide minimum one fire extinguisher in every construction trailer and storage shed.

3. Provide minimum one fire extinguisher on roof during roofing operations using heat producing equipment.

1.18 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by authorities having jurisdiction for public rights-of-way and for public access to existing building.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.19 ENCLOSURES AND FENCING

A. Exterior Enclosures:

1. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.20 SECURITY

A. Security Program:

1. Protect Work and existing premises from theft, vandalism, and unauthorized entry.

2. Initiate program at project mobilization.

3. Maintain program throughout construction period until Owner occupancy Owner acceptance precludes need for Contractor security directed by Architect/Engineer.

B. Entry Control:

1. Restrict entrance of persons and vehicles into Project site and existing facilities.

2. Allow entrance only to authorized persons with proper identification.

3. Maintain log of workers and visitors, make available to Owner on request.

C. Restrictions:

1. Do no work on days indicated in Owner-Contractor Agreement.

1.21 WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.22 DUST CONTROL

A. Execute Work by methods to minimize raising dust from construction operations.

B. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

1.23 EROSION AND SEDIMENT CONTROL

A. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

B. Minimize surface area of bare soil exposed at one time.

C. Provide temporary measures including berms, dikes, and drains, and other devices to prevent water flow.

D. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.

E. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

1.24 NOISE CONTROL

A. Provide methods, means, and facilities to minimize noise produced by construction operations.

1.25 PEST CONTROL

A. Provide methods, means, and facilities to prevent pests and insects from damaging the Work or entering facility.

1.26 POLLUTION CONTROL

A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

B. Comply with pollution and environmental control requirements of authorities having jurisdiction.

1.27 RODENT CONTROL

A. Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

1.28 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.

B. Remove underground installations to minimum depth of 2 feet. Grade site as indicated on Drawings.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

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

END OF SECTION

SECTION 01 57 26

TEMPORARY INDOOR AIR QUALITY CONTROLS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Construction indoor air quality (IAQ) management plan.
2. HVAC air filters.
3. Building flush-out.
4. Indoor air quality testing.

B. Related Sections:

1. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.

2. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.

3. Section 23 00 00 - HVAC Systems, 2.12 TOTAL ENERGY HEAT RECOVERY EQUIPMENT, Air Cleaning Devices: Permanent air filters.

1.2 REFERENCES

A. American Society of Heating, Refrigerating & Air Conditioning Engineers.

1. ASHRAE 52.2 - Method of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size.

B. Sheet Metal and Air Conditioning National Contractors Association.

1. SMACNA IAQ - Guideline for Occupied Buildings under Construction, Chapter 3: Control Measures.

C. US Environmental Protection Agency:

1. EPA 600-4-90-010 - Compendium of Methods for the Determination of Air Pollutants in Indoor Air.

1.3 PLAN REQUIREMENTS

A. Intent:

1. Prevent indoor air quality problems resulting from the construction and renovation process.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit description and performance data for filters, including MERV ratings.

C. Construction Plan: Submit construction IAQ management plan describing methods and procedures for implementation and monitoring compliance.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents:

1. Submit construction photographs showing compliance with construction IAQ management plan.

1.6 CONSTRUCTION IAQ MANAGEMENT PLAN

A. Implement Construction IAQ Management Plan at start of construction.

B. Review Construction IAQ management plan at pre-construction meeting and progress meetings specified in Section 01 30 00.

C. Distribute approved Construction IAQ Management Plan to subcontractors and others affected by Plan Requirements.

D. Oversee plan implementation, instruct construction personnel for plan compliance, and document plan results.

E. Develop a Draft Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building as follows: (1) during construction meet or exceed the minimum requirements of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction 1995, Chapter 3, (2) Protect stored on-site or installed absorptive materials from moisture damage, and (3) conduct a building flush-out after construction ends and prior to occupancy.

1. The SMACNA IAQ Guidelines for Occupied Buildings under Construction provides an overview of air pollution associated with construction, control measures, construction process management, quality control, communicating with occupants, and case studies. These guidelines can be accessed at www.smacna.org. Chapter 3 of the SMACNA Guidelines recommends Control Measures in five areas: HVAC protection, source control, pathway interruption, housekeeping, and scheduling. Review the applicability of each Control Measure and include those that apply in the Draft IAQ Management Plan.
   a. HVAC Protection: Shut down the return side of the HVAC system whenever possible during heavy construction. If the system must remain operational during construction include the following strategies that apply:
      1) Fit the return side of the HVAC system with temporary filters.
      2) Isolate the return side of the HVAC system from the surrounding environment as much as possible (e.g., place all tiles for the ceiling plenum, repair all ducts and air handler leaks).

3) Damper off the return system in the heaviest work areas and seal the return system openings with plastic.
4) Upgrade the filter efficiency where major loading is expected to affect operating HVAC system.
5) Clean permanent return air ductwork per National Air Duct Cleaning Association standards upon completion of all construction and finish installation work.
6) If permanently installed air handlers are used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 shall be used at each return air grille, as determined by ASHRAE 52.2-1999.
7) Install new clean media just prior to substantial completion and occupancy that has a Minimum Efficiency Reporting Value (MERV) of 13 as determined by ASHRAE 52.2-1999.

b. Source Control: Propose the substitution of non-toxic formulations of materials that are generally the responsibility of the contractor such as caulks, sealants, and cleaning products.

c. Pathway Interruption: Prevent contamination of clean spaces. Include the following strategies that apply:
1) Use 100% outside air ventilation (when outside temperatures are between 55 degrees F and 85 degrees F and humidity is between 30% and 60%) with air exhausted directly to the outside during installation of finishes and other VOC emitting materials.
2) Erect some type of barrier between work areas or between the inside and outside of the building to prevent unwanted airflow from dirty to clean areas

d. Housekeeping: Reduce construction contamination in the building prior to occupancy through HVAC and regular space cleaning activities.
1) Store building materials in a weather tight, clean area prior to unpacking for installation.
2) Check for possible damage to the HVAC system and Building assemblies from high humidity.
3) Clean all coils, air filters, and fans before testing and balancing procedures are performed.

e. Scheduling: Specify construction sequencing to reduce absorption of VOC's by materials that act as sinks or contaminant sources. Complete application of wet and odor-emitting materials such as paints, sealants, and coatings before installing sink materials such as ceiling tiles, carpets, insulation, gypsum products, and fabric-covered furnishings are installed.

2. Protect stored on-site or installed absorptive materials from exposure to moisture through precipitation, plumbing leaks, or condensation from the HVAC system to prevent microbial contamination.

3. Conduct a building flush-out. Flush each unit with fresh air, according to the following guidelines:
a. Flush prior to occupancy but after all phases of construction are completed.
b. Flush the entire unit, keeping all interior doors open.
c. Flush for 48 total hours; the hours may be nonconsecutive, if necessary.

d. Keep all windows open and run a fan (e.g., HVAC system fan) continuously or flush the home with all HVAC fans and exhaust fans operating continuously at the highest flow rate.
e. Use additional fans to circulate air within the home.
f. Replace or clean HVAC air filter afterward, as necessary.

F. Draft IAQ Management Plan Review Meeting: Once the Owner and Architect have reviewed the Draft IAQ Management Plan and prior to construction at the site, schedule and conduct a meeting to review the Draft IAQ Management Plan and discuss procedures, schedules and specific requirements for IAQ during the construction and pre-construction phases of the building. Discuss coordination and interface between the Contractor and other construction activities. Identify and resolve problems with compliance to the requirements. Record minutes of the meeting, identify all conclusions reached and matters requiring further resolution.

1. Attendees: The Contractor and related Contractor personnel associated with the work of this section, including personnel to be in charge of the IAQ management program, Architect, Owner and such additional personnel as the Architect or Owner deems appropriate.

G. Final IAQ Management Plan: Make any revisions to the Draft IAQ Management Plan agreed upon during the meeting identified in item (B) above and incorporate resolutions agreed to be made subsequent to the meeting. Submit the revised plan to the Owner and Architect for approval within 10 calendar days of the meeting.

1.7 SEQUENCING

A. Section 01 10 00 - Summary: Requirements for sequencing.

B. Sequence material delivery and installation to avoid exposing insulation, carpeting, acoustical ceilings, gypsum board and other absorptive materials to contamination and moisture.

1. Enclose building before storing and installing moisture sensitive products within building under construction.

PART 2 PRODUCTS

2.1 HVAC AIR FILTERS

A. Return Filters: Filtration media rated for minimum efficiency reporting value (MERV) when tested in accordance with ASHRAE 52.2.

1. Construction Return Filters: MERV of 8, minimum.
2. Flush-Out Return Filters: MERV of 13, minimum.

B. Supply Filters: As specified in Section 23 40 00.

PART 3 EXECUTION

3.1 FILTER INSTALLATION AND REPLACEMENT

A. Install construction return filter at each return grille before operating permanent air handlers during construction.

B. Replace filters after completing construction and before occupancy.

1. Replace construction return filters with permanent filters.

2. Replace supply filters.

3.2 CONSTRUCTION PHOTOGRAPHS

A. Section 01 33 00 - Submittal Procedures: Requirements for construction photographs.

B. Photograph construction operations to show compliance with SMACNA IAQ and construction IAQ management plan.

1. Take minimum six photographs on minimum three different occasions during construction to show consistent adherence with specified requirements.

2. Identify photographs as required in 1.5 Closeout Submittals and identify SMACNA IAQ approach illustrated in each photograph.

3.3 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Products.

B. Product delivery requirements.

C. Product storage and handling requirements.

D. Product options.

E. Product substitution procedures.

F. Equipment electrical characteristics and components.

1.2 PRODUCTS

A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.

B. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.

C. Furnish interchangeable components from same manufacturer for components being replaced.

1.3 PRODUCT DELIVERY REQUIREMENTS

A. Transport and handle products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Store and protect products in accordance with manufacturers' instructions.

B. Store with seals and labels intact and legible.

C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

D. For exterior storage of fabricated products, place on sloped supports above ground.

E. Provide off-site storage and protection with right of entry and certificate of insurance when site does not permit on-site storage or protection and approved by financing authority.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.

H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.5 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit request for substitution for any manufacturer not named in accordance with the following article.

1.6 PRODUCT SUBSTITUTION PROCEDURES

A. Architect/Engineer will consider requests for Substitutions only within 30 days after date of commencement established in Notice to Proceed.

B. Substitutions may only be considered when a product becomes unavailable through no fault of Contractor. Substitutions resulting in product change should be incorporated by Change Order.

C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

D. A request constitutes a representation that Contractor:

1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.

2. Will provide same warranty for Substitution as for specified product.

3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.

4. Waives claims for additional costs or time extension which may subsequently become apparent.

5. Will reimburse Owner and Architect/Engineer for review or redesign services associated with re-approval by authorities having jurisdiction.

E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents. Any Substitutions indicated or implied on Shop Drawing or Product Data submittals are considered rejected regardless of markings on Architect's review stamp and shall be resubmitted as a Substitution request or with a conforming Submittal.

F. Substitution Submittal Procedure:

1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.

2. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.

3. Architect/Engineer will notify Contractor in writing of decision to accept or reject request.

PART 2 PRODUCTS

2.1 EQUIPMENT ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Include lugs for terminal box.

B. Cord and Plug: Furnish minimum 6 foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 70 00

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Closeout procedures.
B. Final cleaning.
C. Starting of systems.
D. Demonstration and instructions.
E. Testing, adjusting and balancing.
F. Protecting installed construction.
G. Project record documents.
H. Operation and maintenance data.
I. Manual for materials and finishes.
J. Manual for equipment and systems.
K. Spare parts and maintenance products.
L. Product warranties and product bonds.
M. Maintenance service.

1.2 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect/Engineer's review.

B. Provide submittals to Architect/Engineer Owner required by authorities having jurisdiction.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.3 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Clean equipment and fixtures to sanitary condition with cleaning materials appropriate to surface and material being cleaned.

D. Replace filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean site; sweep paved areas, rake clean landscaped surfaces.

G. Remove waste and surplus materials, rubbish, and construction facilities from site.

1.4 STARTING OF SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architect Owner seven days prior to start-up of each item.

C. Verify each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.

E. Verify wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable manufacturer's representative Contractors' personnel in accordance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report in accordance with Section 01 33 00 - Submittal Procedures that equipment or system has been properly installed and is functioning correctly.

1.5 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion. final inspection.

B. Demonstrate to Owner’s personnel and the Commissioning Agent the project equipment and instructed by qualified representative who is knowledgeable about the Project.

C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

E. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.

F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

G. Required instruction time for each item of equipment and system is specified in individual sections.

1.6 TESTING, ADJUSTING AND BALANCING

A. Contractor to perform testing, adjusting, and balancing in accordance with the Division 23 specifications.

B. Reports will be submitted by independent firm to Architect indicating observations and results of tests and indicating compliance or non-compliance with requirements of Contract Documents.

1.7 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic from landscaped areas.

1.8 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:

1. Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Reviewed Shop Drawings, Product Data, and Samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress, not less than weekly.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:

1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:

1. Measured depths of foundations in relation to finish first main floor datum.

2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

4. Field changes of dimension and detail.

5. Details not on original Contract drawings.

G. Submit documents to Architect with claim for final Application for Payment.

1.9 OPERATION AND MAINTENANCE DATA

A. Submit data bound in 8-1/2 x 11 inch (A4) text pages, three D side ring binders with durable plastic covers.

B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.

C. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

E. Contents: Prepare Table of Contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:

1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.

2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
   a. Significant design criteria.
   b. List of equipment.
   c. Parts list for each component.
   d. Operating instructions.
   e. Maintenance instructions for equipment and systems.
   f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

3. Part 3: Project documents and certificates, including the following:
   a. Shop drawings and product data.
   b. Air and water balance reports.
   c. Certificates.
   d. Photocopies of warranties and bonds.

1.10 MANUAL FOR MATERIALS AND FINISHES

A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect/Engineer will review draft and return one copy with comments.

B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.

C. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy be reviewed and returned after final inspection, with Architect/Engineer comments. Revise content of document sets as required prior to final submission.

D. Submit two sets of revised final volumes in final form within 10 days after final inspection.

E. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Include information for re-ordering custom manufactured products.

F. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

G. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Include recommendations for inspections, maintenance, and repair.

H. Additional Requirements: As specified in individual product specification sections.

I. Include listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.11 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect/Engineer will review draft and return one copy with comments.

B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.

C. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy be reviewed and returned after final inspection, with Architect/Engineer comments. Revise content of document sets as required prior to final submission.

D. Submit two sets of revised final volumes in final form within 10 days after final inspection.

E. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.

F. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed. by label machine.

G. Include color coded wiring diagrams as installed.

H. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and special operating instructions.

I. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

J. Include servicing and lubrication schedule, and list of lubricants required.

K. Include manufacturer's printed operation and maintenance instructions.

L. Include sequence of operation by controls manufacturer.

M. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

N. Include control diagrams by controls manufacturer as installed.

O. Include Contractor's coordination drawings, with color coded piping diagrams as installed.

P. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

Q. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

R. Include test and balancing reports as specified in Section 01 40 00 - Quality Requirements.

S. Additional Requirements:As specified in individual product specification sections.

T. Include listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

1.12 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Furnish spare parts, maintenance, and extra products in quantities specified in individual specification sections.

B. Deliver to Project site and place in location as directed by Owner; obtain receipt prior to final payment.

1.13 PRODUCT WARRANTIES AND PRODUCT BONDS

A. Obtain warranties and bonds executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.

B. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers.

C. Verify documents are in proper form, contain full information, and are notarized.

D. Co-execute submittals when required.

E. Include Table of Contents and assemble in three D side ring binder with durable plastic cover.

F. Submit prior to final Application for Payment.

G. Time Of Submittals:

1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.

2. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.

3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty or bond period.

1.14 MAINTENANCE SERVICE

A. Furnish service and maintenance of components indicated in specification sections during warranty period.

B. Examine system components at frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by manufacturer of original component.

D. Do not assign or transfer maintenance service to agent or Subcontractor without prior written consent of Owner.

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

END OF SECTION

SECTION 02 41 20

SELECTIVE STRUCTURE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

A. Description: Selective Structure Demolition pertains to selective removals to the remaining structure after the completion of portions of the structure to be completely removed as part of Site Demolition specified in

B. Section Includes:

1. Demolishing designated building equipment and fixtures.
2. Demolishing designated construction.
3. Cutting and alterations for completion of the Work.
4. Removing designated items for reuse.
5. Protecting items designated to remain.
6. Removing demolished materials.

C. Related Sections:

1. Section 01 74 19 – Waste Management and Disposal.
2. Section 06 20 00 – Finish Carpentry: Re-furbishing and re-installing of removed materials.

1.2 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Demolition Schedule: Indicate overall schedule and interruptions required for utility and building services.

C. Shop Drawings:

1. Indicate location of items designated for reuse.
2. Indicate location and construction of temporary work.

1.3 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Accurately record actual locations of capped utilities, concealed utilities discovered during demolition, subsurface obstructions, and approved modifications drawings.

C. Operation and Maintenance Data: Submit description of system, inspection data, and parts lists.

1.4 QUALITY ASSURANCE

A. Conform to applicable code for demolition work, dust control, products requiring electrical disconnection and re-connection.

B. Conform to applicable code for procedures when hazardous or contaminated materials are discovered.

C. Obtain required permits from authorities having jurisdiction.

D. Perform Work in accordance with State and Municipality of project location standard.

1.5 PRE-INSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.6 SEQUENCING

A. Section 01 10 00 - Summary: Requirements for sequencing.

B. Sequence activities in the following order:

1. Contractor shall coordinate with Owner.

C. Owner will conduct salvage operations before demolition begins to remove materials Owner chooses to retain.

1.7 SCHEDULING

A. Section 01 30 00 - Administrative Requirements 01 32 16 - Construction Progress Schedule: Requirements for scheduling.

B. Schedule Work to coincide with new construction.

C. Cooperate with Owner in scheduling noisy operations and waste removal that may impact operation in adjoining properties.

D. Coordinate utility and building service interruptions with Owner.

1. Do not disable or disrupt building fire or life safety systems without three days prior written notice to Owner.

2. Schedule tie-ins to existing systems to minimize disruption.

3. Coordinate Work to ensure fire sprinklers, fire alarms, smoke detectors, emergency lighting, exit signs and other life safety systems remain in full operation in occupied areas.

1.8 PROJECT CONDITIONS

A. Conduct demolition to minimize interference with adjacent and occupied building areas.

B. Cease operations immediately if structure appears to be in danger and notify Architect. Do not resume operations until directed.

PART 2 PRODUCTS - Not Used.

PART 3 EXECUTION

3.1 PREPARATION

A. Notify affected utility companies before starting work and comply with their requirements.

B. Mark location and termination of utilities.

C. Erect, and maintain temporary barriers and security devices at locations indicated, including warning signs and lights, and similar measures, for protection of the public, Owner, and existing improvements indicated to remain.

D. Erect and maintain weatherproof closures for exterior openings.

E. Prevent movement of structure; provide temporary bracing and shoring required to ensure safety of existing structure.

F. Provide appropriate temporary signage including signage for exit or building egress.

G. Do not close or obstruct building egress path.

H. Do not disable or disrupt building fire or life safety systems without 3 days prior written notice to Owner.

3.2 SALVAGE OF ITEMS FOR REUSE REQUIREMENTS

A. Coordinate with Owner and review construction documents to identify building components and equipment required to be removed and reused.

B. Tag components and equipment designated for reuse.

C. Protect designated salvage items from demolition operations until items can be reused.

D. Carefully remove building components and equipment indicated for reuse.

E. Disassemble as required to permit items indicated for reuse.

F. Package small and loose parts to avoid loss.

G. Mark equipment and packaged parts to permit identification and consolidation of components of each item indicated for reuse.

H. Prepare assembly instructions consistent with disassembled parts. Package assembly instructions in protective envelope and securely attach to each disassembled item.

I. Store components, protected from construction operations, until reinstalled.

3.3 DEMOLITION

A. Conduct demolition to minimize interference with adjacent and occupied building areas.

B. Maintain protected egress from and access to adjacent existing buildings at all times.

C. Do not close or obstruct roadways sidewalks without permits.

D. Cease operations immediately when structure appears to be in danger and notify Architect.

E. Disconnect and remove designated utilities within demolition areas.

F. Cap and identify abandoned utilities at termination points when utility is not completely removed. Annotate Record Drawings indicating location and type of service for capped utilities remaining after demolition.

G. Demolish in orderly and careful manner. Protect existing improvements, supporting structural members and items indicated for reuse.

H. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.

I. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.

J. Remove temporary Work.

3.4 SCHEDULES

A. Remove, store and protect the following materials and equipment:

1. Items indicated for reuse or as required to complete the Work.

B. Protect the following materials and equipment remaining:

1. Existing building components indicated to remain or as required to complete the Work.

C. Demolish the following materials and equipment:

1. Items indicated for demolition and as required to complete the Work.

END OF SECTION

SECTION 03 30 00

CAST -IN-PLACE CONCRETE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The drawings and general conditions of the contract including General and Supplementary Conditions and other Division 1 Specification sections apply to work of this section.

B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK:

A. Work included: Provide labor, materials, and equipment necessary to complete the work of this Section and, without limiting the generality thereof, furnish and include the following:

1. The extent of cast-in-place concrete work is shown on drawings and includes (but not by way of limitation) formwork, reinforcing, cast-in-place concrete, accessories, finishing, and casting in of items specified under other Sections of the Specifications or furnished by Owner that are required to be built-in with the concrete.

2. Equipment support pads indicated on mechanical drawings to be installed by the Building Contractor.

3. Cast-in-place retaining walls, exterior slabs on grade and other concrete shown on site drawings.

1.03 RELATED WORK:

A. Metal Fabrications: Section 05 50 00

1. Expansion Anchors - Section 05 12 00

2. Embedded Items - Section 05 50 00

B. Anchor Bolts: Section 05 12 00

C. Joint Sealants: Section 07 90 00

D. Underslab Vapor Retarders/Wall Waterproofing: Division 7

1.04 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of the latest edition of the following except where more stringent requirements are shown or specified:

1. ACI “Manual of Concrete Practice”.
2. ACI 117 “Standard Specifications for Tolerances for Concrete Construction and Materials”.
3. ACI 211.1 "Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete."
4. ACI 212.3R "Chemical Admixtures for Concrete."
5. ACI 301 "Specifications for Structural Concrete for Buildings."
6. ACI 302.1R "Guide for Concrete Floor and Slab Construction."
7. ACI 304R "Guide for Measuring, Mixing, Transporting and Placing Concrete."
8. ACI 304.2R "Placing Concrete by Pumping Methods."
9. ACI 306 R "Cold Weather Concreting."
10. ACI 308 “Standard Practice for Curing Concrete."
11. ACI 309R "Guide for Consolidation of Concrete."
12. ACI 315 "ACI Detailing Manual."
13. ACI 318 "Building Code Requirements for Reinforced Concrete."
14. ACI 347R "Guide to Formwork for Concrete."
15. Concrete Reinforcing Steel Institute, "Placing Reinforcing Bars."
16. AISC “Code of Standard Practice for Steel Buildings and Bridges.”
17. “Code of Federal Regulations, Part 1926” per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).

B. Materials and installed work may require testing and retesting, as directed by the Architect, at any time during progress of work. Allow free access to material stockpiles and facilities. Tests not specifically indicated to be done at Owner's expense, including retesting of rejected materials and installed work, shall be done at Contractor's expense.

1.05 SUBMITTALS:

A. Unless otherwise specified, submittals required in this section shall be submitted for review. Submittals shall be prepared and submitted in accordance with Division 1.

B. General Contractor shall submit a Submittal Schedule to the engineer within 30 days after they have received the Owner’s Notice to Proceed.

C. All submittals shall be reviewed and returned to the Architect within 10 working days.

D. Incomplete submittals will not be reviewed.

E. Submittals not reviewed by the General Contractor prior to submission to the Engineer will not be reviewed. Include on the submittal statement or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in this Section and Division 1 have been complied with.

F. Engineer will review submittals a maximum of two review cycles as part of their normal services. If submittals are incomplete or otherwise unacceptable and re-submitted, General Contractor shall compensate Engineer for additional review cycles.

G. Hardcopy Submittals: Submit three prints. Prints will be reviewed by the Engineer, and then the Architect. One marked print will be returned to Contractor for printing and distribution. Multiple copies will not be marked by the Engineer.

H. Electronic Submittals:

1. Contractor shall include in the submittal schedule an indication of submittals that are intended to be submitted electronically. Upon receipt of the submittal schedule, the Engineer reserves the right to indicate submittals that will not be accepted electronically. Paper copies of such submittals shall be furnished as referenced in this specification.

2. The Engineer reserves the right to require paper copies of submittals that are received electronically. Provide Engineer one (1) paper copies in addition to the electronic submittal. Paper copy will be retained and electronic copy will be returned. Review cycle for such submittals shall not commence until such time that the paper copies are received.

3. Electronic Submittals shall be submitted in Protected Document Format (PDF) compatible with Bluebeam version 12 or later. Electronic files shall not be broken into smaller individual files. File sizes too large to process email or within a file transfer protocol (FTP) site shall be provided on a CD.

4. The submission of submittals electronically does not relieve the contractor of their responsibility to review the submittal prior to transmission to the Engineer. Electronic Submittals shall include contractor comments, and a statement and/or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in this Section and Division 1 have been complied with. Electronic submittals without the Contractor's approval will be rejected and returned.

5. The Engineer assumes no responsibility for the printed reproduction of submittals reviewed electronically, transmission errors or returned electronic submittals that become corrupted or are otherwise not accessible by the Contractor's or Subcontractor's computer hardware and/or software.

I. Product Data: Submit producer's or manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. Reinforcement certified mill reports covering chemical and physical properties and yield strength.

2. Patching products.

3. Non-shrink grout.

4. Curing compounds, where applicable.

5. Admixtures.

6. Expansion/Adhesive Anchors.

J. Shop Drawings:

1. Shop Drawing Preparation: Electronic files of structural drawings will not be provided to the contractor for preparation of shop drawings. Reproduction of any portion of the Construction Documents for use as Shop drawings is prohibited. Shop drawings created from reproduced Construction Documents will be returned without review. Submit shop drawings for fabrication, bending and placement of concrete reinforcement. Comply with ACI 315, showing bar schedules, stirrup and tie spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required at openings through concrete elements. Include supplemental reinforcing and bar supports necessary to support reinforcing steel at proper location within forms or slabs.

a. Review of the shop drawings will be made for the size and arrangement of reinforcement. Conformance of the Shop Drawings to the Contract Drawings remains the responsibility of the General Contractor. Engineer's review in no way relieves the General Contractor of this responsibility.

b. Shop drawings will not be reviewed as partial submittals. A complete submittal shall be provided all items listed prior. **Incomplete submittals will not be reviewed.**

K. Mix designs: Submit all laboratory test reports and materials for each mix design listed within. Prepare mixes by the field experience method and/or trial mixtures per the requirements of chapter 5 of ACI 318. Include the calculation of average strength and standard deviation. Proportioning by water cement ratio method will not be permitted.

L. Samples: Submit samples of materials as specified and as otherwise requested by Architect, including names, sources and descriptions.

M. Curing Methods: Submit documentation of curing methods to be used for review. Account for anticipated project temperature ranges and conditions in curing methods.

N. Contraction/Construction Joints: Submit plan indicating proposed location of contraction and construction joints in walls and slabs.

O. Test Reports: Test reports shall be submitted to the Owner, Architect and Engineer within 48 hour after completion of each test.

PART 2 PRODUCTS

2.01 FORM MATERIALS:

A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.

1. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with piece bearing legible inspection trademark.

B. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

2.02 REINFORCING MATERIALS:

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Welded Wire Fabric: ASTM A 185, welded steel wire fabric. Provide welded wire fabric in flat sheets.

C. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers, and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use plastic, wire bar type supports or concrete block supports complying with CRSI recommendations, unless otherwise specified. Wood, clay brick and other unspecified devices are not acceptable.

1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class I) or stainless steel protected (CRSI, Class 2).

2.03 CONCRETE MATERIALS:

A. Single-Source Supplier: Ready-mix concrete shall be from one supplier unless specific written approval is received from the Structural Engineer.

B. Portland Cement: ASTM C 150, Type I or Type II, unless otherwise approved Use one brand of cement throughout project, unless otherwise acceptable to Architect.

C. Normal Weight Aggregates: ASTM C 33. Provide from a single source for exposed concrete. Do not use aggregates containing soluble salts or other substances such as iron sulfides, pyrite, marcasite, or ochre which can cause stains on exposed concrete surfaces.

D. Light Weight Aggregates: ASTM C 330.

E. Water: Potable.

F. Air-Entraining Admixture: ASTM C 260.

G. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C 494, Type F or Type G containing not more than 1% chloride ions.

H. Fiber reinforcement shall be Type III Synthetic Virgin Homopolymer Polypropylene Fibers conforming to ASTM C1116. Fiber reinforcing shall be added and distributed prior to incorporation of Super Plasticizer.

I. Normal range water reducing admixture: ASTM C 494 Type A containing no calcium chloride.

J. Accelerating Admixture: ASTM C 494, Type C or E.

K. Concrete Moisture Vapor Reduction Admixture: Barrier-1 High Performance Admixture manufactured by Barrier 1 Inc. added to the mix at batch plant or job site for all interior slabs-on-grade and elevated slabs. Refer to manufacturer's published specifications and data sheets for application, curing, quality control and repair recommendations. Comply with manufacturer's criteria to ensure manufacturer's full published warranty. Provide a copy of manufacturer's warranty for project closeout documents.

L. Blast Furnace Slag: ASTM C989

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

N. Calcium Chloride is not permitted.

2.04 RELATED MATERIALS:

A. Underslab Vapor Retarder: Provide vapor retarder over prepared sub base. Refer to architectural drawings, geotechnical report and/or division 7 specifications for additional requirements and vapor retarder location.

B. Non-Shrink Cement-based Grout: Provide grout consisting of pre-measured, prepackaged materials supplied by the manufacturer requiring only the addition of water. Manufacturer's instructions must be printed on the outside of each bag.

1. Non-shrink: No shrinkage (0.0%) and a maximum 4.0% expansion when tested in accordance with ASTM C-827. No shrinkage (0.0%) and a maximum of 0.3% expansion in the hardened state when tested in accordance with CRD-C-621.

2. Compressive strength: A minimum 28 day compressive strength of 5000 psi when tested in accordance with ASTM C-109.

3. Setting time: A minimum initial set time of 60 minutes when tested in accordance with ASTM C-191.

4. Composition: Shall not contain metallic particles or expansive cement.

C. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M182, Class 2.

D. Moisture-Retaining Cover: One of the following, complying with ANSI/ASTM C 171.

1. Waterproof paper.

2. Polyethylene film.

3. Polyethylene-coated burlap.

E. Liquid Membrane-Forming Curing Compound: Liquid type membrane forming curing compound complying with ASTM C 309, Type I, Class A unless other type acceptable to Architect. Curing compound shall not impair bonding of any material, including floor finishes, to be applied directly to the concrete. Demonstrate the non-impairment prior to use.

F. Preformed Expansion Joint Formers:

1. Bituminous Fiber Type, ASTM D 1751.

2. Felt Void, Poly-Styrene Cap with removable top as manufactured by SUPERIOR.

G. Slab Joint Filler: Multi-component polyurethane sealant (self-leveling type).

H. Waterstops shall be Bentonite/Butyl Rubberbased product. Use in conjunction with manufacturer's approved mastic. Acceptable products include:

1. "Waterstop Rx," by American Colloid Co.

2. "Adeka Ultra Seal MC-2010," by Asahi Denka Koeyo, Kik MN.

2.05 PROPORTIONING AND DESIGN OF MIXES:

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 318. Use material, including all admixtures, proposed for use on the project. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing unless otherwise acceptable to Architect.

B. Submit written reports to Architect of each proposed mix for each class of concrete. Do not begin concrete production until mixes have been reviewed by Architect.

C. Proportion design mixes to provide concrete with the following properties:

1. Footings and foundation walls

a. Strength: 3,500 psi at 28 days.

b. Aggregate: 3/4"

c. W/C Ratio: 0.55 maximum

d. Entrained Air: 6% +/- 1.5%

e. Slump: 4" maximum

2. Interior Slabs on grade:

a. Strength: 3,000 psi at 28 days

b. Aggregate: 3/4" minimum, 1 1/2" maximum.

c. W/C Ratio: 0.52 maximum

d. Entrapped Air only (no entrainment), 2.5% +/- 1%

e. Slump: 4” maximum

f. Barrier-1 High Performance Admixture manufactured by Barrier 1 Inc. Mix with concrete per manufacturer’s recommendations. Reference section 2.03 of this specification for additional requirements.

g. Ready-mix supplier’s submittal shall be reviewed and approved by Barrier-1 for compatibility and proper dose rate; provide evidence of acceptance of mix submittal by Barrier-1

3. Exterior Slabs and all other exposed Site Concrete not specified elsewhere:

a. Strength: 5,000 psi at 28 days

b. Aggregate: 3/4"

c. W/C Ratio: 0.40 maximum

d. Entrained Air: 6% +/- 1.5%

e. Slump: 4" maximum

4. Add air entraining admixture at manufacturers prescribed rate to result in concrete at point of placement having the above noted air contents.

5. Additional slump may be achieved by the addition of a mid-range or high-range water reducing admixture. Maximum slump after the addition of admixture shall be 6 or 8 inches for mid-range or high range water reducing admixtures, respectively.

D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor, when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Structural Engineer before using in work.

1. Water may be added at the project only if the maximum specified slump and design mix maximum water/cement ratio is not exceeded.

2. Additional dosages of superplastisizer should be used when delays occur and required slump has not been maintained. A maximum of two additional dosages will be permitted per ACI 212.3R recommendations.

2.06 CONCRETE MIXING:

A. Job-Site Mixing will not be permitted.

B. Ready-Mix Concrete: Must comply with the requirements of ASTM C 94, and as herein specified. Provide batch ticket for each batch discharged and used in work, indicating project name, mix type, mix time and quantity.

1. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required by Structural Engineer.

2. When the air temperature is between 85 degrees F. and 90 degrees F., reduce the mixing and delivery time from 1 1/2 hours to 75 minutes, and when the air temperature is above 90 degrees F., reduce the mixing and delivery time to 60 minutes.

PART 3 EXECUTION

3.01 FORMS:

A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.

B. Design, construct, erect, maintain, and remove forms for cast-in-place concrete work in compliance with ACI 347.

C. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

D. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, dovetail slots, reglets, recesses, and the like to prevent swelling and for easy removal.

F. Provide temporary openings where interior area of formwork is inaccessible for clean out, for inspection before concrete placement and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

G. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

H. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

1. Unless otherwise indicated, provide ties for concrete surfaces to be exposed to view in the final condition so portion remaining within concrete after removal is 1" (minimum) inside concrete.

2. Form ties shall not leave holes larger than 1" diameter in concrete surface. Repair holes left by form ties after removal of formwork.

I. Provision for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

J. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement as required to eliminate mortar leaks and maintain proper alignment.

3.02 PLACING REINFORCEMENT:

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

1. Subgrade tolerance shall conform to a tolerance of +0/-1 1/2". Base tolerance (fine grading) for slabs shall conform to a tolerance of +0”/-3/4” in. Confirm compliance of above tolerances with surveyed measurements taken at 20 ft. intervals in each direction.

2. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

3. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.

4. Place reinforcement to obtain specified coverage for concrete protection within tolerances of ACI-318. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

5. Install welded wire fabric in flat sheets in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.03 JOINTS:

A. Construction Joints: Locate and install construction joints, which are not shown on drawings, so as not to impair strength and appearance of the structure, as acceptable to Architect. Submit plan indicating proposed location of construction joints for review prior to beginning work.

1. Provide keyways at least 1-1/2" deep in construction joints in walls, and slabs; bulkheads reviewed by the Engineer, designed for this purpose may be used for slabs.

2. Roughened surfaces shall be used between walls and footings unless shown otherwise on the drawings. The footing surface shall be roughened to at least an amplitude of 1/4" for the width of the wall before placing the wall concrete.

3. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.

4. Joints in slabs on grade shall be located and detailed as indicated on the drawings. If saw-cut joints are required, the early-entry dry-cut process shall be used. Refer to ACI 302, section 8.3.12.

3.04 INSTALLATION OF EMBEDDED ITEMS:

A. General: Set, securely anchor and build into work prior to concrete placement all anchorage devices and all other embedded items, including but not by limitation reinforcement, reinforcing dowels, embedded plates, anchor rods, anchor inserts, sleeves, load transfer plates, diamond dowels and shelf bulk heads required for other work that is attached to, bear upon, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto. Notify other trades to permit installation of their work. Templates to be utilized for setting of anchorage devices shall be constructed in a manner to allow mechanical consolidation of concrete without disturbance. Embedments shall be placed in a timely fashion to permit the inspection of embedments prior to concrete placement. **“Wet Setting” of embedded items into plastic concrete is strictly prohibited.**

B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface.

C. Provide PVC sleeves where pipes and/or conduit pass through exterior concrete or slabs. Sleeves or penetrations shall not be placed through footings, piers, pedestals, drop caps, columns or pilasters unless specifically noted.

D. Tolerances: Tolerances for Anchor Bolts/Rods, other embedded items and bearing surfaces shall meet the requirement set forth in the latest edition of the American Institute of Steel Construction “Code of Standard Practice for Steel Buildings and Bridges,” and ACI 117. The more stringent criteria from these documents shall apply.

3.05 INSTALLATION OF GROUT

A. Place grout for base plates in accordance with manufacturer's recommendations.

B. Grout below setting plates as soon as practicable to facilitate erection of steel and prior to removal of temporary bracing and guys. If leveling bolts or shims are used for erection grout shall be installed prior to addition of any column load.

C. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials and allow to cure. For proprietary grout materials, comply with manufacturer's instructions.

3.06 PREPARATION OF FORM SURFACES:

A. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

B. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating material manufacturer's directions. Do not allow excess form coating to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

3.07 CONCRETE PLACEMENT:

A. Preplacement Review: Footing bottoms are subject to review by the Geotechnical Engineer. Reinforcement and all concrete preparation work shall be subject to review by the Structural Engineer. Verify that reinforcing, ducts, anchors, seats, plates and other items cast into concrete are placed and securely held. Notify Engineer/Project Special Inspector 48 hours prior to scheduled placement and obtain approval or waiver of review prior to placement. Be sure that all debris and foreign matter is removed from forms.

B. Concrete shall be placed in the presence of an approved testing agency.

C. General: Comply with ACI 304, and as herein specified.

1. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation due to rehandling or flowing.

2. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients and in a manner which will assure that the required quality of the concrete is maintained.

3. Conveying equipment shall be approved and shall be of a size and design such that detectable setting of concrete shall not occur before adjacent concrete is placed. Conveying equipment shall be cleaned at the end of each operation or work day. Conveying equipment and operations shall conform to the following additional requirements:

a. Belt conveyors shall be horizontal or at a slope which will not cause excessive segregation or loss of ingredients. Concrete shall be protected against undue drying or rise in temperature. An arrangement shall be used at the discharge end to prevent apparent segregation. Mortar shall not be allowed to adhere to the return length of the belt. Long runs shall be discharged into a hopper or through a baffle.

b. Chutes shall be metal or metal-lined and shall have a slope not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20 feet long, and chutes not meeting the slope requirements may be used provided they discharge into a hopper before distribution.

c. Pumping or pneumatic conveying equipment shall be of suitable kind with adequate pumping capacity. Pneumatic placement shall be controlled so that segregation is not apparent in the discharged concrete.

d. Concrete shall not be conveyed through pipe made of aluminum alloy. Standby equipment shall be provided on the site.

e. Tined rakes are prohibited as a means of conveying fiber reinforced concrete.

4. Do not use reinforcement as bases for runways for concrete conveying equipment or other construction loads.

D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 18 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

1. Consolidate placed concrete by mechanical vibrating equipment. Hand-spading, rodding or tamping as the sole means for the consolidation of concrete will only be permitted with special permission from the Engineer. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.

2. Use vibrators designed to operate with vibratory equipment submerged in concrete, maintaining a speed of not less than 8000 impulses per minute and of sufficient amplitude to consolidate the concrete effectively. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine, generally at points 18 inches maximum apart. Place vibrators to rapidly penetrate placed layer and at least 6 inches into the preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion maintain the duration of vibration for the time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix, generally from 5 to 15 seconds. A spare vibrator shall be kept on the job site during all concrete placing operation.

E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

1. Consolidate concrete using internal vibrators during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations. Do not sprinkle water on plastic surface.

3. Maintain reinforcing in proper position during concrete placement operations.

4. Slab thicknesses indicated on the drawings are minimums. Provide sufficient concrete to account for structure deflection, subgrade fluctuations, and to obtain the specified slab elevation at the flatness and levelness indicated here within.

5. Finish: See “Monolithic Slab Finishes” in this specification for slab finish requirements.

F. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

1. When air temperature has fallen to or is expected to fall below 40 degrees F (4 degrees C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F (10 degrees C), and not more than 80 degrees F (27degrees C) at point of placement.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators.

4. All temporary heat, form insulation, insulated blankets, coverings, hay or other equipment and materials necessary to protect the concrete work from physical damage caused by frost , freezing action, or low temperature shall be provided prior to start of placing operations.

5. When the air temperature has fallen to or is expected to fall below 40 degrees F, provide adequate means to maintain the temperature in the area where concrete is being placed between 50 and 70 degrees F.

G. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F. Mixing water may be chilled, or chopped ice may be used to control the concrete temperature provided the water equivalent of the ice is calculated to the total amount of mixing water.

2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

3. Wet forms thoroughly before placing concrete.

4. Do not use retarding admixtures without the written acceptance by the Architect.

3.08 FINISH OF FORMED SURFACES:

A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This concrete surface shall have texture imparted by form facing material, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4 in. in height rubbed down or chipped off.

B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, damp-proofing, painting or other similar system. This as-cast concrete surface shall be obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

C. Grout Cleaned Finish: Provide grout cleaned finish to scheduled concrete surfaces which have received smooth form finish treatment. Combine one part Portland cement to 1-1/2 parts fine sand by volume and mix with water to consistency of thick paint. Proprietary additives may be used at Contractor's option. Blend standard Portland cement and white Portland cement, amounts determined by trial patches, so that final color of dry grout will closely match adjacent surfaces.

1. Thoroughly wet concrete surfaces and apply grout to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.

D. Related Unformed Surfaces: At tops of walls and grade beams, horizontal offset surfaces occurring adjacent to formed surfaces, strike-off, smooth and finish with a texture matching adjacent unformed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.09 FLOOR FLATNESS AND LEVELNESS

A. Floor flatness/levelness tolerances: Tolerances for various floor uses shall conform to the requirements set forth in ACI 117 and ACI 302 for “flat” floor profile.

1. Minimum Test Area Flatness/Levelness: F_F35/F_L25

2. Minimum Local F Number: F_F25/F_L15

B. Levelness criteria shall be applied to slabs-on-grade only.

C. Contractor shall measure floor finish within 72 hours after slab finishing and provide corrective measures for finishes not within tolerance. Corrective procedures shall be reviewed by the Architect prior to implementation.

3.10 MONOLITHIC SLAB FINISHES:

A. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds, and as otherwise indicated.

1. After placing slabs, plane surface to a tolerance not exceeding 1/2 in. in 10 ft. when tested with a 10-ft. straightedge. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set with stiff brushes, brooms or rakes.

B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, and as otherwise indicated.

C. Trowel Finish: Apply trowel finish to monolithic slab surfaces indicated, including slab surfaces to be covered with carpet, resilient flooring, paint or other thin-film finish coating system.

D. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.

E. Slab finishes for floor coverings not indicated or exposed to view in the final condition shall be coordinated with the Architect prior to slab placement.

F. Slab Joints: Where indicated, sawn slab contraction joints shall be “soft cut”, immediately after concrete surface is firm enough not to be torn or damaged by the blade.

3.11 CONCRETE CURING AND PROTECTION:

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with the requirements of ACI 308 as herein specified.

B. Curing Methods: Perform curing of concrete by moist curing, by moisture-retaining cover curing, by curing compound, and by combinations thereof, as herein specified unless noted otherwise. Curing shall commence as soon as concrete surfaces are sufficiently hard as to withstand surface damage.

C. Curing of Slabs-on Grade:

1. Slabs-on-grade shall be cured by wet curing methods unless otherwise noted.

2. Slabs-on-grade to receive floor coverings with moisture sensitive adhesives shall be cured by means of a moisture retaining covering. Coordinate curing with flooring adhesive manufacturer and flooring installer. Submit curing methods to Architect for review and approval.

3. Slab-on Grade with Barrier 1 Admixture shall be cured by means of a moisture retaining covering in accordance with recommendations of Barrier 1 Admixture Manufacturer.

D. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

E. Protection From Mechanical Injury: During the curing period and duration of construction, the concrete shall be protected from damaging mechanical disturbances, such as load stresses, heavy shock, and excessive vibration. All finished concrete surfaces shall be protected from damage by construction equipment, materials, or methods, by application of curing procedures, and by rain or running water. Self-supporting structures shall not be loaded in such a way as to overstress the concrete.

3.12 REMOVAL OF FORMS:

A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as joints, slabs and other structural elements, may not be removed in fewer than 14 days or until concrete has attained design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

C. Form facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and support.

3.13 REUSE OF FORMS:

A. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and latency, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

3.14 MISCELLANEOUS CONCRETE ITEMS:

A. Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

3.15 CONCRETE SURFACE REPAIRS:

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to the Architect.

1. Cut out honeycomb, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush coat the area to be patched with approved bonding agent. Place patching mortar after bonding compound has dried.

2. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, form tie holes, cracks, spalls, air bubbles, honeycomb, rock pockets, fins, and other projections on surface and stains and other discolorations that cannot be removed by cleaning.

3.16 QUALITY CONTROL TESTING DURING CONSTRUCTION:

A. Testing Agency/Project Special Inspector shall verify reinforcement, including foundation reinforcement and slab reinforcement (WWF or reinforcing bar). Agent shall verify WWF or reinforcement has been chair/placed with proper clearances.

B. The Owner shall employ a Testing Laboratory to inspect, sample and test the materials and the production of concrete and to submit test reports. Concrete testing shall be performed by technicians certified by the Maine Concrete Technician Certification Board and/or ACI Concrete Field Testing Technician Grade I.

C. Concrete shall be sampled and tested for quality control during placement. Quality control testing shall include the following, unless otherwise directed by the Architect.

D. See Submittals section for report requirements.

E. Sampling Fresh Concrete: ASTM C 172.

1. Slump: ASTM C143; One test for each set of compressive strength test specimens. Sample shall be taken from middle third of the load per ASTM C172. A slump test must be run prior to the incorporation of the CFP fibers per recommendations of ACI 544. A slump test must be run prior to and following the addition of a water reducer (superplasticizer) per recommendations of ACI 301.

2. Air Content: ASTM C231 "Pressure method for normal weight concrete." One test for each set of compressive strength specimens measured at point of discharge.

3. Concrete Temperature: Per ASTM C-1064; One test each time a set of compression test specimens are made.

4. Compression Test Specimen: ASTM C31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

a. An insulated Cure Box for specimen curing shall be supplied by Testing Agency for initial curing as defined in ACI C31.

b. Means of heating or cooling the Cure Box shall be provided by the Inspection Agency if required in order to maintain a temperature between 60 and 80 degrees F. Contractor shall provide an electrical source to the Testing Agency when required for temperature control.

c. A maximum-minimum thermometer shall be provided in the Cure Box by the Testing Agency to record the temperature range of the Cure Box during specimen curing. The Testing Agency shall record the maximum/minimum temperature of the Cure Box when transferring the specimens to the laboratory.

d. Test Specimens shall be moist cured.

e. Refer to ASTM C31 for additional requirements for Test Specimens.

5. Compressive Strength Tests: ASTM C39; one set for each 50 cu. yds. or fraction thereof, of each concrete class placed in any one day or for each 4,000 sq. ft. of surface area placed; 1 specimen tested at 7 days, 3 specimens tested at 28 days, 1 specimen retained in reserve for later testing if required.

6. Pumped concrete shall be tested at point of discharge per ACI 301.

F. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by the Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods, as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

END OF SECTION

SECTION 04 23 00

REINFORCED UNIT MASONRY

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Related Documents: The general provisions of the Contract, including General and Supplementary Conditions and General Requirements apply to work specified in this section.

B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK:

A. Reinforced masonry work includes all labor, materials, and equipment necessary and required for reinforced concrete masonry.

B. Extent of work to be performed and/or coordinated shown on the drawings and indicated in the specifications including, but not limited to masonry units, reinforcing, accessories, and grout.

C. Coordinate work with all other trades, including but not limited to concrete reinforcement and structural steel.

1.03 RELATED WORK

A. Cast-in-Place Concrete: Section 03 30 00

B. Expansion/Adhesive Anchors: Section 05 12 00

C. Embedded Items: Section 05 50 00

1.04 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of the latest edition of the following except where more stringent requirements are shown or specified:

1. ACI 530 “Building Code Requirements for Masonry Structures”.

2. ACI 530.1 “Specification for Masonry Structures”.

3. ACI “Detailing Manual for Reinforced Concrete” (SP-66).

4. CRSI “Manual of Standard Practice”

5. CRSI “Placing Reinforcing Bars”

6. "Code of Federal Regulations, Part 1926" per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).

B. Fire Performance Characteristics: Where indicated, provide materials and construction identical to those of assemblies whose fire resistance has been determined by ASTM E119, by a testing and inspecting organization, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

C. Materials and installed work may require testing and retesting, as directed by the Architect, at any time during progress of work. Allow free access to material stockpiles and facilities. Tests not specifically indicated to be done at Owner's expense, including retesting of rejected materials and installed work, shall be done at Contractor's expense.

1.05 SUBMITTALS:

A. Unless otherwise specified, submittals required in this section shall be submitted for review.

B. General Contractor shall submit a Submittal Schedule to the engineer within 30 days after they have received the Owner's Notice to Proceed.

C. All submittals shall be reviewed and returned to the Architect within 10 working days.

D. Incomplete submittals will not be reviewed.

E. Submittals not reviewed by the General Contractor prior to submission to the Engineer will not be reviewed. Include on the submittal statement or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in this Section and Division 1 have been complied with.

F. Engineer will review submittals a maximum of two review cycles as part of their normal services. If submittals are incomplete or otherwise unacceptable and re-submitted, General Contractor shall compensate Engineer for additional review cycles.

G. Product Data: Submit producer's or manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. Reinforcement certified mill reports covering chemical and physical properties and yield strength.

2. Masonry sizes, shapes, weights, densities, strengths, material composition, admixtures, colors, and manufacturing processes and procedures.

3. Mortar and/or Grout.

4. Accessories, Ties, and Joint Reinforcement

5. Admixtures.

6. Expansion/Adhesive Anchors.

H. Shop Drawings:

1. Shop Drawing Review: Electronic files of structural drawings will not be provided to the contractor for preparation of shop drawings. Submit shop drawings for fabrication, bending and placement of masonry reinforcement. Comply with ACI 315, showing bar schedules, stirrup and tie spacing, diagrams of bent bars, and arrangement of masonry reinforcement. Include special reinforcement required at openings through masonry. Include supplemental reinforcing and bar supports necessary to support reinforcing steel at proper location within masonry units and bond beams. Coordinate masonry reinforcement with concrete reinforcement.

2. Review of the shop drawings will be made for the size and arrangement of reinforcement. Conformance of the Shop Drawings to the Contract Drawings remains the responsibility of the General Contractor. Engineer's review in no way relieves the General Contractor of this responsibility. Submit one print and one reproducible. Print will be reviewed and a reproducible will be returned to Contractor for printing and distribution. Multiple copies will not be marked by Engineer.

3. Shop drawings will not be reviewed as partial submittals. A complete submittal shall be provided all items listed prior. Incomplete submittals will not be reviewed.

4. Mix designs: Submit all laboratory test reports and materials for each mix design listed within. Prepare mixes by the field experience method and/or trial mixtures per the requirements of chapter 5 of ACI 318. Proportioning by water cement ratio method will not be permitted.

5. Samples: Submit samples of materials as specified and as otherwise requested by Architect, including names, sources and descriptions.

6. Contraction/Construction Joints: Submit plan indicating proposed location of contraction and construction joints in masonry walls.

PART 2 - PRODUCTS

2.01 MASONRY MATERIALS

A. Load Bearing Units:

1. Hollow Load Bearing Units: ASTM C-90

a. Normal weight units

b. Minimum average net area compressive strength = 1,900 psi.

2. Solid Load Bearing Units: ASTM C-145

a. Normal weights units

b. Minimum average net area compressive strength = 1,900 psi

3. Nominal Dimensions:

    a. 12” units: 15-5/8”x11-5/8”x7-5/8” actual

    b. 8” units: 15-5/8x7-5/8”x7-5/8” actual

    c. Provide other nominal sizes as indicated on the Architectural Drawings or in related specifications.

    d. Construct lintels using reinforced concrete masonry units with grouted joints where shown. Lintels may be prefabricated for incorporation into work.

4. Single Source for Masonry Units: Obtain masonry units of uniform texture and color as specified from single manufacturer.

B. Fire Rating Requirements: Concrete masonry units shall have a U.L. listed fire rating of as indicated on the Architectural Drawings or in related specifications.

2.02 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I, except Type III may be used for cold weather construction. Provide natural color unless otherwise indicated.

B. Ready-Mixed Mortar: Cementitious materials, water, and aggregate complying with requirements specified here within, combined with set-controlling admixtures to produce ready-mixed mortar complying with ASTM C1142.

C. Aggregate for Mortar: ASTM C144, except for joints less than 1/4" thick, use aggregate graded with 100 percent passing No. 16 Sieve.

D. Aggregate for Grout: ASTM C 404.

E. Water: Clean and potable

F. Additives: None permitted.

2.03 MORTAR AND GROUT MIXES:

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

B. Mortar:

1. Job mixed mortar: Comply with ASTM C270, Proportion Specification for job mixed mortar
2. Ready-mixed mortar: ASTM C 1142
3. Masonry cement shall consist of portland-cement lime; mortar cement is acceptable, masonry cement is not acceptable.
4. Mortar shall be Type S, unless otherwise noted.
5. Mortar compressive stress when tested per ASTM C270 at 28-days shall be a minimum of 1,800 psi.
6. Single Source for Mortar Units: Obtain mortar materials of uniform texture and color as specified

from single manufacturer.

C. Grout:

1. Comply with ASTM C476.

2.04 MASONRY REINFORCEMENT:

A. General: Comply with this specification for placing reinforcement. Comply with Division 3, Section 03 30 00 for other requirements. Shop fabricate, whenever possible, reinforcing bars shown as bent or hooked.

B. Deformed Bars: Provide ASTM A615 Grade 60 deformed bars. Except provide ASTM A615 Grade 60s where field bending of reinforcement is required or intended, and ASTM A-706 Grade 60 for all conditions where welding of reinforcement is required.

C. Smooth Steel Wire: Provide ASTM A675 Grade 80 for all #2 bars of smooth, round stock, where noted on the drawings for use in columns or pilasters as ties.

2.05 MASONRY ACCESSORIES:

A. General: Provide accessories and other items as required herein and in related specification sections and as indicated on the drawings. For all types of accessories, hot-dip galvanize after fabrication with 1.5 oz. zinc coating, ASTM A-153, Class B2.

B. Prefabricated Joint Reinforcing: Provide continuous welded wire units prefabricated in straight lengths of not less than 10', with matching corner and tee units. Fabricate from cold-drawn steel wire complying with ASTM A-82, deformed continuous side rods with 3/16" diameter and plain 9 gage cross-rods, unit width of 1-1/2" less than thickness of wall/partition. Subject to compliance, provide products manufactured by "Dur-O-Wal", "AA Wire Products Company", or approved equal.

a. Single Width Walls: Truss type fabricated with single pair 3/16 gauge side rods and 9 gage continuous diagonal cross-rods.

C. Reinforcing Bar Positioners: Provide reinforcing bar supports/positioners for accurate positioning of horizontal and vertical reinforcement in walls, bond beams, and lintels. Fabricate from cold-drawn plain 9 gage steel wire complying with ASTM A-82. Subject to compliance, provide products manufactured by "Dur-O-Wal", "AA Wire Products Company", or approved equal.

D. Masonry Anchors and Ties: Provide straps, bars, bolts, rods, dovetail slots, metal fasteners indicated and other required accessory items of type, size, spacing, and at locations as required in related specification sections as identified on the drawings. Where masonry is indicated to be anchored to structural framework with flexible anchors, provide 2-piece anchors which will permit horizontal and vertical movement but will provide lateral restraint out of plane of wall.

E. HeliBar: 6mm, Stainless steel by Helifix

F. Related Masonry Items: Provide joint fillers, insulation, flashings, weepholes, and other items related to masonry work as required in related specification sections and as identified on the drawings.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. General: Build masonry construction as required in related specification sections and as identified on the drawings. Build masonry construction to full thickness shown, except, single-wythe walls to actual thickness of masonry units, using units of nominal thickness shown or specified.

B. Do not use frozen materials or materials mixed/coated with ice or frost. Do not build on frozen work. Remove and replace masonry work damaged by frost or freezing. Do not wet concrete masonry units (CMU).

C. Mortar: Provide full mortar coverage on all horizontal and vertical surfaces including face shells and webs.

D. Reinforced Concrete Masonry Unit Walls: Lay CMU wall units in running bond with vertical joints in each course centered on units above and below, unless otherwise indicated. Bond and interlock each course at corners and intersections. Saw tooth at interface with existing masonry. Use special shaped units where shown, and/or as required for corners, jambs, sash, control joints, lintels, bond beams, and other special conditions.

1. Maintain vertical continuity of core or cell cavities which are to be reinforced and grouted Keep cavities free of mortar. Solidly bed webs of masonry with mortar where adjacent to cells to be grouted.

2. Use special units or modify standard units, where horizontal reinforcing is shown to provide for continuous placement of reinforcing and grout. Place small mesh expanded metal lath or wire screening in joints under bond beam courses above cells of non-reinforced or non-grouted masonry elements or provide bond beam units with solid bottoms (lintel block units). Provide open end bond beam units where horizontal and vertical reinforcing pass through same units.

3.02 PLACING REINFORCEMENT:

A. General: Clean reinforcement of loose rust, mill scale, earth, ice, or other materials which will reduce bond to mortar or grout. Do not use reinforcement with kinks or bends not shown on drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes. Position reinforcement accurately at spacing shown on contract drawings.

B. Vertical Reinforcing: Support and secure vertical reinforcing against displacement. Vertical reinforcing shall be held in position at the top and bottom and at intervals not exceeding 192 bar diameters nor 10'-0" with a minimum clearance of ¼" from the face of the masonry and not less than one bar diameter or 1", whichever is greater, between adjacent bars.

1. For columns, piers, and pilasters, provide a clear distance between vertical bars as indicated, but not less than 1-1/2 times the nominal bar diameter or 1-1/2", whichever is greater. Provide lateral ties as indicated in the details.

2. All dowels shall be grouted even if the dowel is in a cell adjacent to the vertical reinforcing. Unless detailed otherwise on the drawings, dowels shall be the same size, number, and spacing as the vertical reinforcing. Provide lap length of dowels to vertical reinforcing equal to forty-eight (48) times nominal diameter of dowel for bars #5 and smaller, eighty (80) times nominal diameter of dowel for bars #6 - #7 (or utilize mechanical splices) unless indicated otherwise on the drawings. Provide dowels for columns and pilasters shall be installed using steel or wood templates to accurately position dowels as indicated on the drawings.

C. Horizontal Reinforcing: Support and secure horizontal reinforcing against displacement. Horizontal reinforcing shall be held in position at intervals not exceeding 100 bar diameters with a minimum clearance of ¼" from the face of the masonry and not less than one bar diameter or 1", whichever is greater, between adjacent bars. Provide laps or dowels around corners and across intersections as indicated on the drawings.

1. Horizontal reinforcing shall be placed in continuous bond beam or lintel block units and shall be solidly grouted in place. Horizontal reinforcement shall be CONTINUOUS THROUGH CONTROL JOINTS, but shall be DISCONTINOUS AT EXPANSION JOINTS. Horizontal reinforcement may be placed as masonry work progresses.

D. Splices: Splice reinforcement where shown or indicated on the drawings. Do not splice at other locations unless acceptable to the Structural Engineer. Minimum lap splice length shall be forty-eight (48) times nominal diameter of dowel for bars #5 and smaller, seventy-five (75) times nominal diameter of dowel for bars #6 - #7 (or utilize mechanical splices) unless indicated otherwise on the drawings. Stagger adjacent splices at least one full lap length so that no more than 25% of the number of bars are spliced at any one location. Where splicing at vertical bars or at dowels, provide full contact, lap ends of bars, and wire tie.

E. Reinforcing Bar Positioners: Provide where required and at required spacing to support and secure horizontal and vertical reinforcing against displacement and to accurately align and position splices in reinforcement.

F. Prefabricated Joint Reinforcing: Provide continuous horizontal joint reinforcing as shown/specified. Fully embed longitudinal side rods in mortar for entire length with minimum cover of 5/8" on exterior side of walls and ½" at other locations. Lap reinforcement a minimum of 6" at ends of units. Do not bridge control/expansion joints with joint reinforcing. Provide continuity at corners/wall intersections by the use of prefabricated "L" and "T" sections. Cut/bend units as directed by manufacturer for continuity at returns/offsets/column fireproofing, pipe enclosures, and/or special conditions. Space continuous horizontal reinforcing as follows:

1. For single-wythe walls, space 16" o.c. vertically, unless indicated.

G. Metal Ties: Where indicate, install in mortar joints as work progresses, with a minimum mortar cover of at least 5/8" on exterior faces and ½" on interior faces of masonry work.

H. Anchors: Install anchors for reinforced masonry elements to supporting structure as indicated on the drawings or required in the specifications.

3.03 FORMWORK AND SHORING:

A. General: Provide temporary formwork and/or shoring as required for temporary support of reinforced masonry work. Refer to Division 3, Section 03300 for additional requirements.

B. Removal: Formwork and/or shoring shall not be removed until the reinforced masonry element has cured sufficiently to carry its own weight and any other loads that may be placed on it during construction. It is the contractor's sole responsibility to determine formwork and shoring requirements and durations. In no case shall formwork or shores be removed before the following periods:

1. Lintels and beams: 10 days

2.	Masonry soffits:	7 days
3.	Columns and pilasters:	7 days

3.04 GROUTING

A. General: Grout mix and grout materials shall conform to ASTM C 476. Refer to Division 3, Section 03 30 00, “Cast-In-Place Concrete” for requirements.

1. Use “Fine Grout” for filling spaces less than 2” in either horizontal dimension. Where shown solid, use mortar for cavities less than ¾” in width or spaces less than 1-1/2” x 2” in horizontal dimensions.

2. Use “Coarse Grout” for filling cavities 2” or larger in width or cells 2”x3” or larger in horizontal dimensions.

3. Use “Concrete”, 3000 psi normal weight, for filling spaces ten (10) inches or larger in both horizontal dimensions.

B. Preparation: Prior to grouting, inspect and clean grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry, and other foreign materials. Clean and position reinforcing. Clean top surface of structural members to ensure bond. After final cleaning and inspection, close and brace clean out holes.
1. Do not grout until entire height of masonry to be grouted has attained sufficient strength to resist forces and pressures of grouting operation. Install shores and braces, if required, before beginning grouting.

C. Grouting Method: Grouting shall conform to low-lift or high-lift grouting, at Contractor’s option, subject to following requirements.

1. Low-Lift Grouting:

a. Low-Lift Grouting SHALL NOT exceed a pour of more than five (5) feet in height not the “Maximum Grout Pour Height” identified below.

b. Provide minimum clear dimension of two (2) inches and minimum clear area of eight (8) sq. inches in vertical cavities, cells, or cores to be grouted.

c. Place vertical reinforcement prior to laying of masonry units. Extend above elevation of maximum pour height as required to allow for splicing. Support and secure reinforcing as masonry is built.

d. Lay masonry to maximum pour height. Do not exceed five feet (5 ft.) or if bond beam occurs below five feet (5 ft.) height, stop pour or course below bond beam.

2. High-Lift Grouting:

a. High-Lift Grouting SHALL NOT exceed a pour of one story, but in no case more than twenty-four (24) feet in height nor the “Maximum Grout Pour Height” identified below.

b. High-Lift Grouting is NOT PERMITTED unless minimum cavity dimension exceeds three (3) inches and minimum cavity area exceeds ten (10) sq. inches.

c. Cleanout holes ARE REQUIRED where high-lift grouting will be employed. Provide cleanouts at the bottom course of masonry at each cell to be grouted for each pour. For solid grouted masonry space cleanouts at 32 in. o.c.

d. Cleanout holes shall have minimum width of 3 inches and a minimum height of 6 inches. After cleaning, close cleanouts and brace closures to resist hydrostatic grout pressure.

e. Prior to grouting, construct masonry elements and place and secure reinforcing to full height of maximum grout pour. Place horizontal bond beam reinforcing as masonry units are laid.

f. Where lateral tie reinforcing is shown, embed in mortar joints at vertical spacing indicated as units are laid. Where lateral ties wrap vertical reinforcing, embed additional lateral tie reinforcing in mortar joints to resist hydrostatic rupture of masonry face shells. Provide not less than No. 2 bars or 8 gage wire ties spaced at 16 in. o.c. for members with side dimensions of 20 in. or less and at 8 in. o.c. where side dimensions exceed 20 in.

D. Maximum Grout Pour Height: In no case shall total grout pour height exceed the following heights regardless of grouting method used.

Grout Type	Max. Height	Min. Cavity	Min. Cell
Fine	1’-0”	¾”	1-1/2” x 2”
Fine	5’-0”	2”	2” x 3”
Fine	12’-0”	2-1/2”	2-1/2” x 3”
Fine	24’-0”	3”	3” x 3”
Coarse	1’-0”	2”	2” x 3”
Coarse	5’-0”	2”	2-1/2” x 3”
Coarse	12’-0”	2-1/2”	3” x 3”
Coarse	24’-0”	3”	3” x 4”

Min. Cavity applies to grouting between wythes of cavity walls. Min. Cell applies to grouting of masonry cells where dimension shown equals grout space width minus horizontal reinforcing bar diameter.

E. Grout Placement: Limit grout pours to sections which can be completed in one working day with not more than one (1) hour of interruption of pouring operation. Allow not less than thirty (30) minutes, nor more than one (1) hour between lifts of given pour. Rod or vibrate each lift during pouring operation.

1. Place grout in lifts not to exceed a maximum height of five (5) feet each, regardless of the maximum height of the pour.

2. Place grout in lintels and beams over openings in one continuous pour.

3. Pour grout using chute or container with spout. Terminate pour 1-1/2” below top course to form key for next pour.

4. Where bond beams occur, terminate grouting of vertical cells 1-1/2" below bond beam course. After placing horizontal reinforcing and prior to filling vertical cells above bond beam, pour grout into bond beam and strike off flush with top of bond beam course.

F. Lintels: Install loose lintels of steel and other materials where shown. Provide masonry lintels where shown and wherever openings of more than 1'-0" are shown without structural steel or other supporting lintels. Provide formed-in-place masonry lintels. Provide minimum bearing at each jamb, of 4" at openings less than 4'-0" wide and 8' for wider openings.

G. Other Items: Provide vertical expansion, control and isolation joints, and provide concealed flashing and weep holes in masonry where shown. Build-in related masonry accessory items as the masonry work progresses. Refer to Section 04 20 00, "Unit Masonry" and related specifications sections and to drawings.

1. Comply with requirements for repair, pointing and cleaning in accordance with Section 04 20 00, "Unit Masonry".

H. Construction Tolerances: Variations in reinforced masonry work from plumb and level, locations of built-in or embedded items, and other required tolerances shall be as required in related specification sections or as identified on the drawings.

I. Protection of Work: Do not apply uniform loading for at least 12 hours after building masonry walls or columns. Do not apply concentrated loads for at least 3 days after building masonry walls, lintels, beams, columns, pilasters, and piers.

J. Responsibility for Errors: Contractor shall bear all costs associated with corrective work resulting from errors or poor workmanship, including costs of architectural and engineering services associated with required correction.

3.05 QUALITY CONTROL TESTING DURING CONSTRUCTION:

A. Testing Agency/Project Special Inspector shall verify reinforcement, including all masonry reinforcement. Agent shall verify reinforcement has been placed with proper clearances.

B. The Owner shall employ a Testing Laboratory to inspect, sample and test the materials and the production of concrete and to submit test reports. Masonry testing shall be performed by technicians certified by the Maine Concrete Technician Certification Board and/or ACI Concrete Field Testing Technician Grade I.

1. Verify that grouting operations are performed and grout is placed and consolidated in accordance with the specifications.

2. Verify that contractor is using approved admixtures for grout.

3. Sample Fresh Grout: ASTM C-172, except modified for slump to comply with ASTM C-94.

a. Slump: ASTM C-143; one (1) test for each grout load at point of discharge; one (1) test for each set of compressive strength test specimens.

b. Air Content: ASTM C-173; volumetric method or ASTM C-231

pressure method for normal weight concrete; one (1) for each of compressive strength test specimens.

c. Grout Temperature; For each load, at time of arrival, at point of discharge test hourly when air temperature is 40 degree F and above; and each time a set of compression test specimens are made.

d. Compression Test Specimens: ASTM C-31; one (1) set of four (4) standard cylinders for each truck or mixer load of grout taken when load is 50% discharged from truck, unless other wise directed. Mold/store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

e. Refer to Section 03300, “Cast-In-Place Concrete” for remaining test requirements. Substitute therein the work “grout” for the word “concrete”.

END OF SECTION

SECTION 05 12 00

STRUCTURAL STEEL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The drawings and general conditions of the contract including General and Supplementary Conditions and other Division 1 Specification sections apply to work of this section.

B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK:

A. Extent of structural steel work is shown on drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.

B. Structural steel is that work defined in AISC “Code of Standard Practice” and as otherwise shown on drawings.

1.03 RELATED WORK

1. Section 05 20 00 – Open Web Steel Joists

2. Section 05 30 00 – Metal Deck

3. Section 05 50 00 - Metal Fabrications

1.04 QUALITY ASSURANCE:

A. Codes and Standards: Comply with latest provisions of the following, except as otherwise indicated:

1. AISC “Code of Standard Practice for Steel Buildings and Bridges”, Latest Edition.

a. Exclude the word “structural” in reference to the “Design Drawings” in section 3.1 of the Code.

2. AISC “Specification for Structural Steel Buildings”, including “Commentary” and Supplements issued thereto.

3. AISC "*Specifications for Structural Joints using ASTM A 325 or A 490 Bolts"* approved by the Research Council on Structural Connections of the Engineering Foundation.

4. AISC 341, "Seismic Provisions for Steel Buildings".

5. AWS D1.1 - "Structural Welding Code" - Steel.

6. AWS D1.3 - "Structural Welding Code" - Sheet Steel.

7. ASTM A6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use."

8. "Code of Federal Regulations, Part 1926" per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).

B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS D1.1 "Standard Qualification Procedure."

1. Provide certification that welders to be employed in work have satisfactorily passed AWS D1.1 qualification tests and maintained a current certification. Current certification and/or continuity log shall be submitted and be available in the field.

2. If re-certification of welders is required, retesting will be the Contractor's responsibility.

C. Fabricator Qualifications:

1. Fabricator must be a member of the American Institute of Steel Construction (AISC), be certified for BU – Certified Building Fabricator. Fabricator shall be certified at time of bidding and for duration of project.

1.05 SUBMITTALS

A. Unless otherwise specified, submittals required in this section shall be submitted for review. Submittals shall be prepared and submitted in accordance with this section and Division 1.

B. General Contractor shall submit a Submittal Schedule to the engineer within 30 days after they have received the Owner's Notice to Proceed.

C. All submittals shall be reviewed and returned to the Architect within 10 working days.

D. INCOMPLETE SUBMITTALS WILL NOT BE REVIEWED.

E. Submittals not reviewed by the General Contractor prior to submission to the Engineer will not be reviewed. Include on the submittal statement or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in Division 1 have been complied with.

F. Engineer will review submittals a maximum of two review cycles as part of their normal services. If submittals are incomplete or otherwise unacceptable and re-submitted, General Contractor shall compensate Engineer for additional review cycles.

G. Hardcopy Submittals: Submit three prints. Prints will be reviewed by the Engineer, and then the Architect. One marked print will be returned to Contractor for printing and distribution. Multiple copies will not be marked by the Engineer.

H. Electronic Submittals:

1. Contractor shall include in the submittal schedule an indication of submittals that are intended to be submitted electronically. Upon receipt of the submittal schedule, the Engineer reserves the right to indicate submittals that will not be accepted electronically. Paper copies of such submittals shall be furnished as referenced in this specification.

2. The Engineer reserves the right to require paper copies of submittals that are received electronically. Provide Engineer one (1) paper copies in addition to the electronic submittal. Paper copy will be retained and electronic copy will be returned. Review cycle for such submittals shall not commence until such time that the paper copies are received.

3. Electronic Submittals shall be submitted in Protected Document Format (PDF) compatible with Bluebeam version 12 or later. Electronic files shall not be broken into smaller individual files. File sizes too large to process email or within a file transfer protocol (FTP) site shall be provided on a CD.

4. The submission of submittals electronically does not relieve the contractor of their responsibility to review the submittal prior to transmission to the Engineer. Electronic Submittals shall include contractor comments, and a statement and/or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in this Section and Division 1 have been complied with. Electronic submittals without the Contractor's approval will be rejected and returned.

5. The Engineer assumes no responsibility for the printed reproduction of submittals reviewed electronically, transmission errors or returned electronic submittals that become corrupted or are otherwise not accessible by the Contractor's or Subcontractor's computer hardware and/or software.

I. Product Data: Submit producer's or manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. Structural steel certified mill reports for each grade of steel covering chemical and physical properties and yield strengths.

2. High-strength bolts (each type), including nuts and washers.

3. Structural steel primer paint (where applicable).

4. Structural steel top coat paint (where applicable). (Refer to Section 09 90 00.)

5. AWS D1.1 Welder certifications.

6. Expansion/Adhesive Anchors (coordinate with section 03 30 00).

J. Fabricator's Quality Control Procedures: Fabricator shall submit their written procedural and quality control manuals, and evidence of periodic auditing of fabrication practices by an approved inspection Agency.

K. Fabricator's Certificate of Compliance: At completion of fabrication, fabricator shall submit a certificate of compliance stating that the work was performed in accordance with the construction documents.

L. Shop Drawings:

1. Shop Drawing Review: Electronic files of structural drawings will not be provided to the contractor for preparation of shop drawings. Reproduction of any portion of the Construction Documents for use as Shop drawings and/or Erection Drawings is prohibited. Shop drawings and/or Erection drawings created from reproduced Construction Documents will be returned without review.

    a. Review of the shop drawings will be made for the size and arrangement of the members and strength of the connections. Conformance of the Shop Drawings to the Contract Drawings remains the responsibility of the General Contractor. Engineer's review in no way relieves the General Contractor of this responsibility.

    b. Shop drawings will not be reviewed as partial submittals. A complete submittal shall be provided and shall include; erection and piece drawings indicating all members, braced frames, moment frames and connections. Incomplete submittals will not be reviewed.

2. Connection Design: Submit design calculations prepared and stamped by a Professional Engineer registered in the State of Maine for all beam and column connections not tabulated in the AISC "Manual of Steel Construction" (ASD or LRFD). Submit design for all building braced frames and moment frames as indicated on design drawings. Connection designs shall be submitted prior to or with the Shop Drawing Submittal.

    a. Fabricator and Erector are responsible to provide connections that meet the requirements of AISC standards. All shop and field welds, bolts, plates and miscellaneous components required to provide complete connection assemblies shall be provided. Connection force have been provided on the drawings. All connections shall have a minimum of 2 bolts rows in the line of force and no connection capacity shall be less than 10 kip (unfactored).

    b. Braced frame connections: A brace force has been provided on the drawings. Brace frame connection shall be dsigned utilizing the Uniform

Force Method, with a connection geometry that does not induce a moment on the connected beam or column.

c. Moment frame connections: A moment force has been provided on the drawings. Where permitted, bolted moment connections shall not reduce the flange area of the beam by more than 15 percent.

d. To the greatest extent possible and where required herewithin, welds shall be designed and detailed to be installed downhand.

3. Test Reports: Submit copies of reports of tests conducted on shop and field bolted and welded connections. Include data on type(s) of test conducted and test results.

1.06 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials to site at such intervals to insure uninterrupted progress of work.

B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place, in ample time to not delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

D. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Steel materials shall be stored in a manner to avoid ponding of precipitation on members. Repair or replace damaged materials or structures as directed.

PART 2 PRODUCTS

2.01 MATERIALS:

A. Structural Steel Shapes, Plates and Bars (U.N.O): ASTM A 36 minimum, higher strength steel is acceptable.

B. Structural Steel Hot Rolled Wide Flange Shapes: ASTM A 992 Grade 50 (ASTM A572 Grade 50 with special requirements per AISC Technical Bulletin #3, dated March 1997)

C. Steel Tube: ASTM A 500, Grade B, Fy = 46 ksi.

D. Steel Pipe: ASTM A 53, Grade B.

E. Anchor Bolts: ASTM F1554, Grade 36 weldable steel, unless noted otherwise on drawings. Anchor rods that are to be exposed to weather, located in unheated enclosures, or in contact with pressure treated lumber shall be hot dipped galvanized. All anchor bolts shall be headed or double nutted. “J” or “L” type anchor bolts are not permitted. Unless otherwise noted, specified embedment it to top face of head or nut.

F. Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular low-carbon steel bolts and nuts. Provide hexagonal heads and nuts for all connections.

G. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:

1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A325 or ASTM A490. Refer to drawings for diameter.

2. Direct tension indicator washers or bolts may be used at Contractor's option.

H. Electrodes for Welding:

1. Minimum 70 ksi electrodes. Filler material shall meet the grouping requirements per AWS D1.1 Table 3.1 for matching strength of connected materials.

2. All filler metal used welding shall meet the following Charpy V-Notch (CVN) requirements.

a. 20 ft-lb at 0 degrees Fahrenheit unless noted otherwise.

b. 20 ft-lb at -20 degrees Fahrenheit and 40 ft-lb at 70 degrees Fahrenheit at all complete joint penetration (CJP) groove welds.

I. Structural Steel Coatings shall be as specified in the Structural Steel Coatings section of this specification, and as specified in Division 9.

J. Steel Coatings for Exterior Exposed Steel: Except where indicated to be primed and painted, Hot Dipped Galvanized per ASTM A123/A123M (latest edition). Galvanizing shall be applied in a manner to provide Class C faying surfaces for slip critical connections. See Structural Steel Coatings section for additional requirements for galvanizing and painting.

K. Non Shrink Cement-Based Grout: See Section 03 30 00

L. Drilled Anchors: Expansion and adhesive by HILTI (or approved submitted equal)

1. Expansion: Hilti Kwik bolt 3

2. Adhesive into concrete: Hilti Hit Hy-200

3. Adhesive into masonry: Hilti Hit Hy-70

2.02 FABRICATION:

A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings.

1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs and other defects.

B. Connections: Weld or bolt shop connections, as indicated.

1. Provide field bolted connections, except where welded connections or other connections are indicated.

2. Provide high-strength threaded fasteners for principal bolted connections, except where unfinished bolts are indicated.

C. High-Strength Bolted Connection: Install high-strength threaded fasteners in accordance with AISC “Specification for Structural Joints using ASTM A 325 or A 490 Bolts”. Unless otherwise indicated, all bolted connections are to be tightened to the snug tight condition as defined by AISC.

D. Welded Construction: Comply with AWS Codes for procedures, appearance and quality of welds, and methods used in correcting welding work.

E. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings.

F. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

G. Fabricator, Erector and General Contractor shall coordinate safety requirements for the project, in accordance with OSHA Part 1926. Provide all necessary pieces and fabrications as required to safely erect and access the structure for the duration of project construction.

H. Camber, if any, is indicated on the drawings. Camber indicated is the required camber at time of erection. Contractor shall survey camber prior to placing metal deck.

2.03 STRUCTURAL STEEL COATINGS

A. Coordinate coating requirements with the Architect, and with Division 9 of the specifications.

B. To the greatest extent possible, structural steel coatings shall be shop applied.

C. Coordinate steel markings with coating system to eliminate “bleed through” on steel permanently exposed to view.

D. Provide venting/drainage holes in closed tubular members to be hot-dipped galvanized. Holes shall be provided in a location hidden from view in the final condition and in a

manner that will not reduce the strength of the member. Hole locations shall be clearly indicated on the Shop Drawings and are subject to review by the Architect.

E. Follow manufacturer's installation and safety instructions when applying coatings. Adhere to recoat time recommendations set forth by manufacturer.

F. General: Shop priming of structural steel is not required for heated, interior steel not exposed to view unless noted otherwise.

G. Steel which is to receive spray-on fireproofing shall not to be primed or painted, unless specified by the Architect.

H. Coatings: All exterior steel and/or steel permanently exposed to view shall receive a coating. Unless noted otherwise, refer to Division 9 specifications for products and surface preparation requirements.

I. Unheated structural steel to be enclosed with architectural finishes, including but not by limitation, canopy members and/or roof pop-up members shall be primed with rust inhibitive mio-zinc filled primer, Tnemec Series 394 unless noted otherwise. Follow manufacturer's instructions for surface preparation and application. Substitution shall be equal to the above specified products, and shall be submitted for review.

J. Steel Embedded in Concrete/Below Grade: Steel which is embedded in concrete, below grade/slab level, or as otherwise indicated on the drawings, shall be field painted with cold-applied asphalt emulsion complying with ASTM D 1187. Paint embedded areas only. Do not paint surfaces which are to be welded until welding is complete.

K. Field Touch-up: Touch-up all paint and galvanizing damage, including but not by limitation, damage caused during shipping, erection, construction damage, and field welded steel. See Division 9 specifications for additional requirements.

PART 3 EXECUTION

3.01 ERECTION:

A. General: Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

B. Erection Procedures: Comply with "Code of Federal Regulations, Part 1926" per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).

C. Surveys: Employ a Registered Land Surveyor to verify elevations of concrete bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Architect and Structural Engineer. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been approved by Structural Engineer of Record. Additional surveys required to verify out-of-alignment work and/or corrective work shall be performed at the contractor's expense.

D. Temporary Shoring and Bracing: This is the sole responsibility of the Contractor. Provide temporary shoring and bracing members with connections of sufficient strength to support imposed loads. Remove temporary members and connections when all permanent members are in place, and all final connections are made, including the floor and roof diaphragms. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds. Comply with OSHA Standard referenced previous. Retain the services of a Specialty Structural Engineer (Not the Engineer of Record) to design specialty shoring and bracing.

E. Anchor Bolts: Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.

1. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.

2. Welding to anchor bolts for corrective measures is strictly prohibited without prior written approval from the Engineer.

F. Setting Plates and Base Plates:

1. Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations. Refer to division 3 of the project Specifications for anchor bolt installation requirements in concrete.

2. Clean concrete bearing surfaces of bond-reducing materials. Clean bottom surface of setting and bearing plates.

3. Set loose and attached base plates for structural members on wedges or shims until fully grouted support is provided. If shown on drawings, anchor bolt nuts under base plates are not intended for erection support of base plate or column.

4. Pack non-shrink grout solidly between bearing surfaces and bases or leveling plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure. For proprietary grout materials, comply with manufacturer's instructions.

G. When installing expansion bolts or adhesive anchors, the contractor shall take measures to avoid drilling or cutting any existing reinforcement or damaging adjacent concrete. Holes shall be blown clean with compressed air and/or cleaned per manufacturer's recommendations prior to the installation of anchors.

H. Field Assembly:

1. Set structural frames accurately to lines and elevations indicated.

2. Align, adjust, level and plumb members of complete frame in to the tolerances indicated in the AISC Code of Standard Practice and in accordance with OSHA regulations.

3. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly.

4. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

5. Splice members only where indicated and accepted on shop drawings.

6. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

I. Tolerances: Erection tolerances shall meet the “Code of Standard Practice” except as noted. Cumulative tolerances of framing elements shall not exceed the available tolerances of façade support systems to ensure and provide a plumb façade face.

J. Coat columns, base plates, and brace elements encased in concrete and/or below grade with cold-applied asphalt emulsion. Coordinate coating with concrete work.

K. Erection bolts: Remove erection bolts. On exposed welded construction and at all braced frame members fill holes with plug welds and grind smooth at exposed surface.

L. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members which are not under stress, as accepted by the Engineer of Record. Finish gas-cut sections equal to a sheared appearance when permitted.

M. Coating Damage: Touch up shop applied paint or galvanizing whenever damaged or bare. See “Coatings” sections for additional requirements.

N. Field Cut Beam Web Penetrations:

1. Field cut beam web penetrations are not permitted without written approval from the Structural Engineer.

2. Gas cutting torches are not permissible for cutting beam web penetrations without written approval from the Structural Engineer.

3. Beams with field cut beam web penetrations may require reinforcement, subject to the evaluation by the Structural Engineer.

4. The evaluation of field cut web penetrations by the Structural Engineers for Design-Build Subcontractors, including but not by limitation, Mechanical, Electrical, Plumbing and Sprinkler Subcontractors shall be compensated by the General Contractor or Design-Build Subcontractor.

5. The cost of executing field cut web penetrations and the associated beam reinforcement for Design-Build Subcontractors, including but not by limitation, Mechanical, Electrical, Plumbing and Sprinkler Subcontractors shall be paid for by the General Contractor or Design-Build Subcontractor.

6. Field cut beam web penetrations may not be permitted in certain locations, subject to the evaluation by the Structural Engineer.

O. Welders shall have current evidence of passing and maintaining the AWS D1.1 Qualifications test available in the field.

P. Welding electrodes, welding process, minimum preheat and interpass temperatures shall be in accordance with AISC and AWS specifications. Any structural steel damaged in welding shall be replaced.

Q. Field Welded Moment Connections:

1. Backing materials for top and bottom flanges for field welded moment connections shall be removed, backgouge the weld root, and apply a reinforcing fillet weld.

2. Where top flange steel backing materials are utilized, the backing may be left in place. In this case, the backing material shall be welded with a reinforcing fillet weld.

3.02 QUALITY CONTROL:

A. General: Contractor is responsible for maintaining quality control in the field and for providing a structure that is in strict compliance with the Contract Documents.

1. Required inspection and testing services are intended to assist the Contractor in complying with the Contract Documents. These specified services, however, do not relieve the Contractor of his responsibility for compliance, nor are they intended to limit the Contractor's quality control efforts in the field.

B. Testing: Owner shall engage an Independent Testing Agency to inspect all high-strength bolted and welded connections, to perform tests and prepare reports of their findings. All

connections must pass these inspections prior to the installation of subsequent work which they support.

1. Testing agency shall conduct tests and state in each report which specific connections were examined or tested, whether the connections comply with requirements, and specifically state any deviations therefrom.

2. Contractor shall provide access for testing agency to places where structural steel work is being fabricated, produced or erected so that required inspection and testing can be accomplished. Testing agency may inspect structural steel at plant before shipment. The Engineer, however, reserves the right, at any time before final acceptance, to reject material not complying with specified requirements.

C. Inspection Requirements (to be performed by the Independent Testing Agency):

1. Bolted Connections: Inspect all bolted connections in accordance with procedures outlined in the AISC "Specification for Structural Joints using ASTM A325 or A490 Bolts.

2. Snug Tight Bolted Connections:

   a. The inspector shall monitor the installation of bolts to determine that all plies of connected material have been drawn together and that the selected procedure is used to tighten all bolts.

   b. If the inspector does not monitor the installation of bolts, he shall visually inspect the connection to determine that all plies of connected material have been drawn together and conduct tests on a sampling connection bolts to determine if they have been tightened to the snug tight condition. The test sample shall consist of 10% of the bolts in the connection, but not less than two bolts, selected at random. If more than 10% of the tested bolts fail the initial inspection, the engineer reserves the right to increase the number of bolts tested.

3. Slip Critical Bolted Connections:

   a. The inspector shall monitor the calibration of torquing equipment and the installation of bolts to determine that all plies of connected material have been drawn together and that the selected procedure is used to tighten all bolts.

   b. If the inspector does not monitor the calibration or installation procedures, he shall test all bolts in the affected connection using a manual torque wrench to assure that the required pretension has been reached.

4. Field Welded Connections: inspect and test during fabrication of structural steel assemblies, and during erection of structural steel all welded connections in accordance with procedures outline in AWS D1.1. Record types and location of defects found in work. Record work required and performed to correct deficiencies.

a. Certify welders and conduct inspections and tests as required. Submit welder certifications to Engineer of Record. Perform visual inspection of all welds. Primary and secondary welds, including fillet welds, full penetration welds, and deck puddle welds, applied in the field and/or shop, shall be visually inspected.

b. Welds deemed questionable by visual inspection shall receive non-destructive testing. In addition, all partial and full penetration welds, and any other welds indicated on the drawings are to receive non-destructive testing. Non-destructive testing methods include the following:

1. Radiographic Inspection (RT): ASTM E 94 and ASTM E 142; minimum quality level "2-2T".

2. Ultrasonic Inspection (UT): ASTM E 164.

3. Magnetic Particle (MT) inspection procedures may be utilized at the inspectors discretion in addition to RT or UT inspection. MT procedures shall not replace RT or UT procedures without permission from the Structural Engineer.

c. All welds deemed unacceptable shall be repaired and retested at the Contractor's expense.

D. Inspector shall verify that all ferrules are removed when applicable and that metal deck is free of debris prior to concrete placement.

E. Testing and inspection reports shall be submitted to the Owner, Architect and Engineer within 48 hours of completion of each test or inspection.

F. Nonconforming Work: Contractor shall be responsible for correcting deficiencies in structural steel work which inspections laboratory test reports have indicated to be not in compliance with requirements. Additional tests and/or surveys shall be performed, at the Contractor's expense, as may be necessary to show compliance of corrected work. Any costs associated with the Engineer's review and disposition of faulty works shall be borne by the Contractor.

END OF SECTION

SECTION 05 20 00

OPEN WEB STEEL JOISTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. The drawings and general conditions of the contract including General and Supplementary Conditions and other Division 1 Specification sections apply to work of this section.

B. Examine all other sections of the Specifications for requirements which affect work of this section whether or not such work is specifically mentioned in this section.

C. Coordinate work with that of all trades affecting or affected by work of this section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK:

A. Extent of steel joists is shown on drawings, including basic layout and type of joists required.

B. Related work specified elsewhere:

1. Section 05 12 00 - Structural Steel

2. Section 05 30 00 - Metal Decking

3. Section 05 50 00 - Metal Fabrications

1.03 QUALITY ASSURANCE:

A. Codes and Standards:

1. Steel Joist Institute (SJI) Standard Specifications, Load Tables and Weight Tables-latest revisions-for:

a. K-Series Open Web Steel Joists as designated on the Contract Drawings.

b. LH/DLH Series Open Web Long Span Steel Joists as designated on the Contract Drawings.

2. Steel Joist Institute (SJI) Recommended Code of Standard Practice for Steel Joists and Joist Girders, latest revision.

3. AWS D1.1 "Structural Welding Code" – Steel

4. AWS D1.3 "Structural Welding Code" - Sheet Steel

5. “Code of Federal Regulations, Part 1926” per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).

B. Qualification for Welding Work: Qualify welding processes and welding operators in accordance with AWS D1.1 "Standard Qualification Procedure".

1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.

2. If recertification of welders is required, retesting will be the Contractor's responsibility.

1.04 SUBMITTALS:

A. Unless otherwise specified, submittals required in this section shall be submitted for review. Submittals shall be prepared and submitted in accordance with this section and Division 1.

B. General Contractor shall submit a Submittal Schedule to the engineer within 30 days after they have received the Owner’s Notice to Proceed.

C. All submittals shall be reviewed and returned to the Architect within 10 working days.

D. Incomplete submittals will not be reviewed.

E. Submittals not reviewed by the General Contractor prior to submission to the Engineer will not be reviewed. Include on the submittal statement or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in Division 1 have been complied with.

F. Engineer will review submittals a maximum of two review cycles as part of their normal services. If submittals are incomplete or otherwise unacceptable and re-submitted, General Contractor shall compensate Engineer for additional review cycles.

G. Hardcopy Submittals: Submit three prints. Prints will be reviewed by the Engineer, and then the Architect. One marked print will be returned to Contractor for printing and distribution. Multiple copies will not be marked by the Engineer.

H. Electronic Submittals:

1. Contractor shall include in the submittal schedule an indication of submittals that are intended to be submitted electronically. Upon receipt of the submittal schedule, the Engineer reserves the right to indicate submittals that will not be accepted electronically. Paper copies of such submittals shall be furnished as referenced in this specification.

2. The Engineer reserves the right to require paper copies of submittals that are received electronically. Provide Engineer one (1) paper copies in addition to the electronic submittal. Paper copy will be retained and electronic copy will be returned. Review cycle for such submittals shall not commence until such time that the paper copies are received.

3. Electronic Submittals shall be submitted in Protected Document Format (PDF) compatible with Bluebeam version 12 or later. Electronic files shall not be broken into smaller individual files. File sizes too large to process email or within a file transfer protocol (FTP) site shall be provided on a CD.

4. The submission of submittals electronically does not relieve the contractor of their responsibility to review the submittal prior to transmission to the Engineer. Electronic Submittals shall include contractor comments, and a statement and/or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in this Section and Division 1 have been complied with. Electronic submittals without the Contractor's approval will be rejected and returned.

5. The Engineer assumes no responsibility for the printed reproduction of submittals reviewed electronically, transmission errors or returned electronic submittals that become corrupted or are otherwise not accessible by the Contractor's or Subcontractor's computer hardware and/or software.

I. Product Data: Submit manufacturer's specifications and installation instructions for each type of joist and accessories. Include manufacturer's certification that joists comply with SJI Standard Specifications. Product data shall include:

1. Joist steel component certified mill reports for each grade of steel covering chemical and physical properties and yield strengths.

2. Steel joist primer paint.

3. Welder certifications

J. Shop Drawings:

1. Shop Drawing Review: Electronic files of structural drawings will not be provided to the contractor for preparation of shop drawings. Reproduction of any portion of the Construction Documents for use as Shop drawings and/or Erection Drawings is prohibited. Shop drawings and/or Erection drawings created from reproduced Construction Documents will be returned without review.

a. Review of the shop drawings will be made for the size and arrangement of the members and strength of the connections. Conformance of the Shop Drawings to the Contract Drawings remains the responsibility of the General Contractor. Engineer's review in no way relieves the General Contractor of this responsibility.

b. Shop drawings will not be reviewed as partial submittals. A complete submittal shall be provided and shall include; erection and piece drawings indicating all joist members, bridging, connections and accessories. Incomplete submittals will not be reviewed.

2. Design

a. Unless noted otherwise, steel joists shall be designed to support the uniformly distributed loads per the "Standard Load Tables" by the Steel Joist Institute. An allowance for MEP equipment and architectural component loads has been included in the uniformly distributed design loads. The joist design shall allow a 150 pound concentrated hanger load be applied at any location along either the top or bottom chord of the joists that is part of the MEP equipment and architectural component allowance, without additional reinforcement.

b. Calculations for SP joists: Submit design calculations for special steel joists indicated on Contract Drawings by SP designation or as otherwise noted. Submit calculations stamped by a Registered Professional Engineer licensed to practice in the State of Maine. Design joists for the loads indicated on the Contract Drawings with a vertical deflection due to live load not exceeding: 1/360 of the span for floor joists, 1/360 of the span for roof joists where plaster ceiling is attached or suspended, and 1/240 of the span for all other roof joists. Concentrated loads applied to SP joists are to be applied as Live Loads unless otherwise indicated.

3. Evidence of in-plant inspections: Per SJI requirements, each manufacturer shall verify his ability to manufacturer steel joists through periodic in-plant inspections. Inspections shall be performed by an independent testing agency. Submit evidence of participation in SJI in-plant inspections program.

4. Test Reports: Submit copies of reports of tests conducted on shop and field bolted and welded connections. Include data on type(s) of test conducted and test results.

1.05 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials to site at such intervals to insure uninterrupted progress of work.

B. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

C. Deliver, store and handle steel joists as recommended in SJI Standard Specifications and SJI Technical Digest #9 "Handling and Erection of Steel Joists and Joist Girders". Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Handle and store joists in a manner to avoid deforming members and to avoid excessive stresses. Protect joist members and packaged materials from corrosion and deterioration.

PART 2 PRODUCTS

2.01 MATERIALS:

A. Steel: Comply with SJI Standard Specifications.

B. Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular hexagon type, low carbon steel

C. High-Strength Bolts and Nuts: ASTM A325, Type I, heavy hex structural bolts, heavy hex nuts and hardened steel washers.

D. Steel Primer Paint: Manufacturer's standard shop paint conforming to Steel Structures Painting Council Specification: SSPC-Paint 15 “Steel Joist Shop Primer”, or a shop paint which meets the minimum performance requirements of SSPC-Paint 15.

2.02 FABRICATION:

A. General: Fabricate steel joists in accordance with SJI Standard Specifications.

B. Holes in Chord Members: Provide holes in chord members where shown for securing other work to steel joists; deduct area of holes from the area of chord when calculating strength of member.

C. Openings in Web: Coordinate openings in joist to allow through passage of HVAC, sprinklers, etc. in locations shown on the drawings.

D. Extended Ends: Provide extended ends on joists where shown and where deck extends beyond supports, complying with manufacturer's standards and requirements of applicable SJI Standard Specifications and Load Tables. Unless noted otherwise, “R” type extended ends shall be utilized.

E. Uplift: Roof joists shall be designed for a net uplift of 23 psf.

F. Camber: Camber in accordance with SJI Standard Specifications. Joists shall not be manufactured with negative camber.

G. Bridging:

1. Provide horizontal or diagonal type bridging for "open web" joists, complying with SJI Standard Specifications and any additional requirements shown on Contract Drawings. Bridging layout shall be clearly indicated on the shop drawings.

2. Provide bridging anchors for ends of bridging lines terminating at walls or beams.

3. Provide bottom chord bridging for uplift, in accordance with SJI Standard Specifications, and SJI Technical Digest #6 “Structural Design of Steel Roof Joists to Resist Uplift Loads” when the above noted uplift load is greater than zero.

H. End Anchorage: Provide end anchorages to secure joists to adjacent construction, complying with SJI Standard Specifications, unless otherwise indicated. Roof joists shall be anchored to resist the above noted uplift force.

1. Minimum final connection each side of joist seat, unless noted otherwise, shall be as follows:

    a. “K” Joists: 2 inches, 1/8” fillet weld or (2) 1/2" diameter A307 Bolts

    b. “LH” Joists: 2 inches, 1/4" fillet weld, or (2) 3/4" diameter A325 Bolts (slip critical)

I. Shop Painting:

1. Remove loose scale, heavy rust and other foreign materials from fabricated joists and accessories before application of shop paint in accordance with SSPC-SP 1 and SSPC-SP 2.

2. Apply one shop coat of primer paint, SSPC-Paint 15, or better, to steel joists 2.0 to 3.0 mils DFT (dry film thickness) measurement in accordance with SSPC-PA 2.

PART 3 EXECUTION

3.01 ERECTION:

A. General: Place and secure steel joists in accordance with SJI Standard Specifications, final shop drawings, and as herein specified. Comply with “Code of Federal Regulations, Part 1926” per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).

B. Placing Joists:

1. Do not start placement of steel joists until supporting work is in place and secured.

2. Place joists on supporting work, adjust and align in accurate location and spacing before permanently fastening.

3. Provide temporary bridging, connections and anchors to ensure lateral stability during construction.

C. Bridging: Install bridging simultaneously with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams.

D. Fastening:

1. Joist at column lines shall be bolted with a minimum (2) 3/4" diameter A325 bolts in a slip critical type connection. Stabilizer plates welded to the columns shall be provided at the bottom chord angles at all column lines. Do not weld bottom chord angles to stabilizer plate unless noted otherwise.

2. Field weld joists to supporting steel framework in accordance with SJI Standard Specifications for type of joists used. Coordinate welding sequence and procedure with placing of joists.

3. Bolt joists to supporting steel framework in accordance with SJI Standard Specifications for type of joists used.

E. Reinforcement for Concentrated Loads: Reinforcing angles shall be applied for concentrated loads in excess of 150 pounds applied to joists. The reinforcing angles shall transfer the concentrated loads to a joist panel point. Unless noted otherwise, hung elements shall be attached to the joist top chords. Hangers and hanger accessories shall be designed by a Specialty Structural Engineer Registered in the State of Maine (Not the Engineer of Record).

F. Touch-up painting: Clean field welds, bolted connections, and abraded areas, and apply same type of primer paint as used in shop.

3.02 QUALITY CONTROL:

A. General: Contractor is responsible for maintaining quality control in the field and for providing a structure that is in strict compliance with the Contract Documents.

B. Required inspection and testing services are intended to assist the Contractor in complying with the Contract Documents. These specified services, however, do not relieve the Contractor of his responsibility for compliance, nor are they intended to limit the Contractor’s quality control efforts in the field.

C. Testing: Owner shall engage an Independent Testing Agency to inspect all puddle welded connections, to perform tests and prepare reports of their findings. All connections must pass these inspections prior to the installation of subsequent work which they support.

D. Joist Inspection Requirements (to be performed by the Independent Testing Agency):

E. Testing:

1. Joist connections, bringing connections and field splices shall be tested as indicated in specification section 05120. Work found to be defective will be removed and replaced at the Contractor's expense.

2. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests. If re-certification of welders is required, re-testing will be the Contractor's responsibility.

END OF SECTION

SECTION 05 30 00

METAL DECKING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The drawings and general conditions of the contract including General and Supplementary Conditions and other Division 1 Specification sections apply to work of this section.

B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK

A. Extent of roof deck is shown on the drawings and includes type roof deck, end plate and sump plates or pans.

1.03 RELATED WORK

1. Section 05 12 00 - Structural Steel

2. Section 05 20 00 – Open Web Steel Joists

3. Section 05 50 00 - Metal Fabrications

1.04 QUALITY STANDARDS

A. Codes and Standards: Comply with provisions of the following codes and standards, except where more stringent requirements are indicated or specified:

1. AISI "Specification for the Design of Cold Formed Steel Structural Members”.

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

3. AWS D1.3 "Structural Welding Code" - Sheet Steel

4. Steel Deck Institute (SDI) " Design Manual for Floor Decks and Roof Decks”.

5. “Code of Federal Regulations, Part 1926” per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).

B. Qualification of field welding: Qualify welding process and welding operators in accordance with AWS D1.1 "Standard Qualification Procedure."

1.05 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials to site at such intervals to insure uninterrupted progress of work.

B. Store materials to permit easy access for inspection and identification. Keep deck sheets off ground, using pallets, platforms, or other supports. Protect deck sheets and packaged materials from corrosion and deterioration.

C. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Materials shall be stored in a manner to avoid ponding of precipitation on members. Repair or replace damaged materials or structures as directed.

PART 2 PRODUCTS

2.01 GENERAL:

A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. United Steel Deck

2. Wheeling Corrugating Co.

3. Epic Metals Corporation

4. Vulcraft

B. Materials:

1. Steel for Metal Deck Units: Roof Deck Units: ASTM A653, Structural Quality, grade 33 or higher.

2. Miscellaneous Steel Shapes: ASTM A36 minimum.

3. Sheet metal Accessories: ASTM A526, commercial quality, galvanized.

C. Galvanizing: Conform to ASTM 924-94 with minimum coating class of G60 (Z180) as defined in ASTM A653-94.

D. Paint: Manufacturer's baked on, rust inhibitive paint, for application to metal surfaces which have been chemically cleaned and phosphate chemical treated.

E. Flexible closure Strips: Manufacturer standard vulcanized, closed-cell, synthetic rubber.

2.02 FABRICATION:

A. General: Form deck units in lengths to span 3 or more supports, unless otherwise noted on the drawings, with flush, telescoped or nested 2" laps at ends and interlocking or nested side laps, unless otherwise indicated. For roof deck units, provide deck configurations complying with SDI "Roof Deck Specifications," of metal thickness, depth and width as shown.

B. Metal Cover Plates: Fabricate metal cover plates for end-abutting floor deck units of not less than same thickness as decking. Form to match contour of deck units and approximately 6" wide.

C. Metal Closure Strips: Fabricate metal closure strips, cell closures, "Z" closures, column closures, pour stops, girder fillers and openings between decking and other construction, of not less than 0.045" min. (18 gage) sheet steel or as indicated on the drawings. Form to provide tight fitting closures at open ends of cells or flutes and sides of decking.

D. Pour Stops: Minimum material thickness shall be 18 gage or as indicate on drawings.. Fabricate vertical leg to accommodate specified slab thickness. Fabricate horizontal leg to minimize field cuts. Provide welded attachment sufficient to resist forces during concrete placement.

PART 3 EXECUTION

3.01 INSTALLATION:

A. Install deck units and accessories in accordance with manufacturer's recommendations and final shop drawings, and as specified herein.

B. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before permanently fastened. Deck shall be in full contact with members parallel to ribs and attached as indicated. Do not stretch or contact side lap interlocks.

C. Place deck units in straight alignment for entire length of run of cells and with close alignment between cells at ends of abutting units.

D. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.

E. Coordinate and cooperate with the structural steel erector in locating decking bundles to prevent overloading of structural members.

F. Do not use decking units for storage or working platforms until permanently installed.

3.02 FASTENING:

A. Roof Deck: Each deck is to be fastened with a minimum of 5/8" diameter puddle welds spaced in a 24/4 pattern (3N deck) or 36/7 pattern (1.5B deck) with a minimum of 2 welds per unit at each support if incomplete sheet is utilized. Where support is parallel to support, at edge of building, at brace lines, at edge of opening or deck discontinuity provide puddle welds at 6” o.c. Secure deck to each supporting member in ribs where sidelaps occur. Deck units shall bear over the ends of supports by a minimum of 1.5”. Sidelaps: #10 Tek screws, 6 per span for B deck, 10 per span for N deck.

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

C. Uplift loading: Decking units used at the roof level shall be designed for a net uplift of 23 psf.

D. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking.

E. Reinforcement at openings: Provide additional metal reinforcement and closures pieces as required for strength, continuity of decking and support of other work shown.

1. Deck penetrations affecting no more than (1) deck rib need not be reinforced.

2. For deck penetration affecting more than (1) deck rib, but less than 10", reinforce the opening with a 0.057" thick plate spanning between unaffected ribs, unless otherwise shown on the Design Drawings or supporting a piece of mechanical equipment (see item 3).

3. Reinforce deck penetrations larger than 10" with the structural frame described in the Design Drawings.

F. Joint Covers: Provide metal joint covers at abutting ends and changes in direction of floor deck units.

G. Closure Strips: Provide metal closure strips at open uncovered ends and edges of roof decking, and in voids between decking and other construction. Weld into position to provide a complete decking installation.

H. Touch-Up Painting:

1. Painted Deck: After decking installation, wire brush, clean and paint scarred areas, welds and rust spots on top and bottom surfaces of decking units and supporting steel members.

a. Touch up painted surfaces with same type paint used on adjacent surfaces.

b. In areas where shop-painted surfaces are to be exposed, apply touch-up paint to blend into adjacent surfaces.

3.03 QUALITY CONTROL:

A. General: Contractor is responsible for maintaining quality control in the field and for providing a structure that is in strict compliance with the Contract Documents.

B. Required inspection and testing services are intended to assist the Contractor in complying with the Contract Documents. These specified services, however, do not relieve the Contractor of his responsibility for compliance, nor are they intended to limit the Contractor's quality control efforts in the field.

C. Testing: Owner shall engage an Independent Testing Agency to inspect all puddle welded connections, to perform tests and prepare reports of their findings. All connections must pass these inspections prior to the installation of subsequent work which they support.

D. Deck Testing Requirements (to be performed by the Independent Testing Agency):

1. Deck and accessory welding and/or attachments subject to inspection and testing. Work found to be defective will be removed and replaced at the Contractor's expense.

2. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests. If re-certification of welders is required, re-testing will be the Contractor's responsibility.

END OF SECTION

SECTION 05 40 00

EXTERIOR COLD FORMED METAL FRAMING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The drawings and general conditions of the contract including General and Supplementary Conditions and other Division 1 Specification sections apply to work of this section.

B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF THE WORK

A. Work specified within this Section includes, but is not necessarily limited to, the following:

1. Provide and install steel stud structural framing system at exterior walls as noted on the Drawings.

2. Providing and installing miscellaneous fasteners, hat channels, stiffeners, bridging, expansion joints, and accessories necessary to complete the work.

B. Related work specified elsewhere:

1. Interior Partition Walls: Section 09 25 00 - Gypsum Wallboard Systems

2. Exterior Gypsum Sheathing: Section 09 26 50 - Gypsum Sheathing

1.03 QUALITY ASSURANCE

A. Materials and installation shall conform to recommendations of the following publications:

1. American Iron and Steel Institute Cold-Formed Steel Design Manual, *“Specification for the Design of Cold-Formed Steel Structural Members”.*

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

3. AWS D1.3 "Structural Welding Code" - Sheet Steel.

4. ASTM C 954, Standard specification for steel drill screws for the application of gypsum board or metal plaster bases to steel studs from 0.033 in. to 0.112 in. thickness.

5. ASTM C 955, Standard Specification for Load-Bearing Steel Studs, Runners, and Bracing or Bridging, for Screw Application of Gypsum Board and Metal Plaster Bases.

6. ASTM C 1007 Standard Specification for installation of load bearing steel studs and related accessories.

7. Standard Specification for installation of load bearing steel studs and related accessories.

8. ASCE 7-05 "Minimum Design Loads for Building and Other Structures."

9. International Building Code, 2009

10. "Code of Federal Regulations, Part 1926" per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).

B. Maximum Allowable Deflections: Deflection limitations, (either horizontal or vertical), include the effect of studs only, not sheathing or facing material. Spans are measured in inches between the attachments to structural steel or concrete.

1. Supporting Siding: 1/360 of span

C. Design wind pressures: Design wind pressures calculated in accordance with ASCE 7-05 for Components and Cladding, shall be used in the design of the exterior cold formed steel framing system. Utilize wind speed, importance factor and exposure indicated on the project General Notes.

D. Slip Track Tolerances: Where non-bearing light gage framing abuts the structure, provide a slip joint capable of accommodating the vertical movement of the structure. Slip joint gaps shall allow for 3/4" Live Load deflection of the supporting member. Minimum depth of slip track shall be 2". Minimum thickness shall be 14 gage. Slide clips are also acceptable where applicable.

1.04 SUBMITTALS

A. Unless otherwise specified, submittals required in this section shall be submitted for review. Submittals shall be prepared and submitted in accordance with this section and Division 1.

B. General Contractor shall submit a Submittal Schedule to the engineer within 30 days after they have received the Owner's Notice to Proceed.

C. All submittals shall be reviewed and returned to the Architect within 10 working days.

D. Incomplete submittals will not be reviewed.

E. Submittals not reviewed by the General Contractor prior to submission to the Engineer will not be reviewed. Include on the submittal statement or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in Division 1 have been complied with.

F. Engineer will review submittals a maximum of two review cycles as part of their normal services. If submittals are incomplete or otherwise unacceptable and re-submitted, General Contractor shall compensate Engineer for additional review cycles.

G. Hardcopy Submittals: Submit three prints. Prints will be reviewed by the Engineer, and then the Architect. One marked print will be returned to Contractor for printing and distribution. Multiple copies will not be marked by the Engineer.

H. Electronic Submittals:

1. Contractor shall include in the submittal schedule an indication of submittals that are intended to be submitted electronically. Upon receipt of the submittal schedule, the Engineer reserves the right to indicate submittals that will not be accepted electronically. Paper copies of such submittals shall be furnished as referenced in this specification.

2. The Engineer reserves the right to require paper copies of submittals that are received electronically. Provide Engineer one (1) paper copies in addition to the electronic submittal. Paper copy will be retained and electronic copy will be returned. Review cycle for such submittals shall not commence until such time that the paper copies are received.

3. Electronic Submittals shall be submitted in Protected Document Format (PDF) compatible with Bluebeam version 12 or later. Electronic files shall not be broken into smaller individual files. File sizes too large to process email or within a file transfer protocol (FTP) site shall be provided on a CD.

4. The submission of submittals electronically does not relieve the contractor of their responsibility to review the submittal prior to transmission to the Engineer. Electronic Submittals shall include contractor comments, and a statement and/or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in this Section and Division 1 have been complied with. Electronic submittals without the Contractor’s approval will be rejected and returned.

5. The Engineer assumes no responsibility for the printed reproduction of submittals reviewed electronically, transmission errors or returned electronic submittals that become corrupted or are otherwise not accessible by the Contractor’s or Subcontractor’s computer hardware and/or software.

I. Product Data: Submit Manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications.

1. Steel Studs

2. Anchors and anchor bolts

3. Self drilling screws

J. Shop Drawings:

1. Shop Drawing Review: Electronic files of structural drawings **will not** be provided to the contractor for preparation of shop drawings. Reproduction of any portion of the Construction Documents for use as Shop drawings and/or Erection Drawings is prohibited. Shop drawings and/or Erection drawings created from reproduced Construction Documents will be returned without review.

2. General: Submit shop drawings showing the following:

    a. Stud gages and spacings.

    b. Sizes, gages and fastenings for all built-up members including but not limited to headers and jambs.

    c. Shop Coatings

    d. Type, size, quantity, locations and spacings of all anchorages and self drilling screws.

    e. Details of attachment to structure and adjacent work

    f. Supplemental strapping, bracing, splices, bridging, hat channels and other accessories required for proper installation.

    g. Critical installation procedures.

3. Conformance of the Shop Drawings to the Contract Drawings remains the responsibility of the General Contractor. Engineer's review in no way relieves the General Contractor of this responsibility.

4. Shop drawings will not be reviewed as partial submittals. A complete submittal shall be provided and shall include; erection and piece drawings. **Incomplete submittals will not be reviewed.**

K. Design calculations shall be prepared by a Professional Engineer (Specialty Engineer) registered in the State of Maine, illustrating the design of exterior steel stud wall systems including all all necessary stiffeners and bracing connections and anchorage required for a complete structural system.

L. The Specialty Engineer shall design the attachments of veneer and siding elements, such that pull out loads under wind or seismic loads will not be exceeded. Coordinate this design with other specification sections.

M. Professional Engineer responsible for design of cold formed framing shall review the installation and submit a correspondence indicating compliance with the design. Review shall include all work. Any discrepancies noted shall be corrected and reviewed by the Engineer prior to the submittal of the correspondence.

1.05 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials to site at such intervals to insure uninterrupted progress of work.

B. Deliver anchorage devices, which are to be embedded in cast-in-place, in ample time to not delay work.

C. Store materials to permit easy access for inspection and identification. Keep cold formed members off ground, using pallets, platforms, or other supports. Protect cold formed members and packaged materials from corrosion and deterioration.

D. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Materials shall be stored in a manner to avoid ponding of precipitation on members. Repair or replace damaged materials or structures as directed.

PART 2 PRODUCTS

2.01 FRAMING MEMBERS

A. Steel Studs:

1. Acceptable manufacturers: Manufacturer shall be a member of the Steel Stud Manufacturers Association.

2. Minimum stud shall be 6", 18 gage with 1.625" flange at siding.

3. Maximum Spacing: 16 inches, on-center.

4. Minimum studs indicated have not been engineered, but are provided as a general guideline. Engineering of studs is the responsibility of the Specialty Design Engineer referenced in the Submittals Section, and not the Engineer of Record nor the Architect of Record. Any exterior stud size, gage, spacing, bracing and connection information shown on the Contract Documents is schematic only. The Contractor shall provide the studs and built-up sections, engineered by the Specialty Engineer. If studs of a thicker gage or lesser spacing are required by the Specialty Engineer's design, the studs shall be provided at no additional cost to the Owner.

5. Provide channel-shaped load-bearing studs, channel-shaped joists, runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, stiffeners, fasteners, and other accessories recommended by manufacturer for complete framing system

6. Steel framing materials shall comply with ASTM A 446, A 570, or A 611, as applicable. Fabricate all components from structural quality sheet steel with the following minimum yield points:

   a. 16 ga. and heavier 50,000 psi

   b. 18 ga., 33,000 psi

   c. 20 ga., 33,000 psi (permitted for bottom track only).

7. Manufacture of studs, runners (track), and other framing members shall comply with ASTM C 955.

8. Framing components shall be galvanized per ASTM A 525, minimum G-60 coating.

B. Screws and other attachment devices:

1. Provide a protective cadmium or zinc plated coating and comply with ASTM A 165 type NS.

2. Self-drilling screws shall comply with the Industrial Fastener Institute Standard for steel self-drilling and tapping screws (IFI-113).

3. Penetration through jointed materials shall not be less than three (3) exposed threads.

C. Standard Steel Shapes: Standard steel shapes, plates, etc. shall conform to material and finish specifications in Division 5 -Miscellaneous Metals.

PART 3 EXECUTION

3.01 INSTALLATION

A. Product Storage: Store studs, joists, track etc. on a flat plane. Material damaged (i.e. rusted, dented, bent or twisted) shall be discarded. Protect adhesives and sealants from freezing.

B. Construction Methods: Construction may be either piece-by-piece (stick-built), or by fabrication into panels either on or off site.

C. Material Fit up: All framing components shall be cut squarely or at an angle to fit squarely against abutting members. Members shall be held firmly in position until properly fastened. Prefabricated panels, if used, shall be square and braced against racking. Provide blocking and strapping within 12” of slip joint and at 8’-0” o.c., or as required for member bracing.

D. Attachment: Components shall be joined by self-drilling screws, so that connection meets or exceeds required design loads. Wire tying of framing components will not be permitted. Field welding will be permitted only where shown on the drawings.

E. Anchorage to Structure: Securely anchor studs and track to floor construction and overhead structure. Provide fasteners at a maximum of 16” on center. Provide slip joints where non-bearing vertical studs meet floor or roof structural steel, or as indicated on the drawings. Provide sill sealer beneath all floor tracks.

F. Welding: Shop and field welds shall conform to applicable AWS and AISI standards, and may be fillet, plug, butt or seam type. Touch-up damage to galvanizing caused by welding with zinc-rich paint.

G. Openings: Frame openings larger than 2 ft. square with double studs. Provide suitable reinforcements (double studs, headers, jack studs, cripples, bracing, etc.) at control joint intersections, corners, and other special conditions.

H. Lintels: Lintels supporting masonry veneer shall be secured to studs by screws or power-driven anchors. Method of anchorage shall be sufficient to support veneer with a factor of safety of 3.0.

I. Bridging/Bracing: Provide horizontal strap bracing for all walls. Minimum requirements are as follows: Horizontal bracing shall be continuous 20 gage x 1 1/2" wide steel straps on each face of the stud, located at 4'-0" maximum for the full height of the wall. Provide CR runner solid bridging at 8'-0" for the full height of the wall at each line of bracing. An additional row of bracing shall be provide within 12 inches of the slip joint.

J. Tolerances: Finished installation shall be level and plumb within a tolerance of 1/8 inch in 10 feet horizontally and vertically. Maximum deviation from plan or section dimension shall not exceed 1/8 inch. Spacing of studs shall not be more than 1/8 inch from design spacing, providing that cumulative error does not exceed requirements of finishing materials.

END OF SECTION

SECTION 05 51 00

METAL GUARD AND HANDRAILS

PART 1 GENERAL

1.1 SUMMARY

Section includes:

1. Shop fabricated ferrous metal items, galvanized (exterior) and primed (interior), painted.
2. Balusters, posts, bracket supports and handrailing.

A. Related Sections:

1. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.
2. Section 03 30 00 - Cast-In-Place Concrete: Execution requirements for placement of anchors specified in this section in concrete.
3. Section 04 20 19 - Unit Masonry: Execution requirements for placement of anchors specified in this section in masonry.
4. Section 06 20 00 - Finish Carpentry: Wood handrail.
5. Section 09 90 00 - Painting and Coating: Paint finish.

1.2 REFERENCES

A. American National Standards Institute:

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.

B. ASTM International:

1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
4. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
5. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
6. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
7. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
8. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
9. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
10. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
11. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
12. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
13. ASTM F436 - Standard Specification for Hardened Steel Washers.
14. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.

15. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.

C. American Welding Society:
   1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
   2. AWS D1.1 - Structural Welding Code - Steel.

D. Green Seal:
   1. GC-03 - Anti-Corrosive Paints.

E. National Association of Architectural Metal Manufacturers:
   1. NAAMM AMP 510 - Metal Stairs Manual.
   2. NAAMM MBG 531 - Metal Bar Grating Manual.

F. National Ornamental & Miscellaneous Metals Association:
   1. NOMMA Guideline 1 - Joint Finishes.

G. SSPC: The Society for Protective Coatings:
   1. SSPC - Steel Structures Painting Manual.
   2. SSPC SP 1 - Solvent Cleaning.
   3. SSPC SP 10 - Near-White Blast Cleaning.
   4. SSPC Paint 15 - Steel Joist Shop Paint.
   5. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

1.3 DESIGN REQUIREMENTS

A. Design handrail, guardrail, and attachments to resist forces as required by applicable building code. Apply loads non-simultaneously to produce maximum stresses.
   1. 1. Guard Top Rail and Handrail Concentrated Load: 200 pounds applied at any point in any direction.
   2. 2. Guard Top Rail Uniform Load: 50 plf applied in any direction.
   3. 3. Intermediate Rails, Panels, and Baluster Concentrated Load: 50 pounds applied to 1 sf area.

B. Fabricate assembly to NAAMM AMP 510, Class: Architectural.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal requirements.

B. Product Data: Submit data on product characteristics, performance criteria and limitations.

C. Shop Drawings: Match the design intent indicated on the drawings. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

D. Manufacturer's Installation Instructions: Submit procedure for preparation and installation.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM E985 - Permanent Metal Railing Systems and Rails for Buildings

B. Finish joints in accordance with NOMMA Guideline 1.

1.6 QUALIFICATIONS

A. Prepare Shop Drawings under direct supervision of Professional Engineer experienced in design of this Work and licensed at Project location.

1.7 PRE-INSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 COMPONENTS

A. Steel Pipe: ASTM A53/A53M, Grade B Schedule 40. .

B. Bolts: ASTM A307; Grade A or B. ASTM A325; Type 1.
1. Finish: Unfinished. Hot dipped galvanized. Mechanically galvanized.

C. Nuts: ASTM A563 heavy hex type.
1. Finish: Unfinished. Hot dipped galvanized. Mechanically galvanized.

D. Washers: ASTM F436; Type 1.
1. Finish: Unfinished. Hot dipped galvanized. Mechanically galvanized.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; consistent with design of stair structure.

F. Welding Materials: AWS D1.1; type required for materials being welded.

G. Shop Primer: SSPC Paint 15, Type 1, red oxide.

H. Touch-Up Primer: Match shop primer.
1. Interior Anti-Corrosive Paints: Maximum volatile organic compound content in accordance with GC-03.

2.2 FABRICATION

A. Fit and shop assemble components in largest practical sections, for delivery to site.

B. Fabricate components with joints tightly fitted and secured.

C. Continuously seal joined pieces by continuous welds.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Exposed Welded Joints: NOMMA Guideline 1 Joint Finish 2

F. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

G. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

H. Accurately form components required for anchorage of stairs and landings and railings to each other and to building structure.

I. Heat weld joints and trim smooth.

2.3 FABRICATION – GUARD RAIL BALUSTERS

A. Form balusters with inch diameter square rectangular steel sections, welded or bolted to stringers.

2.4 SHOP FINISHING

A. Prepare surfaces to be primed in accordance with SSPC SP 2.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Interior Locations - Prime paint items with one coat.

D. Exterior Locations - G90 Galvanizing: ASTM A123/A123M; hot dip galvanize after fabrication.
   1. Galvanizing for Fasteners, Connectors, and Anchors:
      a. Hot-Dipped Galvanizing: ASTM A153/A153M.
      b. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify field conditions are acceptable and are ready to receive work.

C. Verify concealed blocking and reinforcement is installed and correctly located to receive wall mounted handrails.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete and or embedded in masonry with setting templates.

3.3 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Allow for erection loads. Install sufficient temporary bracing to maintain framing safe, plumb, and in alignment.

C. Field weld components indicated on Drawings shop drawings. Perform field welding in accordance with AWS D1.1.

D. Field bolt and weld to match shop bolting and welding. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

E. Mechanically fasten joints butted tight, flush, and hairline. Grind welds smooth and flush.

F. Obtain approval of Architect/Engineer prior to site cutting or creating adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

H. Prepare for final painting in accordance with section 09 90 00 - Painting and Coating: Paint finish.

3.4 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation From Plumb: 1/8 inch per 10 feet.

C. Maximum Offset From Alignment: 1/8 inch.

3.5 FIELD QUALITY CONTROL

A. Welding: Inspect welds in accordance with AWS D1.1.

3.6 SCHEDULES

A. Interior Stairs/Guardrails: Primed metal handrails and attachment components as indicated for final painting in accordance with section 09 90 00 - Painting and Coating: Paint finish.

B. Exterior Stairs/Guardrails: G90 Galvanized and primed metal handrails and attachment components as indicated for final painting in accordance with section 09 90 00 - Painting and Coating: Paint finish.

END OF SECTION

SECTION 05 80 00

EXPANSION CONTROL

PART 1 GENERAL

1.1 SUMMARY

A. Provide all labor, materials, equipment and services, and perform all operations required for complete installation of Expansion Control and related work as indicated on the drawings and specified herein.

B. Work Included: The work of this section shall include, but not be limited to the following:

1. Floor expansion joint cover assemblies.
2. Wall/ceiling expansion joint cover assemblies.
3. Exterior expansion joint seals.
4. Roof expansion joint assemblies.

C. Related Work Specified Elsewhere

1. Concrete - Section 03 30 00.
2. Unit Masonry - Section 04 20 00.
3. Cold Formed Metal Framing
3. Miscellaneous Metal - Section 05 50 00.
4. Joint Sealers - Section 07 90 00.

1.2 QUALITY ASSURANCE

A. Materials and work shall conform to the latest edition of reference specifications specified herein and to all applicable codes and requirements of local authorities having jurisdiction.

B. Fire Performance Characteristics:

1. Fire Resistance: Where indicated, provide expansion joint cover assemblies identical to those of assemblies whose fire resistance and cycling capability has been determined per UL 2079 by Underwriter Laboratories, Inc. Fire rating not less than the rating of adjacent construction.

2. Surface Burning Characteristics: Composite fiberglass interior wall and ceiling covers shall be U.L.® Tested, classified and labeled reflecting a class I fire rating in accordance with UL-723 (ASTM E84-91a) test procedures.

C. Loading Characteristics:

1. Standard Floor Covers: Shall be designed to withstand a minimum load of 500 lbs. without damage or permanent deformation. Heavy duty covers should withstand a point load of 2,000 lbs.

2. Fiberglass Wall Covers: Shall be designed to withstand a minimum impact load of 75 ft/lbs without damage or permanent deformation. Tested in accordance with applicable provisions of ASTM F476-84.

1.3 SUBMITTALS

A. Product Data: Submit copies of manufacturer's latest published literature for materials specified herein for approval, and obtain approval before materials are fabricated and delivered to the site. Data shall clearly indicate movement capability of cover assemblies and suitability of material used in exterior seals for UV exposure.

B. Certificates: Material test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of fire-rated expansion joint assemblies with requirements indicated.

C. Shop Drawings: Submit shop drawings for work specified herein for approval and obtain approval prior to fabrication and shipment of materials to the job site.

1. Shop Drawings showing full extent of expansion joint cover assemblies; include large-scale details indicating profiles of each type of expansion joint cover assembly, splice joints between sections, joinery with other types, special end conditions, anchorage's, fasteners, and relationship to adjoining work and finishes. Include description of materials and finishes and installation instructions.

D. Samples: Samples of materials specified herein shall be submitted for approval, and approval obtained before materials are delivered to the site. Samples shall include the following:

1. Samples for each type of metal finish indicated on metal of same thickness and alloy to be used in work. Where normal color and texture variations are to be expected, include 2 or more units in each set of samples showing limits of such variations.

2. Samples of each type of flexible seal to be used in work with color samples as above.

1.4 DELIVERY, STORAGE AND HANDLING

A. Exercise proper care in the handling of all work so as not to injure the finished surface, and take proper precautions to protect the work from damage after it is in place.

B. Deliver materials to the job site ready for use, and fabricated in as large sections and assemblies as practical. Assemblies shall be identical to submitted and reviewed shop drawings, samples and certificates.

C. Store materials under cover in a dry and clean location off the ground. Remove materials that are damaged or otherwise not suitable for installation from the job site and replace with acceptable materials at no additional cost.

1.5 PROJECT CONDITIONS

A. Where necessary, check actual locations of walls and other construction to which work must fit, by accurate field measurements before fabrication. Show recorded measurements on final shop drawings and coordinate fabrication schedule with construction progress to avoid delay of work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Expansion joint cover assemblies specified herein and indicated on the drawings shall be manufactured by Balco, Inc., 2626 S. Sheridan, Wichita, KS 67217; Watson Bowman Acme Corp. 95 Pineview Drive, Amherst NY 14228; or other manufacturers considered an approved equal.

2.2 MATERIALS

A. Structural Steel Shapes: ASTM A36.

B. Steel Plates: ASTM A283 Grade C.

C. Rolled Steel Floor Plates : ASTM A786.

D. Aluminum: ASTM B 221, alloy 6063-T5 for extrusions; ASTM B 209, alloy 6061-T6, sheet and plate.
   1. Protect aluminum surfaces in contact with cementitious materials with heavy metal free high solids primer or chromate conversion coating.

E. Bronze: ASTM B455 alloy C38500 for extrusions; alloy C28000, Muntz Metal for plates.

F. Brass: UNS Alloy C26000 for half-hard sheet and coil.

G. Stainless Steel: ASTM A 167, Type 304 with 2B finish, unless indicated otherwise, for plates, sheets and strips.

H. Extruded Preformed Seals: Single or multilayered rubber extrusions as classified under ASTM D 2000, designed with or without continuous, longitudinal, internal baffles and formed to fit compatible frames, in color indicated, or, if not indicated, as selected by architect from manufacturer's standard colors.

I. Exterior Seals: Typically two single layered flexible extrusions, one interior PVC and one exterior Santoprene 8000 Series non-hydroscopic, thermoplastic rubber, as classified under ASTM D 2000, retained in a set of compatible frames, in color indicated, or, if not indicated, as selected by architect from manufacturer's standard colors.

J. Fire Barriers: Designed for indicated or required dynamic structural movement without material degradation or fatigue in accordance with ASTM E 1399. Tested in maximum joint width condition as a component of an expansion joint cover in accordance with UL 2079 including hose stream testing of wall assemblies at full-rated period by Underwriters Laboratories Inc.

K. Composite Fiberglass Panels: Shall be UL® tested, classified and labeled reflecting a class I fire rating in accordance with UL-723 (ASTM E84-91a) test procedures and impact tested in accordance with applicable provisions of ASTM F476-84.

L. Accessories: Manufacturer's standard anchors, fasteners, set screws, spacers, flexible vapor seals and filler materials, drain tubes, adhesive and other accessories compatible with material in contact, as indicated or required for complete installations.

2.3 FABRICATION

A. General: Provide expansion joint cover assemblies of design, basic profile, materials, and operation indicated. Select units comparable to those indicated or required to accommodate joint size, variations in adjacent surfaces, and structural movement. Furnish units in longest practicable lengths to minimize number of end joints. Provide hairline-mitered corners where joint changes directions or abuts other materials. Include closure materials and transition pieces, tee-joints, corner, curbs, cross-connections, and other accessories as required to provide continuous joint cover assemblies.

B. Interior Expansion Joint Covers

1. Flush Cover Assemblies: Provide continuous extruded aluminum frame assemblies of a suitable profile to receive free floating cover plate of design indicated. Furnish colorable, thermoplastic frame seal with rigid edges for positive attachment to frame and center plate free from grooves or ridges. Seals to have flexible core of shore hardness 73 to allow movement of joint width without gaps occurring between seal and cover assembly. Seals to be replaceable without removal of center plate and to be in one of four standard colors unless otherwise specified. All aluminum in contact with concrete to receive heavy metal free/high solids primer, exposed aluminum to be mill finish.
   a. Model number and description: Refer to Drawings.

2. Extruded Aluminum Cover Assemblies: Provide continuous extruded aluminum frame assemblies of suitable profile to receive free floating cover plate of design indicated. Furnish depth and configuration to suit type of construction with no exposed fasteners. All aluminum in contact with concrete to have zinc chromate finish, exposed aluminum to be finished as noted free of gaskets and fillers assemblies to be capable of +50% expansion and contraction without loss of cover. Floor covers must withstand min. 500 lb. point load without damage or permanent deformation unless otherwise indicated. Provide continuous flexible waterstop where detailed.
   a. Model number and description: Refer to Drawings

C. Interior Seismic Joint Covers

1. Flush Seismic Cover Assemblies: Provide continuous extruded aluminum frame assemblies of a suitable profile to receive free floating cover plate of design indicated. Center plate to be held in place and kept centered throughout movement cycle by stainless steel turnbar spaced 24" on center max. Assembly (where indicated) to be sealed with dual durometer, colorable thermoplastic seals with rigid edges for positive attachment to frame and center plate. Free from grooves or ridges, seals to have flexible core of shore hardness 73 to allow maximum movement of + 1 inch without gaps occurring between seal and cover assembly. Center plate to include concealed lifting device to allow full seismic movement without damage to cover. Seals to disengage under seismic conditions only. All aluminum in contact with concrete to have a zinc chromate finish.

2. Extruded Aluminum Seismic Cover Assemblies: Provide continuous extruded aluminum frame assemblies of suitable profile to receive free floating center plate of design indicated. Center plate to be held in place and kept centered throughout movement cycle by stainless steel turnbar spaced 24" on center max. All aluminum in contact with concrete to have a zinc chromate finish.
   a. Exposed Extruded Aluminum Floor Covers: Refer to Drawings

D. Exterior Joint Covers
   1. Vertical Exterior Seals: Thermoplastic rubber primary seals extruded in Santoprene retained in extruded aluminum side frames complete with independent continuous PVC back seal. Side frames mounted on butyl caulk tape with appropriate anchors 18" o.c. Installation to include factory, heat welded transitions where applicable to ensure a watertight system. Color of primary seal to be one of four standard colors or custom color selected by architect.
      a. Exposed Exterior Joint Covers: Fiberglass, refer to Drawings.

E. Roof Covers

   1. Metal Roof Covers: Provide continuous extruded aluminum base frame sections fastened to roof curb at 24" o.c. with aluminum cover formed from minimum .078" thick aluminum sheet. Frames sealed with continuous extruded PVC gasket and seated on continuous neoprene waterstop. Frames to incorporate adjustable angle flange folded on site to cover adjacent edge of roof membrane. All transitions and end caps to be factory fabricated to ensure maximum weather tightness. All butt joints to be sealed with aluminum splice cover bedded on caulk and fastened on one side only.

   2. Elastomeric Flexible Roof Covers: Continuous neoprene sheet bellows complete with foam support membrane and continuous galvanized attachment flanges, mechanically fastened to curb member 24" o.c. Cover to be one-piece unit with optional back seal. All transitions and end caps to be factory fabricated with butt joints sealed with site applied flexible splice covers.

F. Metal Finishes

   1. Comply with NAAM “Metal Finishes Manual” for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory after products are fabricated. Protect finishes on exposed surfaces with protective covering before shipment.

   2. Aluminum Finishes
      a. Paint Finish: Shall be inhibited thermocured primer, .02 mil minimum dry film thickness and thermocured fluorocarbon coating containing full 70% Kynar 500 resin, 1.0 mil minimum dry film thickness. Provide color indicated or, if not indicated, as selected by Architect from manufacturer’s standard colors.
      b. Factory-Primed Concealed Surfaces: Protect concealed metal surfaces that will be in contact with concrete and masonry surfaces when installed by applying a shop coat of manufacturer’s standard primer to contact surfaces. Provide minimum dry film thickness of 2.0 mils.

PART 3 EXECUTION

3.1 EXAMINATION

A. Make a thorough examination of all surfaces receiving the work of this Section and before starting the installation, notify the Architect, in writing, of any defect which would affect the satisfactory completion of the work of this section.

3.2 PREPARATION

A. Examine the Contract Drawings and specifications in order to insure the completeness of the work required under this Section.

B. Verify all measurements and dimensions at the job site and cooperate in the coordination and scheduling of the work of this Section with the work of related trades, with particular attention

given to the installation of items embedded in concrete and masonry so as not to delay job progress.

C. Provide all templates as required to related trade for location of all support and anchorage items.

3.3 INSTALLATION

A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for all phases of work, including preparation of substrate, applying materials, and protection of installed units.

B. Provide anchorage devices and fasteners where necessary for securing expansion joint cover assemblies to in-place construction, including threaded fasteners with drilled-in fasteners for masonry and concrete where anchoring members are not embedded in concrete. Provide fasteners of metal, type, and size to suit type of construction indicated and provide for secure attachment of expansion joint cover assemblies.

C. Perform all cutting, drilling and fitting required for installation of expansion joint covers. Install joint cover assemblies in true alignment and proper relationship to expansion joints and adjoining finished surfaces measured from established lines and levels.

D. Allow adequate free movement for thermal expansion and contraction of metal to avoid buckling.

E. Set floor covers at elevations to be flush with adjacent finished floor materials. If necessary, shim to level, but ensure base frames have continual support to prevent rocking and vertical deflection.

F. Locate wall, ceiling, roof, and soffit covers in continuous contact with adjacent surfaces. Securely attach in place with all required accessories.

G. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches on centers.

H. Maintain continuity of expansion joint cover assemblies with end joints held to a minimum and metal members aligned mechanically using splice joints. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames.

I. Adhere flexible filler materials (if any) to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

1. Installation of Extruded Preformed Seals: Install seals to comply with manufacturer's instruction and with minimum number of end joints.

2. For straight sections provide preformed seals in continuous lengths.

2. Vulcanize or heat-seal all field splice joints in preformed seal material to provide watertight joints using manufacturer's recommended procedure.

3. Apply manufacturer's approved adhesive, epoxy, or lubricant-adhesive to both frame interfaces prior to installing preformed seal.

4. Seal transitions in accordance with manufacturer's instruction.

J. Installation of Exterior Seal Joint Assemblies

1. Seal all end joints within continuous runs and joints at transitions in accordance with manufacturer's directions to provide a watertight installation.

2. Install exterior flexible seal in standard lengths.

3. Seal transitions and butt joints in accordance with manufacturer's instructions.

4. Install secondary seals in continuous lengths; vulcanize all field splice joints in secondary seal material to provide watertight joints using manufacturer's recommended procedures.

3.4 CLEANING AND PROTECTION

A. Do not remove strippable protective material until finish work in adjacent areas is complete. When protective material is removed, clean exposed metal surfaces to comply with manufacturer's instructions.

END OF SECTION

SECTION 06 10 53

MISCELLANEOUS ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Section includes roof curbs, cants, and perimeter nailers; blocking in wall and roof openings; wood furring and grounds; concealed wood blocking for support of toilet and bath accessories wall cabinets wood trim and door stops; miscellaneous sheathing and underlayment; telephone and electrical panel back boards; and preservative treatment of wood.

B. Related Sections:
   1. Flooring, roof and wall systems to receive underlayment and blocking.

1.2 REFERENCES

A. American National Standards Institute:
   1. ANSI A208.1 - Mat-Formed Wood Particleboard.

B. American Wood-Preservers' Association:
   1. AWPA M4 - Standard for the Care of Preservative-Treated Wood Products.
   2. AWPA U1 - Use Category System: User Specification for Treated Wood.

C. ASTM International:
   1. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   2. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
   3. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   4. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

D. Forest Stewardship Council:
   1. FSC Guidelines - Forest Stewardship Council Guidelines.

E. The Redwood Inspection Service:
   1. RIS - Standard Specifications for Grades of California Redwood Lumber.

F. Southern Pine Inspection Bureau:
   1. SPIB - Standard Grading Rules for Southern Pine Lumber.

G. National Lumber Grades Authority:
   1. NLGA - Standard Grading Rules for Canadian Lumber.

H. Northeastern Lumber Manufacturers Association:
   1. NELMA - Standard Grading Rules for Northeastern Lumber.

I. U.S. Department of Commerce National Institute of Standards and Technology:
   1. DOC PS 1 - Construction and Industrial Plywood.
   2. DOC PS 2 - Performance Standard for Wood-Based Structural-Use Panels.
   3. DOC PS 20 - American Softwood Lumber Standard.

J. West Coast Lumber Inspection Bureau:
   1. WCLIB - Standard Grading Rules for West Coast Lumber.

K. Western Wood Products Association:
   1. WWPA G-5 - Western Lumber Grading Rules.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit technical data on wood preservative and fire retardant treatment materials and application instructions.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with the following:
   1. Lumber Grading Agency: Certified by DOC PS 20.
   2. Wood Structural Panel Grading Agency: Certified by EWA - The Engineered Wood Association.
   3. Lumber: DOC PS 20.
   4. Wood Structural Panels: DOC PS 1 or DOC PS 2.

B. Surface Burning Characteristics:
   1. Fire Retardant Treated Materials: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

C. Apply label from agency approved by authority having jurisdiction to identify each preservative treated and fire retardant treated material.

Maintain one copy copies of each document on site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

PART 2 PRODUCTS

2.1 MATERIALS

A. Lumber Grading Rules: AP&PA. RIS. SPIB. WCLIB. WWPA G-5.

B. Miscellaneous Framing: Stress Group D, species, grade 19 percent maximum moisture content after treatment, pressure preservative treat.

C. Plywood: APA/EWA Rated Sheathing Structural I, Grade C-D; Exposure Durability 1; unsanded.
   1. Interior Composite Wood and Agrifiber Products: Contain no added urea-formaldehyde resins.

2.2 ACCESSORIES

A. Fasteners and Anchors:
1. Fasteners: ASTM A153/A153M, hot dipped galvanized ASTM B695, Class 55 mechanically galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
2. Nails and Staples: ASTM F1667.
3. Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt or ballistic fastener for anchorages to steel.

2.3 FACTORY WOOD TREATMENT

A. Wood Preservative (Pressure Treatment): AWPA U1, Commodity Specification A-Sawn Products or F-Wood Composites using water-borne ACQ SBX preservative.

B. Fire Retardant Treatment: Chemically treated and pressure impregnated, having flame spread of 25 or less when tested in accordance with ASTM E 84 and showing no evidence of significant progressive combustion when test is continued for an additional 20 minute period, Interior Type.

C. Moisture Content after Treatment: Redried Kiln dried (KDAT).
1. Lumber: Maximum 19 percent.
2. Structural Panels: Maximum 15 percent.

2.4 UNDERLAYMENT MATERIALS

A. Plywood Underlayment: EWA Underlayment Structural I, Span Rating; Exposure Durability 1 Exterior; sanded.
1. Interior Composite Wood and Agrifiber Products: Contain no added urea-formaldehyde resins.

2.5 SHEATHING AND UNDERLAYMENT LOCATIONS

A. Floor Sheathing: Refer to 06100 Rough Carpentry, Floor Patch where indicated.

B. Floor Underlayment: Span Rating 32/16, 48 x 96 inch sized sheets, location and thickness as indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify substrate conditions are ready to receive blocking, curbing and framing.

3.2 PREPARATION

A. Coordinate placement of blocking, curbing and framing items.

3.3 INSTALLATION

A. Set members level and plumb, in correct position.

B. Place horizontal members, crown side up.

C. Construct curb members of solid wood sections.

D. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.

E. Coordinate curb installation with installation of decking and support of deck openings, roofing vapor retardant, and parapet construction.

F. Space framing and furring as indicated.

G. Secure sheathing to framing members with ends over firm bearing and staggered.

H. Install telephone and electrical panel back boards with wood structural panel sheathing material where required. Size back boards 12 inches beyond size of electrical panel.

3.4 SITE APPLIED WOOD TREATMENT

A. Brush apply one two coats of preservative treatment on wood in contact with cementitious materials roofing and related metal flashings and.

B. Treat site-sawn cuts. Apply preservative to site-sawn cuts in accordance with AWPA M4.

C. Allow preservative to dry prior to erecting members.

3.5 SHEATHING UNDERLAYMENT

A. Fasten sheathing in accordance with applicable code.

B. Install flooring underlayment after dust and dirt generating activities have ceased and prior to application of finished flooring. Apply perpendicular to subflooring, stagger joints of underlayment. Secure with deformed shank type fasteners.

3.6 SCHEDULES

A. Roof Blocking: S/P/F species, 19 percent maximum moisture content, pressure preservative treatment.

B. Telephone and Electrical Panel Boards: 3/4 inch thick, square edges, site brush applied preservative treated.

C. Sheathing Underlayment: Refer to Drawings.

END OF SECTION

SECTION 07 11 00

DAMPPROOFING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes hot applied asphalt bituminous dampproofing; and protective cover.

B. Related Sections:
1. Section 07 21 13 - Board Insulation: Perimeter insulation protective cover.
2. Section 31 23 23 - Fill.

1.2 REFERENCES

A. ASTM International:
1. ASTM D41 - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
2. ASTM D43 - Standard Specification for Coal Tar Primer Used in Roofing, Dampproofing, and Waterproofing.
3. ASTM D449 - Standard Specification for Asphalt Used in Dampproofing and Waterproofing.
4. ASTM D450 - Standard Specification for Coal-Tar Pitch Used in Roofing, Dampproofing, and Waterproofing.
5. ASTM D1227 - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing.
6. ASTM D3747 - Standard Specification for Emulsified Asphalt Adhesive for Adhering Roof Insulation.
7. ASTM D4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
8. ASTM D5643 - Standard Specification for Coal Tar Roof Cement, Asbestos Free.

B. National Roofing Contractors Association:
1. NRCA - The NRCA Waterproofing and Dampproofing Manual.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit properties of primer, bitumen, and mastics.

C. Manufacturer's Installation Instructions: Submit special procedures and perimeter conditions requiring special attention.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until membrane has cured.

PART 2 PRODUCTS

2.1 BITUMINOUS DAMPPROOFING

A. Manufacturers:
1. Karnak Corp.
2. Lambert Corporation.
3. W.R. Meadows.
4. Substitutions: Not Permitted.

2.2 COMPONENTS

A. Cold Asphaltic Materials:
1. Asphalt Emulsion: Conforming to ASTM D3747.
2. Asphalt Primer: ASTM D41, compatible with substrate.

2.3 ACCESSORIES

A. Protection Board: 1/4 inch thick biodegradable hardboard.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.

C. Verify items penetrating surfaces to receive dampproofing are securely installed.

3.2 PREPARATION

A. Protect adjacent surfaces not designated to receive dampproofing.

B. Clean and prepare surfaces to receive dampproofing.

C. Do not apply dampproofing to surfaces unacceptable to manufacturer or applicator.

D. Apply mastic to seal penetrations, small cracks, or minor honeycomb in substrate.

3.3 INSTALLATION

A. Prime surfaces in accordance with NRCA - Waterproofing Manual.

B. Apply bitumen in one two coats, continuous and uniform, at rate recommended by manufacturer.

C. Apply from 2 inches below finish grade elevation to top of footings.

D. Seal items Projecting through dampproofing surface with mastic. Seal watertight.

E. Adhere protection board panel and drainage panel to substrate with mastic. Scribe and cut boards around Projections, penetrations, and interruptions.

F. Immediately backfill against dampproofing to protect from damage.

3.4 SCHEDULES

A. New Foundation Wall: Two coatings of asphalt dampproofing.

END OF SECTION

SECTION 07 13 00

SELF-ADHESIVE FLASHING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes sheet membrane waterproofing.

B. Related Sections:
   1. Section 07 90 00 - Joint Protection.

1.2 REFERENCES

A. ASTM International:
   1. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
   2. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
   3. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
   4. ASTM D1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
   5. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.

B. National Roofing Contractors Association:
   1. NRCA - The NRCA Waterproofing and Dampproofing Manual.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data for flexible flashings with temperature range for application of waterproofing membrane.

C. Manufacturer's Installation Instructions: Submit special procedures and perimeter conditions requiring special attention.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with NRCA Waterproofing Manual.

B. Maintain one copy of each document on site.

1.5 QUALIFICATIONS

A. Membrane Manufacturer: Company specializing in waterproofing sheet membranes with minimum three years documented experience.

B. Applicator: Company specializing in performing work of this section with minimum three years documented experience, approved by manufacturer.

1.6 PRE-INSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Maintain ambient temperatures above 25 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.

1.8 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Furnish five year manufacturer warranty for waterproofing failing to resist penetration of water.

C. For warranty repair work, remove and replace materials concealing waterproofing.

PART 2 PRODUCTS

2.1 SHEET MEMBRANE WATERPROOFING

A. Manufacturers:
1. Grace Construction Products, Vycor V-40, or equal.

B. Alternate Manufacturers:
1. Alternate products of adequate dimension and durability will be considered.
2. Substitutions: Section 01 60 00 - Product Requirements

2.2 COMPONENTS

A. Rubber Membrane: Asphalt based adhesive backed by high density cross laminated polyethylene. 32 inch wide roll; conforming to following criteria:

B. Performance Properties:

Property	Value	Test Method
Color	Gray-black	
Thickness	Membrane: 40 mil (1.02 mm)	ASTM D3767 method A
Adhesive	Asphalt based	

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.

C. Verify items penetrating surfaces to receive waterproofing are securely installed.

D. Verify substrate surface slopes to drain away from structure.

3.2 PREPARATION

A. Protect adjacent surfaces not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing. Vacuum substrate clean.

C. Do not apply waterproofing to surfaces unacceptable to manufacturer or applicator.

D. Seal cracks and joints with sealant materials using depth to width ratio as recommended by sealant manufacturer.

3.3 INSTALLATION - SELF ADHERED MEMBRANE WATERPROOFING

A. Roll out membrane. Minimize wrinkles and bubbles.

B. Remove release paper layer. Roll out on substrate with mechanical roller to encourage full contact bond.

C. Lap sides and ends per manufacturer’s recommendations.

D. Overlap edges and ends and seal minimum 3 inches. Seal permanently waterproof.

E. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.

F. Weather lap joints on sloped substrate in direction of drainage. Seal joints and seams.

G. Seal membrane to adjoining surfaces.

H. Extend membrane up intersecting surfaces at membrane perimeter minimum 6 inches above horizontal surface for first ply and as indicated at subsequent plies laid in shingle fashion.

I. Seal items protruding to or penetrating through membrane and install Counterflashing membrane material.

3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.

B. Do not permit traffic over or against unprotected or uncovered membrane.

END OF SECTION

SECTION 07 19 50

AIR AND VAPOR BARRIER

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Materials and installation methods for fluid-applied, vapor permeable air barrier membrane system located in the non-accessible part of the wall.
2. Materials and installation methods to bridge and seal air leakage pathways in roof and foundation junctions, window and door openings, control and expansion joints, masonry ties, piping and other penetrations through the wall assembly.

B. Related Sections include the following:

1. Section 03 30 00 – Cast-In-Place Concrete
2. Section 04 20 19 – Unit Masonry
3. Section 07 11 00 – Dampproofing
4. Section 07 13 00 – Self-Adhesive Flashing
5. Section 07 53 00/05 – Elastomeric Membrane Roofing
6. Section 07 90 00 – Joint Protection
7. Section 09 21 00 – Gypsum Board Assemblies

1.2 DEFINITIONS

A. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.3 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. The building envelope shall be designed and constructed with a continuous air barrier to control air leakage into, or out of the conditioned space. An air barrier shall also be provided for interior partitions between conditioned space and space designed to maintain temperature or humidity levels which differ from those in the conditioned space by more than 50% of the difference between the conditioned space and design ambient conditions. The air barrier shall have the following characteristics:

1. It must be continuous, with all joints made airtight.
2. It shall have an air permeability not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.02 L/s. x sq. m. @ 75 Pa), when tested in accordance with ASTM E2178.

3. It shall have an air permeability not to exceed 0.04 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.2 L/s. x sq. m. @ 75 Pa), when tested in accordance with ASTM E2357.
3. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
4. It shall be durable or maintainable.
5. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:

    a. Foundation and walls
    b. Walls and windows or doors
    c. Different wall systems
    d. Wall and roof
    e. Wall and roof over unconditioned space
    f. Walls, floor and roof across construction, control and expansion joints
    g. Walls, floors and roof to utility, pipe and duct penetrations

6. All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made airtight.

1.4 REFERENCES

A. The following standards and publications are applicable to the extent referenced in the text. The most recent version of these standards is implied unless otherwise stated.

B. American Society for Testing and Materials (ASTM)

1. ASTM C1193 Guide for Use of Joint Sealants
2. ASTM D412 Standard Test Methods for Rubber Properties in Tension
3. ASTM D570 Test Method for Water Absorption of Plastics
4. ASTM D903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
5. ASTM D1004 Test Method for Initial Tear Resistance of Plastic Film and Sheeting
6. ASTM D1876 Test Method for Peel Resistance of Adhesives
7. ASTM D1938 Test Method for Tear Propagation Resistance of Plastic Film and Sheeting
8. ASTM D1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
9. ASTM D4258 Practice for Surface Cleaning Concrete for Coating
10. ASTM D4263 Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
11. ASTM E96 Test Methods for Water Vapor Transmission of Materials
12. ASTM E154 Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
13. ASTM E1186 Practice for Air Leakage Site Detection in Building Envelopes and Air Retarder Systems
14. ASTM E2178 Standard Test Method for Air Permeance of Building Materials
15. ASTM E2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

1.5 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.

B. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.

1.6 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on product characteristics, performance criteria and limitations.

C. Manufacturer's Installation Instructions: Submit procedure for preparation and installation.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's recommendations for storage and handling of each product.

1.8 WARRANTY

A. Standard Product Warranty:
   1. Submit manufacturer’s warranty that air & vapor barrier and accessories are free of defects at time of delivery, and are manufactured to meet manufacturer's published physical properties and material specifications.
   2. Installer to warrant that air & vapor barrier and accessories have been installed in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 FLUID-APPLIED, VAPOR PERMEABLE MEMBRANE AIR BARRIER

A. FLUID-APPLIED AIR BARRIER MEMBRANE: Fluid-applied, vapor permeable, acrylic membrane that cures to form a resilient, monolithic, fully bonded elastomeric membrane when applied to construction surfaces. The membrane provides superior protection against the damaging effects of air and liquid water ingress on the building structures. Perm-A-Barrier VP, as manufactured by Grace Construction Products, 62 Whittemore Avenue, Cambridge, MA, or equal. Product shall have the following minimum physical properties:

   1. Membrane Air Permeance: ASTM E2178: Not to exceed 0.0004 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.002 L/s. x sq. m. @ 75 Pa)
   2. Assembly Performance: Provide a continuous air barrier assembly that has an air leakage not to exceed 0.0008 cfm/sq. ft. of surface area under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.004 L/s. x sq. m. of surface area at 75 Pa) when tested in accordance with ASTM E2357.
   3. Membrane Vapor Permeance: ASTM E96, Method B: 11.2 perms

4. Peel Adhesion: ASTM D903: min. 5 pli or substrate failure to glass faced wall board, min. 20 pli to concrete/CMU
5. UV Exposure Limit: Not more than 180 calendar days

B. TRANSITION MEMBRANE: Perm-A-Barrier Detail Membrane manufactured by Grace Construction Product; a 0.9 mm (36 mils) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (4 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:

1. Water Vapor Transmission: ASTM E96, Method B: 0.05 perms (2.9 ng/Pa s. sq. m.) max.
2. Air Permeance at 75 Pa (0.3 in. water) pressure difference: 0.0006 L/s. sq. m (0.00012 cfm/ sq. ft.) max.
3. Puncture Resistance: ASTM E154: 178 N (40 lbs.) min.
4. Lap Adhesion at -4ºC (25ºF): ASTM D1876: 880 N/m (5.0 lbs./in.) of width
5. Low Temperature Flexibility: ASTM D1970: Unaffected to -43ºC (-45ºF)
6. Tensile Strength: ASTM D412, Die C Modified: min. 2.7 MPa (400 psi)
7. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200%

C. FLEXIBLE MEMBRANE WALL FLASHING: Perm-A-Barrier Wall Flashing manufactured by Grace Construction Products; a 0.8 mm (32 mils) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (8 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:

1. Water Vapor Transmission: ASTM E96, Method B: 0.05 perms (2.9 ng/ Pa s. sq. m.) max.
2. Water Absorption: ASTM D570: max. 0.1% by weight
3. Puncture Resistance: ASTM E154: 356 N (80 lbs.) min.
4. Tear Resistance
    a. Initiation ASTM D1004: min. 58 N (13.0 lbs.) M.D.
    b. Propagation ASTM D1938: min. 40 N (9.0 lbs.) M.D.
5. Lap Adhesion at -4ºC (25ºF): ASTM D1876: 880 N/m (5.0 lbs./in.) of width
6. Low Temperature Flexibility: ASTM D1970: Unaffected to -43ºC (-45ºF)
7. Tensile Strength: ASTM D412, Die C Modified: min. 5.5 MPa (800 psi)
8. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200%

D. FLEXIBLE MEMBRANE ALUMINUM FLASHING: Perm-A-Barrier Aluminum flashing manufactured by Grace Construction Products; a 0.9 mm (35 mils) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (5 mil) of aluminum film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:

1. Water Absorption: ASTM D570: max 0.1% by weight
2. Puncture Resistance: ASTM E154: 355N (80 lbs) min.
3. Lap Adhesion at -4ºC (25ºF): ASTM D1876 Modified: 880 N/m (5.0 lbs./in.) of width
4. Low Temperature Flexibility: ASTM D1970 Modified: Unaffected to -26ºC (-15ºF)
5. Tensile Strength: ASTM D412, Die C Modified: min. 4.1 MPa (600 Psi)
6. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C Modified: min. 200%

2.02 PRIMERS

A. Wall Primer for Self-adhered transition membrane and Self-adhered flexible membrane wall flashing: Perm-A- Barrier WB Primer manufactured by Grace Construction Products; a water-based primer which imparts an aggressive, high tack finish on the treated substrate.

1. Flash Point: No flash to boiling point
2. VOC Content: Not to exceed 10 g/L
3. Application Temperature: -4°C (25°F) and above
4. Freezing point (as packaged): -7°C (21°F)

2.03 PENETRATIONS & TERMINATION SEALANT

A. Liquid Membrane for Details and Terminations: Bituthene Liquid Membrane manufactured by Grace Construction Products; a two-part, elastomeric, trowel grade material designed for use with fluid-applied membranes, self-adhered membranes and tapes. 10 g/L max. VOC content.

B. Substrate Patching Membrane: Bituthene Liquid Membrane manufactured by Grace Construction Products; a two- part, elastomeric, trowel grade material designed for use with fluid-applied membranes, self-adhered membranes and tapes. 10 g/L max. VOC content.

C. Joint Sealant: Refer to sealant manufacturer's recommendations.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrates and conditions are ready to accept the Work of this section. Notify [engineer] [architect] [consultant] in writing of any discrepancies. Commencement of the Work or any parts thereof shall mean acceptance of the prepared substrates.
B. All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the membranes. Fill voids, gaps and spalled areas in substrate to provide an even plane. Strike masonry joints full-flush.
Curing compounds or release agents used in concrete construction must be resin based without oil, wax or pigments.

3.02 SURFACE PREPARATION

A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods that are acceptable to manufacturer of the fluid-applied air barrier assembly.

B. Exterior sheathing panels: Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws. Pre-treat all board joints with 50 – 75 mm (2-3 in.) wide, manufacturer's recommended mesh-style wallboard tape. Gaps greater than 6 mm (1/4 in.) should be filled with mastic or caulk, allowing sufficient time to fully cure before application of the mesh-style wallboard tape and fluid applied air barrier system.

C. Masonry Substrates: Apply air and vapor barrier over concrete block and brick with smooth trowel-cut mortar joints, struck full and flush. Fill all voids and holes, particularly in the mortar joints, with a lean mortar mix, non-shrinking grout or parge coat.

D. Related Materials: Treat construction joints and install flashing as recommended by manufacturer.

E. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.

F. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

G. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

H. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate patching membrane.

I. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

J. At changes in substrate plane, apply sealant or Bituthene Liquid Membrane at sharp corners and edges to form a smooth transition from one plane to another.

K. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.03 JOINT TREATMENT

A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C1193 and air barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D4258 before coating surfaces.

1. Prime substrate as required.

B. Gypsum Sheathing: Fill joints greater than 1/4 inch (6 mm) with sealant according to ASTM C1193 and with air barrier manufacturer's written instructions. Apply mesh-style wallboard tape to joint prior to installing fluid air barrier membrane.

3.04 AIR BARRIER MEMBRANE INSTALLATION

A. Apply air barrier membrane to achieve a continuous air barrier according to air barrier manufacturer's written instructions.

B. Apply air barrier membrane within manufacturer's recommended application temperature ranges.

C. Apply a continuous unbroken air barrier to substrates according to the following minimum thickness. Apply membrane in full contact around protrusions such as masonry ties.

1. Vapor-Permeable Membrane Air Barrier: 90-mil (2.4-mm) wet film thickness, 42~45-mil (1.2-mm) dry film thickness.

D. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.05 TRANSITION MEMBRANE INSTALLATION

A. Install strips, transition membrane, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.

B. Apply primer to substrates to receive transition membrane at required rate and allow to dry. Limit priming to areas that will be covered by transition tape in same day. Re-prime areas exposed for more than 24 hours.

1. Prime glass-fiber-surfaced gypsum sheathing not covered with air membrane material with number of prime coats needed to achieve required bond, with adequate drying time between coats.

C. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

D. At end of each working day, seal top edge of strips and transition membrane to substrate with termination sealant.

E. Apply joint sealants forming part of air barrier assembly within sealant manufacturer's recommended application temperature ranges. Consult sealant manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition membrane so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates.

1. Transition Membrane: Roll firmly to enhance adhesion.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

H. Repair punctures, voids, and deficient lapped seams in strips and transition membrane. Slit and flatten fish-mouths and blisters. Patch with transition membrane extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.06 FIELD QUALITY CONTROL

A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes
2. Continuous structural support of air barrier system has been provided
3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings

4. Site conditions for application temperature and dryness of substrates have been maintained
5. Maximum exposure time of materials to UV deterioration has not been exceeded
6. Surfaces have been primed, if applicable
7. Laps in strips and transition membrane have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fish-mouths
8. Termination sealant has been applied on cut edges
9. Strips and transition membrane have been firmly adhered to substrate
10. Compatible materials have been used
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal
13. All penetrations have been sealed

C. Tests: Testing to be performed will be determined by Owner's testing agency from among the following tests:

1. Qualitative Testing: Air barrier assemblies will be tested for evidence of air leakage according to ASTM E1186.

D. Remove and replace deficient air barrier components and retest as specified above.

3.07 CLEANING AND PROTECTION

A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

B. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace main air barrier material exposed for more than 180 days.

C. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

D. Remove masking materials after installation.

END OF SECTION

SECTION 07 21 00

MISCELLANEOUS BUILDING INSULATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.

B. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.

C. 07 26 00 Vapor Retarders.

1.2 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on product characteristics, performance criteria, limitations, and adhesives .

C. Manufacturer's Installation Instructions: Submit special environmental conditions required for installation, and installation techniques.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.2 SECTION INCLUDES

A. Miscellaneous insulation materials not specified in other sections.

1.3 SYSTEM DESCRIPTION

A. System performance to provide continuity of thermal barrier and vapor retarder at building enclosure elements.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Install insulation adhesives in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 INSULATION MATERIALS

A. Non-Expansive Spray Foam Insulation: spray applied high-performance non-expansive foam insulation system:
   1. Thermal Resistance: R-3 minimum per inch, provide to seal and fill gaps at all door and window jamb rough openings, between panelized wood framing and where indicated. Provide window and door manufacture acceptance of product.

B. Sill Seal Insulation: Between concrete/wood structural floor systems and sill plates where indicated, ¼" x 3 ½" or 5 ½" as indicated, Owens Corning FoamSealR Sill Plate Gasket, or equal. Seal to concrete and wood surface front and back.

C. Spray Applied Open Cell Form Insulation: Applied as indicated on the drawings, Light density, open celled, flexible, 100 percent water blown polyurethane foam insulation that contains no urea-formaldehyde, Icynene Classic, (LD-C-50) by Icynene Inc. or equal.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that substrate, adjacent materials, and insulation boards are dry and ready to receive insulation and adhesive. Install all products as per manufacturer's instructions.

END OF SECTION

SECTION 07 21 13

BOARD INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes rigid and semi-rigid board insulation at cavity wall construction, perimeter foundation wall, underside of floor slabs, exterior wall cavity, and miscellaneous locations.

B. Related Sections:
1. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.
2. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.
3. Section 07 21 00 – Miscellaneous Building Insulation.
4. Section 07 26 00 - Vapor Retarders: Vapor retarder materials to adjacent insulation.
5. Section 07 27 00 - Air Barriers: Air seal materials to adjacent insulation.

1.2 REFERENCES

A. ASTM International:
1. ASTM C240 - Standard Test Methods of Testing Cellular Glass Insulation Block.
2. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.
3. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
4. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
5. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
6. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.
7. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
8. ASTM E970 - Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source.

B. Green Seal:
1. GS-36 - Aerosol Adhesives.

1.3 SYSTEM DESCRIPTION

A. Materials of This Section: Provide continuity of thermal barrier at building enclosure elements.

B. Materials of This Section: Provide thermal protection to vapor retarder in conjunction with vapor retarder materials in Section 07 26 00.

C. Materials of This Section: Provide thermal protection to air seal materials at building enclosure elements in conjunction with air barrier materials in Section 07 27 00.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on product characteristics, performance criteria, limitations, and adhesives.

C. Manufacturer's Installation Instructions: Submit special environmental conditions required for installation, and installation techniques.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Insulation Installed in Concealed Locations Surface Burning Characteristics:
   1. Foam Plastic Insulation: Maximum 75/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
   2. Other Insulation: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

B. Insulation Installed in Exposed Locations Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

C. Apply label from agency approved by authority having jurisdiction to identify each foam plastic insulation board.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Do not install adhesives when temperature or weather conditions are detrimental to successful installation.

1.7 SEQUENCING

A. Section 01 10 00 - Summary: Work sequence.

1.8 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate Work with Section 07 26 00 for installation of vapor retarder and Section 07 27 00 for air seal materials.

PART 2 PRODUCTS

2.1 BOARD INSULATION

A. Manufacturers:
   1. DiversiFoam Products - Extruded-Polystyrene Insulation.
   2. Dow Chemical - Extruded-Polystyrene Insulation.
   3. Tenneco Foam Products - Extruded-Polystyrene Insulation.
   4. UC Industries/Owens Corning - Extruded-Polystyrene Insulation.

2.2 COMPONENTS

A. Extruded Polystyrene Insulation (Foundations, slabs, new addition walls): ASTM C578 Type VI; cellular type, conforming to the following:
   1. Board Size: 24 inch width.
   2. Board Thickness: as indicated in listed construction assemblies.
   3. Thermal Resistance: R of 5.0 per inch.
   4. Water Absorption: In accordance with ASTM D2842; 0.3 percent by volume maximum.
   5. Compressive Strength: Minimum 25 psi.
   6. Board Edges: Square edges and lap joints as indicated.

B. Insulation (Auditorium walls): ASTM C1289, Type II, Class I, faced rigid cellular polyisocyanurate closed cell foam core insulation with manufacturer's standard facing; thicknesses as indicated, square edges, R value of 6.0-7.0 per inch thickness.
   1. Insulation Thickness: Provide a minimum of R-20 of insulation at retrofit wall system based on insulation thickness indicated. (Note: Provision for R-20 insulation assumes R-21 will be achieved across complete wall assembly, including framing and sheathing materials)

2.3 ACCESSORIES

A. Adhesive Type 1: Type recommended by insulation manufacturer and for specific application (adhesive may change with application)
   1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
   2. Interior Aerosol Adhesives: Maximum volatile organic compound content in accordance with GS-36.

B. Adhesive: OSI QB-300, Chemlink M-1, Chemlink Build Secure, Chemlink Wall Secure or architect approved equal

C. Sealants: 30 year Siliconized Acrylic Sealant, Chemlink M-1, 100% pure silicone or architect approved equal.

D. Tape: Bright aluminum Polyethylene self-adhering type, mesh reinforced, 2 inch wide.

E. Foundation Insulation Fasteners: Impaling clip of galvanized steel with washer retainer and clips, to be mechanically fastened to surface to receive board insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify substrate, adjacent materials, and insulation boards are dry and ready to receive insulation and adhesive.

C. Verify substrate surface is flat, free of honeycomb, fins, irregularities, materials or substances affecting adhesive bond.

3.2 INSTALLATION - FOUNDATION PERIMETER BOARD INSULATION

A. Adhere 6 inch wide strip of polyethylene sheet over construction joints with double beads of Type 1 adhesive each side of joint.
   1. Tape seal joints.
   2. Extend sheet full height of joint.

B. Apply Type 1 adhesive in three continuous beads per board length to full bed 1/8 inch thick.

C. Install boards on foundation wall perimeter. Place membrane surface of insulation against adhesive.

D. Extend boards over control and expansion joints, unbonded to foundation 6 inches on one side of joint.

E. Cut and fit insulation tight to protrusions or interruptions to insulation plane.

F. Immediately following application of board insulation, place protective boards over exposed insulation surfaces, apply Type 1 adhesive in five continuous beads per board length.
   1. Install boards horizontally from base of foundation to top of insulation as indicated in drawings.
   2. Butt board joints tight; stagger from insulation joints.

3.3 INSTALLATION - UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tight to protrusions or interruptions to insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.4 INSTALLATION – MISCELANIOUS LOCACTIONS

A. Place insulation in miscellaneous locations indicated on drawings. Air seal joints and panels to substrate.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.

B. Do not permit damage to insulation prior to covering.

END OF SECTION

SECTION 07 21 19

FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes foamed-in-place insulation in exterior envelope assemblies as indicate on the drawings, including but not limited to exterior wall insulation system, wall and roof crevices requiring thermal seal, and; and at junctions of dissimilar wall and roof materials to achieve thermal and air seal, with protective overcoat.

B. Related Sections:
1. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.
2. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.
3. Section 07 26 00 - Vapor Retarders.
4. Section 07 27 07 - Air Barriers: Materials continuing air barrier seal.
5. Section: Roof insulation.
6. Section: Integral wall insulation.

1.2 REFERENCES

A. ASTM International:
1. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
2. ASTM C1029 - Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation.
3. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
4. ASTM D1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics.
5. ASTM D2482 - Standard Test Method for Surface Strength of Paper (Wax Pick Method).
6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
7. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.

B. Green Seal:
1. GS-11 - Product Specific Environmental Requirements.

1.3 PERFORMANCE REQUIREMENTS

A. Conform to applicable code for flame and smoke, concealment, and over coat requirements.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit product description, insulation properties, preparation requirements, and overcoat properties.

C. Manufacturer's Installation Instructions: Submit special procedures, and perimeter conditions requiring special attention.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Insulation Installed in Concealed Locations Surface Burning Characteristics:
   1. Foam Plastic Insulation: Maximum 75/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
   2. Overcoat: 15 minute thermal barrier, Class A flame spread/smoke developed index when tested in accordance with ASTM E84.

B. Apply label from agency approved by authority having jurisdiction to identify each foam plastic component.

C. Perform Work in accordance with State and Municipality of project location standard.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum three years documented experience approved by manufacturer and with service facilities within 100 miles of project.

1.7 PRE-INSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Do not install insulation when ambient temperature is lower manufacturers required minimum installation temperature.

PART 2 PRODUCTS

2.1 FOAMED-IN-PLACE INSULATION

A. Products/Manufacturer:
   1. Polyurethane: Spray applied polyurethane, ASTM D 1622, closed cell insulation, 2.5 lbs./sf density, aged (180 days) R-value of 6.2 per inch, DEMILEC HeatLoc Soy, or equal.
   2. Thermal Resistance of new Foamed-in-Place Insulation as required to supplement existing insulation systems as indicated on drawings to achieve the following minimum R-values as indicated on listed assemblies (see Drawings).
   3. Substitutions: Section 01 60 00 - Product Requirements.

B. Furnish materials in accordance with State and Municipality of project location standards.

2.2 ACCESSORIES

A. Primer: As required by insulation manufacturer for adhesion to substrate.
   1. Interior Flat and Non-Flat Paints: Maximum volatile organic compound content in accordance with GS-11.

B. Overcoat: Provide approved Ignition Barrier at all locations of exposed foam insulation, spray applied, type approved by the State Fire Marshal to provide a 15 minute thermal barrier and to achieve required flame spread/smoke developed index.
   1. Acceptable products:
      a. International Fireproof Technology Inc. DC333
      b. TPR2 Fireshell F10E
      c. Cafco TB-415
   2. Install as per manufacturers instructions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify Work within construction spaces or crevices are complete prior to insulation application.

C. Verify surfaces are clean, dry, and free of matter capable of inhibiting insulation or overcoat adhesion.

3.2 PREPARATION

A. Mask and protect adjacent surfaces from over spray or dusting.

B. Apply primer as required.

3.3 INSTALLATION

A. Prime delineated substrate to receive specified components if required by manufacturer.

B. Apply insulation by spray method, to uniform monolithic density without voids.

C. Apply to achieve thermal resistances as indicated in listed individual assemblies (see drawings).

D. Apply overcoat monolithically, without voids to fully cover foam insulation, to achieve fire rating required at exposed insulation locations.

E. Patch damaged areas.

3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements

B. Section 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

C. Field inspection and testing will be performed under provisions of Section 01 40 00 - Quality Requirements.

D. Inspection will include verification of insulation and overcoat thickness and density.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.

B. Do not permit subsequent construction Work to disturb applied insulation.

END OF SECTION

SECTION 07 21 60

CONTINUOUS INSULATION WALL PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Continuous insulation plywood wall panels (with non-fire retardant rated plywood for use in wood frame construction not required to comply with NFPA 285).

1.2 RELATED SECTIONS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.

B. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.

C. Section 07 27 00 - Air Barriers: Air seal materials over insulation to adjacent insulation.

D. Section 06 10 00 – Rough Carpentry

E. Section 07 46 46 –Fiber Cement Siding System

1.3 REFERENCES

A. ASTM C 209 – Methods of Testing Insulating Board, Structural and Decorative.

B. ASTM C 1289 – Specifications for Faced Rigid Cellular Polyisocyanurate Thermal Insulating Board.

C. ASTM D 1621 – Test Methods for Compressive Properties of Rigid Cellular Plastics.

D. ASTM D 2126 - Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.

E. ASTM D 3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

F. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

G. ASTM E 96 - Test Method for Water Vapor Transmission of Materials.

H. CAN/ULC S770 - Standard Test Method for Determination of Long Term Thermal Resistance of Closed Cell Plastic Thermal Insulating.

I. NFPA 285 - Standard Fire Test Method For Evaluation Of Fire Propagation Characteristics Of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components. (NOT APPLICABLE)

1.4 DESIGN REQUIREMENTS

A. Perform work in accordance with all federal, state and local codes.

B. Physical properties (Foam Core):
1. Compressive Strength: ASTM D 1621; Grade 2, 20 psi (138 kPa) minimum or Grade 3, 25 psi (172 kPa).
2. Dimensional Stability: ASTM D 2126, 2 percent linear change (7 days).
3. Moisture Vapor Permeance: ASTM E 96, less than 1 perm (57.5ng/(Pa•s•m2)).
4. Water Absorption: ASTM C 209, less than 0.1 percent by volume.
5. Service Temperature: Minus 100 degrees to 250 degrees F (Minus 73 degrees C to 122 degrees C).
6. Resistance to Mold: ASTM D 3273 Passed (10).

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Manufacturer's data sheets on wall panels and fasteners to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Manufacturer's Certificate: Certify panels will conform to specified performance requirements.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall be a company that regularly manufactures and assembles specified insulation in house with no outside fabrication operations.

B. Pre-Installation Meeting: Convene minimum one week prior to commencing Work of this section. Review installation procedures and coordination required with Related Work and include the following:
1. Participants: Authorized representatives of the Contractor, Architect, Installer, and Manufacturer.
2. Review wall assemblies for potential interference and conflicts and coordinate layout and support provisions for interfacing work.
3. Review continuous insulation wall panels installation methods and procedures related to application, including manufacturer’s installation guidelines.
4. Review firestopping requirements and weather resistive membrane requirements and placement locations.
5. Review field quality control procedures.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products off the ground, in dry conditions, under cover and in manufacturer's unopened packaging until ready for installation.

1.8 SEQUENCING

A. Coordinate with the installation of air barriers specified is Section 07 27 00.

B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.9 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Insulating panel products produced by Hunter Panels, 15 Franklin Street, Portland, Maine 04101. ASD. Phone: (207) 761-5678 or (888) 746-1114. Fax: (207) 775-1769. E-mail: info@hpanels.com, or equal.

B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 BOARD INSULATION

A. Board Insulation Bonded to Plywood: high thermal resistive rigid insulation panel composed of a closed cell polyisocyanurate foam core bonded to plywood.
   1. Type: ASTM C 1289, Type V:
      a. Grade 2 (20 psi).
   2. Plywood Thickness (non-Fire Retardant Treated):
      a. 3/4 inch.
   3. Panel Size:
      a. 4 feet by 8 feet (1220 mm by 2440 mm).
   4. Thickness / R Value: Long Term Thermal Resistance Values based on ASTM C 1289 and CAN/ULC S770 with a 15-year time weighted average.
      a. 2.7 inches (66 mm) / R Value 12.7.

2.3 SEALANT

A. Polyurethane Foam Sealant: Liquid urethane prepolymer mixture packaged under pressure, designed to seal, fill and insulate small cracks, gaps and voids applied with a straw applicator, a professional dispensing unit or a professional hose kit, Handi-Foam, Fomo Products, Inc, or equal. Apply to structurally bond and air seal between all panel butt edges and between panel butt ends and adjacent insulation envelope materials.

2.4 APPLICATION

A. Non-Rated Exterior Wood Stud Walls: Continuous board type insulation applied to wood sheathing over wood studs with exterior air barrier and siding system. Refer to details in Drawings

2.5 PANEL FASTENERS

A. Fasteners to be a corrosion resistant type with oversized flat heads, manufactured in accordance with ASTM A510 (60KSI tensile strength), 0.172" root diameter, "Headlok" screws, manufactured by Fastenmaster, or pre-approved equivalent. Fasteners to be of such a length as to provide 2" penetration (minimum) into studs. Install fasteners into wood studs at a pattern of 8" o.c. (maximum) vertical x 24" o.c. (maximum) horizontal (36 fasteners per 4'x8' panel).

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until exterior walls have been properly prepared.

B. Verify that all exterior wall assembly construction has been completed to the point where the insulation may correctly be installed.

C. Verify that mechanical and electrical services in walls have been installed and tested and, if appropriate, verify that adjacent materials and finishes are dry and ready to receive insulation.

D. If wall assembly preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in exterior spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Air seal between all panel butt edges and between panel butt ends and adjacent insulation envelope materials with specified sealant.

E. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within plane of insulation.

F. Fasten insulation as recommended by the Hunter Panel Installation Guide. Provide base support for the insulation panels as required for the exterior cladding to be installed over the panels.

G. Exposed insulation must be protected from open flame and kept dry at all times.

H. Install air barriers over insulation panels as specified in Section 07270.

I. Exterior wall insulation is not intended to be left exposed for extended periods of time in excess of 45-60 days without adequate protection. If extended exposure is anticipated all exposed foam surfaces including corners, window and door openings, should be taped with a compatible waterproof tape.

J. Install exterior cladding as recommended by the cladding manufacturer and as specified in other sections of this specification.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Cover the top and edges of unfinished roof panel work to protect it from the weather and to prevent accumulation of water in the cores of the panels.

C. Do not leave panels exposed to moisture. Wet panels shall be removed or allowed to completely dry prior to application of vapor barrier and/or roof covering.

D. Repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 26 00

VAPOR RETARDERS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes sheet and sealant materials for controlling vapor diffusion.

B. Related Sections:
1. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.
2. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.
3. Section 07 27 00 - Air Barriers: Continuation of wall air barrier system.
4. Section 06 10 00 - Rough Carpentry
5. Section 03 30 00 - Cast-in-Place Concrete.
6. Section 07 27 00 - Air Barriers.
7. Section 31 21 13 - Radon Mitigation.

1.2 REFERENCES

A. ASTM International:
1. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
2. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.

B. Green Seal:
1. GS-36 - Aerosol Adhesives.

C. Sealant, Waterproofing and Restoration Institute:
1. SWRI - Sealant Specification.

1.3 PERFORMANCE REQUIREMENTS

A. Vapor Retarder Permeance: Maximum 1 perm perms when tested in accordance with ASTM E96/E96M, desiccant method.

1.4 SUBMITTALS

A. Product Data: Submit data on product characteristics, performance criteria and limitations.

B. Manufacturer's Installation Instructions: Submit procedure for preparation and installation.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with SWRI - Sealant and Caulking Guide Specification requirements for materials and installation.

1.6 SEQUENCING

A. Section 01 10 00 - Summary: Work sequence.

B. Sequence Work to permit installation of materials in conjunction with other retardant materials and seals, and air barrier assemblies specified in Section 07 27 00.

C. Do not install vapor retarder until items penetrating vapor retarder are in place.

PART 2 PRODUCTS

2.1 VAPOR RETARDERS

A. Manufacturers:
1. Raven Industries Model Vapor Block 15, or equal
2. Alumiseal Corp.
3. Fiberweb Corp.
4. Griffolyn, Reef Industries
5. Substitutions: Section 01 60 00 - Product Requirements.

2.2 COMPONENTS

A. Sheet Retarder Type 1: Clear polyethylene film for above grade application, 10 mil thick – where indicated in the roof and ceiling assembly.

B. Sheet Retarder Type 2: polyethylene film, 15 mil thick.

2.3 ACCESSORIES

A. Seam Tape: Vapor Bond Tape, by Raven Industries or other 4” wide tape approved by vapor retarder manufacturer.

B. Pipe Boots: Raven VaporBoot or other manufacturer’s supplied pipe boot.

PART 3 EXECUTION

3.1 PREPARATION

A. Remove loose or foreign matter capable of impairing adhesion.

B. Clean and prime substrate surfaces to receive adhesive and sealants.

3.2 EXISTING WORK

A. Clean and repair existing construction to provide positive and continuous seal for vapor retarders.

3.3 INSTALLATION

A. Vapor Retarder For Below Grade Locations: Secure sheet retarder Type 2 in accordance with manufacturer’s instructions and ASTM E 1643.
1. Unroll Vapor Retarder with the longest dimension parallel with the direction of the pour.
2. Lap Vapor Retarder over footings and seal to foundation walls.
3. Overlap joints 6 inches and seal with Vapor Bond Tape or other 4” wide pressure sensitive tape.

4. Seal all penetrations (including pipes) with manufacturer's pipe boot. Seal to all penetrations in attic ceiling for lighting, and electrical items.
5. No penetration of the Vapor Retarder is allowed except for reinforcing steel and permanent utilities.
6. Repair damaged areas by cutting patches of Vapor Retarder, overlapping damaged area 6 inches and taping all four sides with Vapor Bond Tape or other 4" wide pressure sensitive tape.
7. Coordinate installation of vapor barrier with requirements for installation of 31 21 13 Radon Mitigation system.

B. Vapor Retarder For Stud Framed Walls: Secure sheet retarder Type 1 to stud faces with adhesive. Lap edges over stud faces, lap ends onto adjacent construction; calk ends with Type sealant to ensure complete seal.

C. Vapor Retarder For Wall/Roof Junction: Lap sheet retarder Type 1 from wall retarder onto roof vapor retarder continuously. Seal edges and ends with adhesive. Calk with sealant to ensure complete seal. Position laps over firm bearing.

D. Vapor Retarder Seal For Openings: Install sheet retarder Type 1 between window and door frames and adjacent vapor retarder and seal with adhesive. Calk with sealant to ensure complete seal. Position laps over firm bearing.

E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges or where compatibility with adjacent materials may be in doubt.

3.4 SCHEDULES

A. Provide at all locations indicated on Drawings.

B. Window Frame Perimeter: Lap sheet retarder Type 1 from wall vapor retarder (with 3 inches of contact over firm bearing) to window frame (with 1 inch of contact). Seal with sealant Type A.

C. Wall and Roof Junction: Lap sheet retarder Type 1 from wall vapor retarder (with 6 inches of contact over firm bearing) to roof vapor retarder (with 4 inches of contact). Seal with sealant Type A.

D. Below Slab: Type 2 so as to provide a complete vapor seal between foundation walls.

END OF SECTION

SECTION 07 41 13

METAL PANEL ROOFING SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. EXTERIOR FINISH TYPE D - REFER TO DRAWINGS A3.00 AND A.3.01 BUIDLING ELEVATIONS

B. Furnish and install no clip metal panel roofing system, including:

1. Roofing manufacturer's requirements for the specified warranty.

2. Preparation of roofing substrates.

3. Wood nailers for roofing attachment.

4. Insulation.

5. Cover boards.

6. Self-adhering underlayment.

7. Metal roof edging and copings.

8. Flashings.

9. Other roofing-related items specified or indicated on the drawings or otherwise necessary to provide a complete roofing system.

C. Disposal of demolition debris and construction waste is the responsibility of Contractor. Perform disposal in manner complying with all applicable federal, state, and local regulations.

D. Comply with the published recommendations and instructions of the roofing system manufacturer, at http://manual.fsbp.com .

E. Commencement of work by the Contractor shall constitute acknowledgement by the Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing system manufacturer. No modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.

1.2 RELATED SECTIONS [as present or needed]

A. Section 06 10 00 - Rough Carpentry:

1. Roof Sheathing: Plywood or oriented strand board (OSB), minimum 7/16 inch (11 mm) thickness with H-clip or tongue-and-grooved joints.

2. Perimeter wood members for attachment of edge trim.

3. Wood nailers associated with roof insulation installed by others.

B. Section 07 62 00 - Sheet Metal Flashing and Trim: Formed metal flashing and trim items associated with non-metal roofing.

C. Section 07 72 00 - Roof Accessories: Roof hatches and vents for installation on curbs specified in this section.

D. Section 08 62 00 - Unit Skylights: For installation on curbs specified in this section.

1.3 REFERENCES

A. Referenced Standards: These standards form part of this specification only to the extent they are referenced as specification requirements.

1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers; 2011.

2. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.

3. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2008.

4. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2013.

5. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2013.

6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2013a.

7. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; American Society for Testing and Materials; 2011.

8. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2012.

9. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference; American Society for Testing and Materials; 2005 (Reapproved 2012)

10. ASTM E1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference; American Society for Testing and Materials; 1995 (Reapproved 2011).

11. ASTM E1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems; American Society for Testing and Materials; 2011.

12. MBMA - Metal Roofing Systems Design Manual; Metal Building Manufacturers Association; 2012.

13. PS 1 - Construction and Industrial Plywood; 2009.

14. PS 20 - American Softwood Lumber Standard; 2010.

15. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

16. UL 2218 - Standard for Impact Resistance of Prepared Roof Covering Materials; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's data sheets on each product to be installed and manufacturer's standard detail drawings applicable to this project.

B. Installation Instructions: Provide manufacturer's instructions to installer, marked up to show exactly how all components will be installed; where instructions allow installation options, clearly indicate which option will be used.

C. Samples: Submit following samples for approval:

1. 12 inch (300 mm) long sample of roof panel.

2. Roof attachment clips.

3. Color chips for selection of finish color and sheen.

4. After selection of finish color, provide two 3 by 5 inch (75 by 125 mm) metal samples finished in color selected.

D. Shop Drawings: Provide drawings prepared especially for this project for all relevant conditions, including plans and elevations, sections and details, specified loads, flashings, roof edges, terminations, expansion joints, curbs, penetrations, and drainage. Specifically include interfaces with materials not supplied by metal roof panel manufacturer and identify each component and its finish.

E. Pre-Installation Notice: Copy to show that manufacturer's required Pre-Installation Notice (PIN) has been accepted and approved by the manufacturer.

F. Manufacturer's Installation Inspection Reports: Manufacturer may, at its option, inspect the installation at any time to appraise the installing contactor of their compliance with manufacturer's requirements. Typical inspections will include:

1. Prior to the installation of the metal roofing panels to inspect the underlayments. The roofing contractor is responsible for assuring that the substrate is in suitable condition for the installation of the metal roofing components to the substrate.

2. Intermediate inspections to ensure proper installation of the metal roofing panels (if required).

3. At final completion of all metal roofing system work.

4. Submit to Owner, for the project record, a copy of each report of inspection made.

5. Executed Warranty, by authorized company official with final close-out.

6. Specimen Warranty: Submit prior to starting work.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Roofing installer shall have received training from metal panel manufacturer for installation of the specified roof panel system, and:

1. Current Firestone Red Shield licensed installer status.

2. Having and using only equipment authorized and inspected by metal panel manufacturer.

3. Capability to provide payment and performance bond to building owner.

B. Pre-Installation Conference: Before start of roofing work, Contractor shall hold a meeting to discuss the proper installation of materials and requirements to achieve the warranty.

C. Require attendance with all parties directly influencing the quality of roofing work or affected by the performance of roofing work.

D. Notify Architect well in advance of meeting.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.

B. Exercise extreme care in unloading, storing, and installing metal panels to prevent bending, warping, twisting, and surface damage.

C. Store products above ground on well-supported platforms that provide minimum of 1:48 slope. Store under waterproof covering or indoors and provide proper ventilation of metal components to prevent condensation build-up between metal components.

1.7 WARRANTY

A. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.

B. Manufacturer's warranty is in addition to, and not a limitation of, other rights the owner may have under the contract documents.

C. Warranty: Firestone Red Shield Limited Warranty covering roof panels and associated metal components, roof sheathing/insulation manufactured by Firestone, and accessories, covering weathertightness, finish, materials, labor, and workmanship.

D. Limit of Liability: No dollar limitation.

E. Scope of Coverage: Repair leaks in the roofing system caused by:

1. Ordinary wear and tear of the elements.

2. Manufacturing defect in Firestone brand materials.

3. Defective workmanship used to install these materials.

4. Damage due to winds up to 55 or 72, 80, 90 mph.

F. Not Covered:

1. Materials made by entities other than Firestone Building Products

2. Damage due to winds in excess of 55 or 72, 80, 90 mph.

3. Damage due hurricanes or tornadoes.

4. Hail.

5. Intentional damage.

6. Unintentional damage due to normal rooftop inspections, maintenance, or service.

G. Painted Finish Warranty: Provide Firestone standard Red Shield non-prorated warranty covering durability of painted finish, to include film integrity, color change, fading, and chalking, unless otherwise indicated below.

1. Warranty Period: 20 years commencing on date of substantial completion.

2. Metallic Colors (as identified by Firestone): Not warranted against color change or fading.

3. Firestone Standard Color "Regal Red": Warranted against color change or fading for a maximum period of ten (10) years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer - Metal Roof Panels and Associated Sheet Metal Components: Firestone Building Products LLC, Carmel, IN: www.firestonebpco.com .

1. Provide all components of system supplied or specified by same manufacturer.

2. Roofing systems manufactured by others may be acceptable provided the roofing system is completely equivalent in materials and warranty conditions and the manufacturer meets the following qualifications:

a. Specializing in manufacturing the roofing system to be provided.

b. Minimum ten years of experience manufacturing the roofing system to be provided.

c. Able to provide a no dollar limit, single source roof system warranty that is backed by corporate assets in excess of one billion dollars.

d. ISO 9002 certified.

e. Able to provide waterproofing membrane underlayment.

f. Able to provide polyisocyanurate insulation.

B. Manufacturer of Insulation: Same manufacturer as metal roof panels.

C. Substitutions: See Section 1 - Product Requirements.

1. Submit evidence that the proposed substitution complies with the specified requirements.

2.2 ROOFING SYSTEM DESCRIPTION

A. Roofing System: Standing seam metal roof panels and other components, together forming a watertight assembly having the following characteristics:

1. Warranty: 5 year, 10 year, 15 year, 20 year, 25 year Medallion.

2. Panel Seam Type: Self-locking; not requiring field seaming.

3. Panel Material: Aluminum, 0.032 inch (0.81 mm) 0.040 inch (1.02 mm), with fluoropolymer coating.

3. Color: To be selected from manufacturer’s standard and premium colors.

4. Design Loads: In accordance with ASCE 7, current edition.

a. Design Snow Load: Not less than snow load listed on Structural Drawings.

b. Maximum Deflection Under Snow Load: Not more than L/180 or as recommended by ASCE 7, whichever is less.

c. Wind Uplift Resistance: Class 90 rating, minimum, when tested in accordance with UL 580.

d. Wind Pull-Off Resistance: No failure of roof panel or fasteners when tested in accordance with ASTM E1592 for negative loading equal to negative design wind load; for assemblies not tested, capacity for gauge, span, or loading may be determined by interpolating between test values only.

5. Impact Resistance: Minimum of Class 4, when tested in accordance with UL 2218.

6. Thermal Effects: Design roof panels and their attachment to allow free movement in response to expansion and contraction forces resulting from temperature variation, as specified in the MBMA Metal Roofing Systems Design Manual.

7. External Fire Resistance: Class A, B, C, when tested in accordance with ASTM E108 or UL 790.

8. Provide all necessary members and connections, whether indicated in the manufacturer's standard detail drawings or not.

9. Accessories and Fasteners: Capable of resisting the specified design wind uplift forces and allowing for thermal movement of the roof panel system, not restricting free movement of the roof panel system resulting from thermal forces except at designed points of roof panel fixity.

B. Roof System Components: In order from the top down:

1. Metal roofing panels and trim.

2. Underlayment: Self-adhering, high temperature underlayment over entire roof; material as specified.

3. Insulation cover board.

4. Roof Insulation: Polyisocyanurate foam insulation board.

a. Thickness: 2 inches (51 mm). [Note: Nominal R value = 5.7 R per 1 inch.]

5. Cover Board: Oriented strand board or plywood, minimum 7/16 inch (11 mm) thick.

OR

5. Cover Board: Gypsum-based cover board; minimum 1/4 inch (6 mm) thick.

2.3 ROOF PANELS AND SHEET METAL FABRICATIONS

A. Roof Panels: Firestone UNA-CLAD UC-4 No-Clip Standing Seam Roofing; roll formed roofing panels produced in a permanent factory environment with fixed-base roll-forming equipment.

1. Seam Height: 1-1/2 inches (38 mm).

2. Seam Spacing (Panel Width): 9.75 inches (248 mm) or 17.75 inches (450.9 mm).

3. Profile: Flat. Flat Ribs, Pencil Ribs or Striations.

4. Texture: Smooth. or Stucco Embossed.

5. Provide factory applied integral seam sealant in leg of panel.

6. Form roofing panels in longest practical lengths, true to shape, accurate in size, square, and free from distribution or manufacturing defects.

B. Steel Sheet: ASTM A653/A653M, lock-forming quality, extra smooth, tension-leveled, galvanized/galvannealed steel, minimum spangle.

OR

B. Aluminum Sheet For Painted and Mill Finish: ASTM B209, alloy 3003-H14/3105-H14.

C. Fluoropolymer Coating: 70 percent full strength Kynar 500/Hylar 5000.

1. Exposed Surface: 1.0 mil (0.25 mm) plus/minus 0.1 mil (0.025 mm) total dry film thickness.

2. Concealed Surface: 0.2 to 0.3 mils (0.05 to 0.08 mm) total dry film thickness.

3. Color: To be selected from manufacturer’s standard and premium colors.

D. Sheet Metal Components Associated with Metal Roof Panels: Made by same manufacturer and compatible with roof panels; of not less than minimum thickness required by roof panel manufacturer.

1. Fabricate trim, flashing, and accessories to roofing manufacturer’s specified or approved profiles.

2. Exposed metal components of same finish as panels.

3. Color: Same as panels.

4. Provide the following formed sheet metal components: (Retain as needed)

a. Eave.

b. Ridge.

c. Vented ridge.

d. Hip.

e. High eave.

f. High eave, vented.

g. Valleys

h. Rake edge.

i. Vertical fascia.

j. Side wall flashing.

k. Pipe and other penetration flashings, for penetrations over 8 inches.

l. Flashings at interface to other roofing types.

m. Other flashings.

n. Copings, parapet covers.

o. Soffit panels, solid.

p. Soffit panels, vented.

2.4 ROOF INSULATION AND COVER BOARDS (Retain as needed)

A. Polyisocyanurate Board Insulation: Closed cell polyisocyanurate foam with black glass reinforced mat laminated to faces, complying with ASTM C1289 Type I Class 1, with the following additional characteristics:

1. Thickness: As indicated elsewhere.

2. Thermal Value: R-value of 5.7 per 1 inch, when tested in accordance with ASTM C1289-13.

3. Compressive Strength: 20 psi (138 kPa) when tested in accordance with ASTM C1289.

4. UL-Classified and FM-approved for direct to steel deck applications.

5. Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents.

6. Recycled Content: 19 percent post-consumer and 15 percent post-industrial, average.

7. Acceptable Product: ISO 95+ GL Polyisocyanurate Insulation by Firestone.

B. Composite OSB/Polyisocyanurate Foam Insulation Boards: Closed cell polyisocyanurate foam complying with ASTM C1289 Type I Class 1, laminated to oriented-strand board, with black glass-fiber-reinforced mat on other face, with the following additional characteristics:

1. OSB Thickness: 7/16 inch (11 mm) thick.

2. Foam Thickness: As indicated elsewhere.

3. Foam Compressive Strength: 20 psi (138 kPa) when tested in accordance with ASTM C1289.

4. Recycled Content -- Foam Component: 19 percent post-consumer and 15 percent post-industrial, average.

5. Acceptable Product: HailGard (Nailbase) Insulation by Firestone.

C. High Density Polyisocyanurate Cover Board: Non-combustible, water resistant, high density closed cell polyisocyanurate core with coated glass mat facers, with the following characteristics:

1. Size: 48 inches (1220 mm) by 96 inches (2440 mm), nominal.

2. Thickness: 1/2 inch (12 mm).

3. Thermal Value: R-value of 2.5, when tested in accordance with ASTM C518 and ASTM C177.

4. Surface Water Absorption: 3 percent, maximum, when tested in accordance with ASTM C209.

5. Compressive Strength: 120 psi (830 kPa), when tested in accordance with ASTM D1621.

6. Density: 5 pcf (80 kg/cu m), when tested in accordance with ASTM D1622.

7. Factory Mutual approved for use with FM 1-60 and 1-90 rated roofing assemblies.

8. Mold Growth Resistance: Passing ASTM D3273.

9. Acceptable Product: ISOGARD HD Cover Board by Firestone.

D. Gypsum-Based Cover Board: Non-combustible, water resistant gypsum core with embedded glass mat facers, complying with ASTM C1177/C 1177M, and with the following additional characteristics:

1. Thickness: As indicated elsewhere.

2. Surface Water Absorption: 2.5 g, maximum, when tested in accordance with ASTM C473.

3. Spanning Capability: Recommended by manufacturer for following minimum flute spans:

a. 1/4 inch (6 mm) Thickness: 2-5/8 inches (66 mm), minimum.

4. Surface Burning Characteristics: Flame spread of 0, smoke developed of 0, when tested in accordance with ASTM E84.

5. Combustibility: Non-combustible, when tested in accordance with ASTM E136.

6. Factory Mutual approved for use with FM 1-60 and 1-90 rated roofing assemblies.

7. Mold Growth Resistance: Zero growth, when tested in accordance with ASTM D3273 for minimum of 4 weeks.

8. Pre-primed for better adhesion.

9. Acceptable Product: Georgia-Pacific DensDeck Prime Roof Guard.

E. Insulation/Cover Board Fasteners: Type and size as required by roof membrane manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof system manufacturer.

2.5 ACCESSORY MATERIALS

A. Self-Adhered Underlayment: Rubberized sheet waterproof membrane complying with ASTM D 1970/D1970M, self-adhering.

1. Resistance to Direct Exposure: At least 90 days.

2. Minimum High Temperature Resistance: 230 degrees F (110 degrees C).

3. Water Vapor Permeance: 0.1 perm (5.7 ng/(Pa s sq m)), maximum.

4. Acceptable Product: Clad-Gard SA by Firestone

B. Fasteners: In strict accordance with metal roof panel manufacturer's requirements; minimize exposed fasteners.

1. Fasteners Exposed to Weather: Sealed or with sealed washers on exterior side of covering to waterproof fastener penetration; washer material compatible with screw head; minimum 3/8 inch (9.5 mm) diameter washer for structural connections; gasket portion of fasteners or washers made of EPDM, neoprene, or other equally durable elastomeric material.

2. Fasteners Exposed to View: Head of color matching panel or component in which installed.

PART 3 INSTALLATION

3.1 GENERAL

A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.

B. Obtain all relevant instructions and maintain copies at project site for duration of installation period.

C. Verify that shop drawings prepared by metal roof panel manufacturer have been approved and are available to installers; do not use drawings prepared by others for installation drawings.

D. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptable of project conditions and requirements.

E. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.

F. Perform work using competent and properly equipped personnel.

G. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.

H. Install roofing only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 60 to 80 degrees F (15 to 25 degrees C).

I. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.

1. Protect from spills and overspray from bitumen, adhesives, sealants and coatings.

2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.

3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.

J. Until ready for use, keep materials in their original containers as labeled by the manufacturer.

K. Consult panel manufacturer's instructions, container labels, and Safety Data Sheets (SDS) for specific safety instructions. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

3.2 EXAMINATION

A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment and that deflection will not strain or rupture roof components or deform deck.

B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.

C. Verify that the substructure installation is in accordance with the approved shop drawings and roof panel manufacturer's requirements, the fasteners are correct for the substrate, and the substrate is installed to accommodate and support the appropriate fastener spacing and attachment.

D. Verify that installed work of other trades that such work is complete to a point where the roofing system installation may commence.

E. Verify that roof openings, curbs, pipes, sleeves, ducts, vents, and other penetrations through roof substrate are complete and properly located.

F. In event of discrepancy, notify Architect in writing; do not proceed with installation until discrepancies have been resolved.

3.3 INSULATION INSTALLATION

A. Install insulation over entire area to be roofed, mechanically fastened as required by roofing manufacturer.

B. Provide wood nailers at all perimeters of insulation and at other locations where indicated on the drawings, of total height matching the total thickness of insulation being used.

1. Install with 1/8 inch (3 mm) gap between each length and at each change of direction.

2. Mechanically fasten to deck to resist force of 200 lbf per linear foot (35 kN/m).

3.4 COVER BOARD INSTALLATION

A. Install cover board over entire area to be roofed, mechanically fastened as required by roofing manufacturer.

3.5 UNDERLAYMENT INSTALLATION

A. Install underlayment in accordance with manufacturer's instructions.

B. Install self-adhered underlayment over entire roofing surface.

3.6 ROOF PANEL INSTALLATION

A. Install the metal roof panel system in accordance with the manufacturer's instructions, installation drawings, and approved shop drawings, so that it is weathertight and allows for thermal movement.

B. Locate and space all fasteners in accordance with roof panel manufacturer's recommendations. For required exposed fasteners, use proper torque settings to obtain controlled uniform compression for a positive seal without rupturing the sealing washers.

C. Do not place utility penetrations through the panel seams.

D. Do not allow panels or trim to come into contact with dissimilar materials (i.e. copper, lead, graphite, treated lumber, mortar, etc). Protect from water run-off from these materials.

E. Perform field cutting of panels and related sheet metal components by means of hand or electric shears. At no time shall a hot/friction saw be used.

F. Remove protective film immediately after installation.

3.7 FLASHING AND ACCESSORIES INSTALLATION

A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by roof panel manufacturer's recommendations and details.

B. Install metal trim, accessories, and edgings in locations indicated on the drawings.

1. Follow roofing manufacturer's instructions.

2. Remove protective plastic surface film immediately before installation.

C. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at all walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces that the roofing system abuts to; extend flashing at least 8 inches high above panel surface.

D. Flashing at Penetrations: Flash all penetrations passing through the panel; make flashing seals directly to the penetration.

1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical.

2. Where pre-molded pipe flashings are not practical, provide flashing detail as recommended by metal panel manufacturer.

3.8 FIELD QUALITY CONTROL

A. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e. not a sales person).

B. Perform all corrections necessary for issuance of warranty.

3.9 ADJUSTING AND CLEANING

A. Repair panels having minor damage.

B. Remove panels damaged beyond repair and replace with new panels to match adjacent undamaged panels.

C. Clean exposed panel surfaces promptly after installation in accordance with recommendations of panel and coating manufacturers.

D. Clean all contaminants generated by roofing work from building and surrounding areas, including adhesives, sealants, and coatings.

E. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.

F. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

3.10 PROTECTION

A. Where construction traffic must continue over finished roof panels, provide durable protection and replace or repair damaged roofing to original condition.

END OF SECTION

SECTION 07 42 13

EXPOSED FASTENER HORIZONTAL METAL WALL PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Exposed fastener metal wall panels, with related metal trim and accessories.

1.2 RELATED REQUIREMENTS

A. Division 05 Section "Structural Steel Framing" for structural steel framing supporting metal panels.

B. Division 05 Section "Steel Decking" for continuous metal decking supporting metal panels.

C. Division 05 Section "Cold-Formed Metal Framing" for cold-formed metal framing supporting metal panels.

D. Division 05 Section "Cold-Formed Metal Trusses" for cold-formed metal trusses supporting metal panels.

E. Division 07 Section "Thermal Insulation" for thermal insulation installed under metal panels.

F. Division 07 Section "Air Barriers" for air barriers within wall assembly and adjacent to wall assembly.

G. Division 07 Section "Metal Roof Panels" for factory-formed metal roof panels.

H. Division 07 Section "Joint Sealants" for field-applied Joint Sealants.

I. Division 13 Section "Metal Building Systems" for steel framing supporting metal panels.

1.3 REFERENCES

1. AAMA 621 - Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) & Zinc-Aluminum Coated Steel Substrates.
2. AAMA 809.2 - Voluntary Specification Non-Drying Sealants.

B. American Society of Civil Engineers (ASCE): www.asce.org/codes-standards:

1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

C. ASTM International (ASTM): www.astm.org:

1. ASTM A 653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM A 755 - Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.

3. ASTM A 792/A 792M - Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
4. ASTM C 645 - Specification for Nonstructural Steel Framing Members.
5. ASTM C 754 - Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
6. ASTM C 920 - Specification for Elastomeric Joint Sealants.
7. ASTM D 1003 - Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics.
8. ASTM D 2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
9. ASTM D 4214 - Test Methods for Evaluating Degree of Chalking of Exterior Paint Films.
10. ASTM E 283 - Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
11. ASTM E 331 - Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
12. ASTM E 1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
13. ASTM E 1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.
14. ASTM E 1980 - Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

D. International Accreditation Service (IAS):

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Prior to erection of framing, conduct preinstallation meeting at site attended by Owner, Architect, manufacturer's technical representative, inspection agency and related trade contractors.

1. Coordinate building framing in relation to metal panel system.
2. Coordinate openings and penetrations of metal panel system.

1.5 QUALITY ASSURANCE

A. Manufacturer/Source: Provide metal panel assembly and accessories from a single manufacturer providing fixed-base roll forming, and accredited under IAS AC 472 Part B.

B. Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum five years experience in manufacture of similar products in successful use in similar applications.

1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:

a. Product data, including certified independent test data indicating compliance with requirements.
b. Samples of each component.
c. Sample submittal from similar project.
d. Project references: Minimum of five installations not less than five years old, with Owner and Architect contact information.
e. Sample warranty.
f. IAS AC 472 certificate.

2. Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements.
3. Approved manufacturers must meet separate requirements of Submittals Article.

C. Installer Qualifications: Experienced Installer with minimum of five years experience with successfully completed projects of a similar nature and scope.

1. Installer's Field Supervisor: Experienced mechanic, able to communicate with Owner, Architect, and installers, supervising work on site whenever work is underway.
2. Buy American Act of 1933 BAA-41 U.S.C §§ 10a – 10d.
3. Buy American provisions of Section 1605 of the American Recovery and Reinvestment Act of 2009 (ARRA).

1.6 ACTION SUBMITTALS

A. Product Data: Manufacturer’s data sheets for specified products.

B. Shop Drawings: Show layouts of metal panels. Include details of each condition of installation, panel profiles, and attachment to building. Provide details at a minimum scale 1-1/2-inch per foot of edge conditions, joints, fastener and sealant placement, flashings, openings, penetrations, and special details. Make distinctions between factory and field assembled work.

1. Indicate points of supporting structure that must coordinate with metal panel system installation.
2. Include data indicating compliance with performance requirements.
3. Include structural data indicating compliance with requirements of authorities having jurisdiction.

C. Samples for Initial Selection: For each exposed product specified including sealants. Provide representative color charts of manufacturer's full range of colors.

D. Samples for Verification: Provide 12-inch- (305 mm-) long section of each metal panel profile. Provide color chip verifying color selection.

1.7 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Indicating compliance of products with requirements, witnessed by a professional engineer.

B. Qualification Information: For Installer firm and Installer’s field supervisor.

C. IAS Accreditation Certificate: Indicating that manufacturer is accredited under provisions of IAS AC 472.

D. Manufacturer's Warranty: Sample copy of manufacturer's standard warranty.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance data.

B. Manufacturer's Warranty: Executed copy of manufacturer's standard warranty.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect products of metal panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage. Protect panels and trim bundles during shipping.

1. Deliver, unload, store, and erect metal panel system and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.
2. Store in accordance with Manufacturer's written instructions. Provide wood collars for stacking and handling in the field.

1.10 WARRANTY

A. Special Manufacturer’s Warranty: On manufacturer’s standard form, in which manufacturer agrees to repair or replace metal panel assemblies that fail in materials and workmanship within one year from date of Substantial Completion.

B. Special Panel Finish Warranty: On Manufacturer’s standard form, in which Manufacturer agrees to repair or replace metal panels that evidence deterioration of factory-applied finish within [25] years from date of Substantial Completion, including:

1. Fluoropolymer Two- Coat System:

a. Color fading in excess of [5] [10] Hunter units per ASTM D 2244.
b. Chalking in excess of No. [8] [6] rating per ASTM D 4214.
c. Failure of adhesion, peeling, checking, or cracking.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis of Design Manufacturer: Metl-Span, an NCI Building Systems company; Houston TX. Tel: (877)713-6224; Email: info@metlspan.com; Web: www.metlspan.com.

1. Provide basis of design product, [or comparable product approved by Architect prior to bid].

2.2 PERFORMANCE REQUIREMENTS

A. General: Provide metal wall panel system meeting performance requirements as determined by application of specified tests by a qualified testing facility on manufacturer's standard assemblies.

B. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction. Allow for deflection and design for thermal stresses caused by temperature differences from one side of the panel to the other.

C. Structural Performance: Provide metal panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated:

1. Wind Loads: Determine loads based on uniform pressure, importance factor, exposure category, and basic wind speed indicated on drawings.
2. Deflection Limits: Withstand inward and outward wind-load design pressures in accordance with applicable building code with maximum deflection of [1/120] [1/180] [1/240] of the span with no evidence of failure.
3. Seismic Performance: Comply with ASCE 7, Section 9, "Earthquake Loads."

D. Air Infiltration: ASTM E 283: Maximum 0.000 cfm/sq. ft. at 6.24 lbf/sq. ft. static-air-pressure difference.

E. Water Penetration: ASTM E 331: No uncontrolled water penetration at a static pressure of 13.24 lbf/sq. ft.

2.3 METAL PANEL MATERIALS

A. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, structural quality, Grade 50, Coating Class AZ50 prepainted by the coil-coating process per ASTM A 755/A 755M.

2.4 METAL WALL PANELS

A. Tapered-Rib-Profile, Exposed Fastener Metal Panels: Structural metal panel consisting of formed metal sheet with trapezoidal ribs, installed by lapping edges of adjacent panels.
1. Basis of Design: Metl-Span, 7.2 Panel, http://www.metlspan.com/products/single-skin-wall-panels/7-2-rib/.
2. Coverage Width: 36 inches.
3. Continuous Rib Spacing: 7.2 inches on center.
4. Rib Height: 1-1/2 inch.
5. Nominal Coated Thickness: 24 gage.
6. Panel Surface: Smooth
7. Exterior Finish: Fluoropolymer Two-Coat System two-coat system.
8. Color: As indicated.

2.5 METAL PANEL ACCESSORIES

A. General: Provide complete metal panel assembly incorporating base, corner, and opening trims and miscellaneous flashings, in [manufacturer's standard profiles] [profiles as indicated]. Provide required fasteners, closure strips, support plates, and sealants as indicated in manufacturer's written instructions.

B. Flashing and Trim: Match material, thickness, and finish of metal panel face sheet.

C. Panel Fasteners: Self-tapping screws and other acceptable fasteners recommended by metal panel manufacturer.

1. Exposed Fasteners: Long life fasteners with EPDM or neoprene gaskets, with heads matching color of metal panels by means of factory-applied coating.

D. Joint Sealers: Manufacturer's standard or recommended liquid and preformed sealers and tapes, and as follows:

1. Tape Sealers: Manufacturer's standard non-curing butyl tape, AAMA 809.2.

E. Rain Screen Furring Components: Horizontal: SV-3 Siding Vent 7/16” thick x 3” high at top and bottom of wall and where indicated; Vertical: Sturdi-Strips 3/8” thick x 1 ½” wide at all fastener locations; Cor-A-Vent, or equal.

2.6 FABRICATION

A. General: Provide factory fabricated and finished metal panels and accessories meeting performance requirements, indicated profiles, and structural requirements.

B. Panel Lengths: Form panels in continuous lengths for full length of detailed runs, except where otherwise indicated on approved shop drawings.

C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's written instructions, approved shop drawings, and project drawings. Form from materials matching metal panel substrate and finish.

2.7 FINISHES

A. Finishes, General: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

B. Fluoropolymer Two-Coat System: 0.2 – 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat, AAMA 621, meeting solar reflectance index requirements.

1. Basis of Design: Fluoropolymer Two-Coat System.

C. Interior Finish: 0.5 mil total dry film thickness consisting of primer coat and wash coat of manufacturer's standard light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine metal panel system substrate and supports with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal panel installation.

1. Inspect metal panel support substrate to determine if support components are installed as indicated on approved shop drawings. Confirm presence of acceptable supports at recommended spacing to match installation requirements of metal panels.
2. Panel Support Tolerances: Confirm that panel supports are within tolerances acceptable to metal panel system manufacturer but not greater than the following:

a. 1/4 inch in 20 foot in any direction.

B. Correct out-of-tolerance work and other deficient conditions prior to proceeding with metal panel system installation.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, girts, furring, and other miscellaneous panel support members according to ASTM C 754 and manufacturer's written instructions.

B. Flashings: Install flashings to cover exposed underlayment per Section 07 62 00 "Sheet Metal Flashing and Trim."

3.3 METAL PANEL INSTALLATION

A. Exposed Fastener Metal Wall Panels: Install weathertight metal panel system in accordance with manufacturer's written instructions, approved shop drawings, and project drawings. Install metal panels in orientation, sizes, and locations indicated, free of waves, warps, buckles, fastening stresses, and distortions. Anchor panels and other components securely in place. Provide for thermal and structural movement.

B. Panel Sealants: Install manufacturer's recommended tape sealant at panel sidelaps and endlaps.

C. Panel Fastening: Attach panels to supports using screws, fasteners, and sealants recommended by manufacturer and indicated on approved shop drawings.

1. Fasten metal panels to supports at each location indicated on approved shop drawings, with spacing and fasteners recommended by manufacturer.
2. Provide weatherproof jacks for pipe and conduit penetrating metal panels of types recommended by manufacturer.
3. Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by manufacturer.

3.4 ACCESSORY INSTALLATION

A. General: Install metal panel trim, flashing, and accessories using recommended fasteners and joint sealers, with positive anchorage to building, and with weather tight mounting. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel assembly, including trim, copings, flashings, sealants, closure strips, and similar items.
2. Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.
3. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.

B. Joint Sealers: Install joint sealers where indicated and where required for weathertight performance of metal panel assemblies, in accordance with manufacturer's written instructions.

1. Prepare joints and apply sealants per requirements of Division 07 Section Joint Sealants.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage an independent testing and inspecting agency acceptable to Architect to perform field tests and inspections and to prepare test reports.

3.6 CLEANING AND PROTECTION

A. Remove temporary protective films immediately in accordance with metal panel manufacturer's instructions. Clean finished surfaces as recommended by metal panel manufacturer.

B. Replace damaged panels and accessories that cannot be repaired to the satisfaction of the Architect.

END OF SECTION

SECTION 07 42 14

INSULATED HORIZONTAL METAL WALL PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Foamed-insulation-core concealed fastener metal wall panels, with related metal trim and accessories.

1.2 RELATED REQUIREMENTS

A. Division 05 Section "Structural Steel Framing" for steel framing supporting metal panels.

B. Division 05 Section "Cold-Formed Metal Framing" for cold-formed metal framing supporting metal panels.

C. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal flashing items in addition to items specified in this Section.

D. Division 07 Section "Metal Wall and Roof Panels" for factory-formed metal wall, roof, and soffit panels.

E. Division 13 Section "Metal Building Systems" for steel framing supporting metal panels.

1.3 REFERENCES

A. American Architectural Manufacturer's Association (AAMA): www.aamanet.org:

1. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.

2. AAMA 621 - Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) & Zinc-Aluminum Coated Steel Substrates.

B. American Society of Civil Engineers (ASCE): www.asce.org/codes-standards:

1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

C. ASTM International (ASTM): www.astm.org:

1. ASTM A 653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

2. ASTM A 755 - Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.

3. ASTM A 792 - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

4. ASTM A 240 – Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

5. ASTM C 518 - Standard Test Method for Steady State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

6. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus

7. ASTM D 1621 - Compressive Properties of Rigid Cellular Plastics.

8. ASTM D 1622 - Apparent Density of Rigid Cellular Plastics.

9. ASTM D 2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

10. ASTM D 4214 - Test Methods for Evaluating Degree of Chalking of Exterior Paint Films.

11. ASTM D 6226 - Standard Test Method for Open Cell Content of Rigid Cellular Plastics

12. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.

13. ASTM E 84 - Test Methods for Surface Burning Characteristics of Building Materials.

14. ASTM E 283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

15. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

16. ASTM E 1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.

D. National Fire Protection Association (NFPA)

1. NFPA 259 – Test Method for Potential Heat of Building Materials.

2. NFPA 285 – Evaluation of Fire Propagation Characteristics of Exterior Non-Load Bearing Wall Assemblies.

3. NFPA 286 – Fire Test of Evaluating Conditions of Wall and Ceiling Finish to Roof Fire Growth.

E. FM Global (FM): www.fmglobal.com:

1. FM 4880 American National Standard for Evaluating Insulated Wall and Roof/Ceiling Assemblies

2. FM 4881 Approval Standard for Class 1 Exterior Wall Systems.

F. Canadian Standards Association (CSA)

1. CAN/ULC S102 – Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

2. CAN/ULC S101 – Fire Endurance Tests of Building Construction and Materials.

3. CAN/ULC S134 – Fire Test of Exterior Wall Assemblies.

4. CAN/ULC S138 – Fire Growth of Insulated Building Panels in a Full Scale Room Configuration.

G. Green Seal (GS) www.greenseal.org

1. GS-11 – Green Seal Standard for Paints and Coatings, Edition 3.2, October 26, 2015.

1.4 QUALITY ASSURANCE

A. Manufacturer/Source: Provide metal panel assemblies and accessories from a single manufacturer approved under an accredited third-party quality control program

B. Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum ten years' experience in the manufacturing of similar products and successful use in similar applications.

1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:

1) Product data, including certified independent test data indicating compliance with requirements.

2) Samples of each component.

3) Sample submittal from similar project.

4) Project references: Minimum of five installations not less than five years old, with Owner and Architect contact information.

5) Sample warranty.

6) Certificate from an accredited third-party Quality Control Program.

2. Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements

C. Installer Qualifications: Experienced Installer [certified by metal panel manufacturer] with minimum of five years experience with successfully completed projects of a similar nature and scope.

1. Installer's Field Supervisor: Experienced mechanic [certified by metal panel manufacturer] supervising work on site whenever work is underway.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Prior to erection of framing, conduct preinstallation meeting at site attended by Owner, Architect, metal panel installer, metal panel manufacturer's technical representative, inspection agency and related trade contractors.

1. Coordinate building framing in relation to metal panel system.

2. Coordinate openings and penetrations of metal panel system.

1.6 ACTION SUBMITTALS

A. Product Data: Manufacturer’s data sheets for specified products.

B. Shop Drawings: Show layouts of metal panels. Include details of each condition of installation, panel profiles, and attachment to building. Provide details at a minimum scale 1-1/2-inch per foot of edge conditions, joints, fastener and sealant placement, flashings, openings, penetrations, and special details. Make distinctions between factory and field assembled work.

1. Include data indicating compliance with performance requirements.

2. Indicate points of supporting structure that must coordinate with metal panel system installation.

3. Include structural data indicating compliance with performance requirements and requirements of local authorities having jurisdiction.

C. Samples for Initial Selection: For each exposed product specified including sealants. Provide representative color charts of manufacturer's full range of colors.

D. Samples for Verification:

1. Provide 12-inch- (305 mm) long section of each metal panel profile.

2. Provide color chip verifying color selection.

1.7 INFORMATIONAL SUBMITTALS

A. Product Test Results: Indicating compliance of products with requirements.

B. Qualification Information: For Installer

C. Accreditation Certificate: Indicating that manufacturer is accredited under an accredited third-party Quality Control Program, including IAS AC472 and based upon chapter 17 of the International Building Code (IBC).

D. Buy American Certification: Manufacturers' letters of compliance acceptable to authorities having jurisdiction, indicating products comply with requirements.

E. Florida State Building Code Compliance: Indicating that products comply with requirements of Florida State Building Code. www.floridabuilding.org/pr/pr_app_srch.aspx

F. Warranty:

1. Submit manufacturer’s written two (2) year limited warranty providing panels to be free from defects in materials and workmanship, beginning from the date of substantial completion excluding coil coatings (paint finishes) that are covered under a separate warranty.

2. The installation contractor shall issue a separate warranty against defects in installed materials and workmanship, beginning from the date of substantial completion of the installation.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance data.

B. Manufacturer's Warranty: Executed copy of manufacturer's warranty.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect products of metal panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage. Protect panels and trim bundles during shipping. Protect painted surfaces with a protective covering before shipping.

1. Deliver, unload, store, and erect metal panels and accessory items without deforming panels or exposing panels to surface damage from weather or construction operations.

2. Store in accordance with Manufacturer's written instructions.

3. Shield foam insulated metal panels from direct sunlight until all components are installed.

1.10 WARRANTY

A. Special Manufacturer’s Warranty: Submit Manufacturer’s two (2) year limited warranty providing panels to be free from defects in materials and workmanship, beginning from the date of substantial completion excluding coil coatings (paint finishes) that are covered under a separate warranty.

B. The installation contractor shall issue a separate warranty against defects in installed materials and workmanship, beginning from the date of substantial completion of the installation.

C. Special Panel Finish Warranty: Submit Manufacturer's limited warranty on the exterior paint finish for adhesion to the metal substrate and limited warranty on the exterior paint finish for chalk and fade.

1. Fluoropolymer Two-Coat System:

1) Color fading in excess of 5 Hunter units per ASTM D 2244.

2) Chalking in excess of 8 rating per ASTM D 4214.

3) Failure of adhesion, peeling, checking, or cracking.

2. Modified Silicone-Polyester Two-Coat System:

1) Color fading in excess of 5 Hunter units per ASTM D 2244.

2) Chalking in excess of 8 rating per ASTM D 4214.

3) Failure of adhesion, peeling, checking, or cracking.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Basis of Design Manufacturer: Metl-Span, a Division of NCI Group, Inc.; Lewisville, Texas Tel: 972.221.6656; Email: info@metlspan.com; Web: metlspan.com.

B. Provide basis of design product or comparable product approved by Architect prior to bid.

2.2 PERFORMANCE REQUIREMENTS

A. General: Provide metal panel system meeting performance requirements as determined by application of specified tests by a qualified testing facility on manufacturer's standard assemblies.

B. Structural Performance: Provide metal panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated, as determined by ASTM E 72 or ASTM E 1592 applied in accordance with ICC AC 04, Section 4, Panel Load Test Option or Section 5, Panel Analysis Option:

1. Wind Loads: Determine loads based on applicable building code, wind speed, importance factor, exposure category, and internal pressure coefficient indicated on drawings.

1) Wind Negative Pressure: Certify capacity of metal panels by testing of proposed assembly.

2. Deflection Limits: Withstand inward and outward wind-load design pressures in accordance with applicable building code with maximum deflection of 1/24] of the span with no evidence of failure.

C. FM Approvals Listing: Comply with FM Approval 4881. Provide metal wall panel assembly listed in FM Approvals' "Approval Guide."

D. Fire Performance Characteristics: Provide metal panel systems with the following fire-test characteristics determined by indicated test standard as applied by testing and inspection agency acceptable to authorities having jurisdiction.

1. Surface-Burning Characteristics: The insulating core shall have been tested per ASTM E 84. The core shall have:

1) Flame spread index: 25 or less.

2) Smoke developed index: 450 or less.

2. Room Test Performance: FM Global 4880: The panel assembly shall not support a self-propagating fire which reaches any limits of the 50’ (15.24m) high corner test structure as evidenced by flaming or material damage of the ceiling of the assembly.

3. Fire Propagation: The fire assembly shall meet the requirements of the standard for NFPA 285

4. Fire Growth: The fire assembly shall meet the requirements of the standard for NFPA 286

5. Potential Heat: Determined in accordance with NFPA 259

6. IBC Chapter 26: Panel Performance under the above test methods, shall meet the requirements of IBC, Chapter on foam plastics.

E. Air Infiltration, ASTM E 283:

1. Maximum 0.0002 cfm/sq. ft. (0.001 L/s per sq. m) at static air pressure difference of 1.57 lbf/sq. ft. (75 Pa).

2. Maximum 0.0009 cfm/sq. ft. (0.005 L/s per sq. m) at static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).

3. Maximum 0.01 cfm/sq. ft. (0.050 L/s per sq. m) at static-air-pressure difference of 20 lbf/sq. ft. (958 Pa).

F. Water Penetration Static Pressure:

1. ASTM E 331: No uncontrolled water penetration at a static pressure of 20 lbf/sq. ft. (958 Pa).

2. ASTM E 331 Modified (2 hour duration): No uncontrolled water penetration at a static pressure of 6.24 lbf/sq. ft. (300 Pa).

G. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal

expansion and contraction. Allow for deflection and design for thermal stresses caused by temperature differences from one side of the panel to the other.

H. Thermal Performance: When tested in accordance with ASTM C 518, Measurement of Steady State thermal Transmission, the panels shall provide a k factor of 0.14 btu/sf/hr/deg F at a 75° F (24° C) mean temperature, as required by code, or 0.126 btu/sf/hr/deg F at a 40° F (4° C) mean temperature.

2.3 INSULATED METAL WALL PANELS

A. Concealed Fastener, Insulated Metal Wall Panels with foam core: Structural metal panels consisting of flat exterior metal sheet with 7.2 rib pattern, and interior metal sheet with mesa profile, with factory foamed-in-place polyurethane core in thermally-separated profile, with tongue-and-groove panel edges, attached to supports using concealed fasteners.

1. Basis of Design: Metl-Span, CF 7.2 Insul-Rib

2. G-90 galvanized coated steel conforming to ASTM A 653 and/or AZ50 aluminum-zinc alloy coated steel, conforming to ASTM A 792/A 792M, minimum grade 33, prepainted by the coil-coating process per ASTM A 755/A 755M

1) Exterior Face Sheet: 24 gauge thickness, with stucco embossed surface

2) Interior Face Sheet: 26 gauge thickness, with stucco embossed surface and Mesa profile

3. Fluoropolymer Two-Coat System: 0.2 – 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat, AAMA 621, meeting solar reflectance index requirements.

4. Panel Width: 36 inches

5. Panel Thickness: 6 inch. Panel thickness measured from inside skin to top of high cell.

6. Insulating Core: Polyurethane with zero ozone depletion potential blowing agent

1) Closed Cell Content: 90% or more as determined by ASTM D 6226

2) Compressive Strength: As required to meet structural performance requirements and with a minimum of 15 psi as determined by ASTM D 1621

3) Minimum Density: 2.0 pcf (32 kg/m3) as determined by ASTM D 1622

4) Thermal Resistance R-Value: [insert corresponding value] deg. F * hr * sq. ft./Btu (K * sq. m/W) per ASTM C 518 at 75 degrees Fahrenheit mean temperature.

7. Heat Transfer Coefficient (U-factor): [insert corresponding value] Btu/hr * sq. ft. * deg. F (W/K * sq. m) as determined by ASTM C 1363 at 75 degrees Fahrenheit mean temperature. Tested specimen must include at least two engaged side joints. For actual overall R and U values, refer to the Technical Bulletins on metlspan.com

2.4 METAL WALL PANEL ACCESSORIES

A. General: Provide complete metal panel assemblies incorporating trim, copings, fasciae, gutters and downspouts, and miscellaneous flashings. Provide required fasteners, closure strips, and sealants as indicated in manufacturer's written instructions.

B. Flashing and Trim: Match material, thickness, Concealed Fastener, Insulated Metal Wall Panels with foam core: Structural metal panels consisting of flat exterior metal sheet with heavy, stucco finish, and interior metal sheet with a light mesa profile, with factory foamed-in-place polyurethane core in thermally-separated profile, with tongue-and-groove panel edges, attached to supports using concealed fasteners.

C. Joint Sealers:

1. Sealants: Provide Tape Mastic Sealants, Non-skinning sealants, and Urethane Sealants in accordance with manufacturers standards

2. Vertical Joint Gasket: Manufacturers standard EPDM gasket. Color: [Black] [Or custom color].

2.5 FABRICATION

A. General: Provide factory fabricated and finished metal panels, trim, and accessories meeting performance requirements, indicated profiles, and structural requirements.

B. Fabricate metal panel joints configured to accept sealant providing weathertight seal.

C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's written instructions, approved shop drawings, and project drawings.

2.6 FINISHES

A. Finishes, General: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer’s written instructions.

B. Exterior Face Sheet Coil-Coated Finish System

1. Silicone-Polyester Two-Coat System: 0.20 – 0.25 mil primer with 0.7 – 0.8 mil color coat, [meeting solar reflectance index requirements].

1) Basis of Design: Metl-Span, Silicone Polyester.

2. Fluoropolymer Two-Coat System: 0.2 – 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat, AAMA 621, [meeting solar reflectance index requirements].

1) Basis of Design: Metl-Span, Fluoropolymer.

C. Interior Face Sheet Coil-Coated Finish System

1. Polyester Two-Coat System: 0.20 – 0.25 mil primer with 0.7 – 0.8 mil color coat

1) Basis of Design: Metl-Span, Igloo White

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine metal panel system substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal panels.

1. Inspect framing that will support insulated metal panels to determine if support components are installed as indicated on approved shop drawings and are within tolerances acceptable to metal panel manufacturer and installer. Confirm presence of acceptable framing members at recommended spacing to match installation requirements of metal panels.

2. Panel Support Tolerances: Confirm that metal panel supports are within tolerances acceptable to metal panel manufacturer but not greater than the following:

1) 1/4 inch (6 mm) in 20 foot (6100 mm) in any direction.

2) 3/8 inch (9 mm) over any single wall plane.

3) Girt Spacing 8 feet (2438 mm) or more: 1/4 inch (6 mm) out only.

4) Girt Spacing Less Than 8 feet (2438 mm): 1/8 inch (3 mm) out only.

5) CF Architectural girt spacing less than 4 feet (1219 mm): 1/16 inch (1.5 mm) inch out only.

B. Correct out-of-tolerance work and other deficient conditions prior to proceeding with insulated metal panel installation.

3.2 METAL PANEL INSTALLATION

A. Concealed-Fastener Insulated Metal Panels with foam core: Install metal panel system in accordance with manufacturer's written instructions, approved shop drawings, and project drawings. Install metal panels in orientation, sizes, and locations indicated. Anchor panels and other components securely in place. Provide for thermal and structural movement.

B. Attach panels to metal framing using screws, fasteners, sealants, and adhesives recommended for application by metal panel manufacturer.

1. Fasten metal panels to supports with fasteners at each location indicated on approved shop drawings, at spacing and with fasteners recommended by manufacturer.

2. Cut panels in field where required using manufacturer's recommended methods.

3. Provide weatherproof jacks for pipe and conduit penetrating metal panels.

4. Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by metal panel manufacturer

C. Attach panel flashing trim pieces to supports using recommended fasteners and joint sealers

D. Joint Sealers: Install sealants where indicated and where required for weatherproof performance of metal panel assemblies

1. Seal panel base assembly, openings, panel head joints, and perimeter joints using sealants indicated in manufacturer's instructions

2. Seal wall panel joints; apply continuously without gaps in accordance with manufacturer's written instructions, approved shop drawings, and project drawings

3. Prepare joints and apply sealants per requirements of Division 07 Section.

3.3 ACCESSORY INSTALLATION

A. General: Install metal panel accessories with positive anchorage to building and weather tight mounting; provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel assembly, including trim, copings, flashings, sealants, closure strips, and similar items.

2. Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.

3. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: [Owner will engage] [Engage] an independent testing and inspecting agency acceptable to Architect to perform field tests and inspections and to prepare test reports.

B. Water-Spray Test: After completing portion of metal panel assembly including accessories and trim, test 2-bay area selected by Architect for water penetration, according to AAMA 501.2.

3.5 CLEANING AND PROTECTION

A. Remove temporary protective films immediately in accordance with metal panel manufacturer's instructions. Clean finished surfaces as recommended by metal panel manufacturer.

B. Replace damaged panels and accessories that cannot be repaired to the satisfaction of the Architect.

END OF SECTION

SECTION 07 42 15

FLAT METAL PANEL WALL SYSTEM

PART 1 PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall panel assembly consisting of:
   a. Exterior Cladding Panel
   b. Installation System
   c. Accessories

2. The extent of the wall panel assembly as indicated in these specifications and in the drawings.

B. Related Sections:

1. Section 05 10 00 - Structural Metal Framing
2. Section 06 10 00 - Rough Carpentry
3. Section 07 20 00 - Thermal Protection
4. Section 07 60 00 - Flashing And Sheet Metal
5. Section 07 90 00 - Joint Protection
6. Section 08 80 00 - Glazing
7. Section 08 40 00 - Entrances, Storefronts, And Curtain Walls
8. Section 08 50 00 - Windows

1.2 REFERENCES

A. American Society For Testing And Materials (ASTM)

1. ASTM B117 Standard Practice For Operating Salt Spray (Fog) Apparatus
2. ASTM B137 Standard Test Method For Measurement Of Coating Mass Per Unit Area On Anodically Coated Aluminum
3. ASTM B211 Standard Specification For Aluminum And Aluminum-Alloy Rolled Or Cold Finished Bar, Rod, And Wire
4. ASTM B680 Standard Test Method For Seal Quality Of Anodic Coatings On Aluminum By Acid Dissolution
5. ASTM C267 Standard Test Methods For Chemical Resistance Of Mortars, Grouts, And Monolithic Surfacings And Polymer Concretes
6. ASTM C1371 Standard Test Method For Determination Of Emittance Of Materials Near Room Temperature Using Portable Emissometers
2. ASTM D523 Standard Test Method For Specular Gloss

3.	ASTM D714	Standard Test Method For Evaluating Degree Of Blistering Of Paints
7.	ASTM D968	Standard Test Methods For Abrasion Resistance Of Organic Coatings By Falling Abrasive
8.	ASTM D1308	Standard Test Method For Effect Of Household Chemicals On Clear And Pigmented Organic Finishes
9.	ASTM D2244	Standard Practice For Calculation Of Color Tolerances And Color Differences From Instrumentally Measured Color Coordinates
10.	ASTM D2247	Standard Practice For Testing Water Resistance Of Coatings In 100% Relative Humidity
4.	ASTM D2248	Standard Practice For Detergent Resistance Of Organic Finishes
11.	ASTM D2794	Standard Test Method For Resistance Of Organic Coatings To The Effects Of Rapid Deformation (Impact)
5.	1ASTM D3359	Standard Test Methods For Measuring Adhesion By Tape Test
6.	ASTM D3363	Standard Test Method For Film Hardness By Pencil Test
7.	ASTM D4145	Standard Test Method For Coating Flexibility Of Prepainted Sheet
12.	ASTM D4214	Standard Test Methods For Evaluating The Degree Of Chalking Of Exterior Paint Films
13.	ASTM E84	Standard Test Method For Surface Burning Characteristics Of Building Materials
14.	ASTM E903	Standard Test Method For Solar Absorptance, Reflectance And Transmittance Of Materials Using Integrated Spheres

B. American Architectural Manufacturers Association (AAMA)

1. AAMA 2605 Voluntary Specification, Performance Requirements And Test
   a. Procedures For Superior Performing Organic Coatings On
   b. Aluminum Extrusions And Panels

1.3 DEFINITIONS

A. Leadership In Energy And Environmental Design (LEED):

1. A set of guidelines set forth by the United States Green Building Council (USGBC) to promote the building of environmentally responsible and sustainable structures.

B. ISO 9001:2008

1. A set of guidelines set forth by the International Organization For Standardization (ISO) to provide guidance and tools for companies and organizations who want to ensure that their products and services consistently meet customer’s requirements, and that quality is consistently improved.

1.4 SYSTEM DESCRIPTION

A. Design Requirements:

1. Barrier System:
Wall panel assembly shall be designed in accordance with manufacturer's guidelines to be sealed at all panel joints, intersections, dissimilar material abutments, and cutouts, thus providing a weathertight barrier system.

2. Expansion And Contraction:
Wall panel assembly shall be designed with provisions for thermal expansion and contraction of the component parts to prevent buckling, failure of joint seals, undue stress on fasteners or other detrimental effects due to accumulation of dead loads and various live loads.

3. Windload:
Wall panel assembly shall be designed to withstand a positive and negative windload pressure acting inward and outward normal to the plane of the wall to meet the requirements of the latest adopted Local Building Code.

B. General Performance:

1. Wall panel assembly shall comply with performance requirements, as determined by the following testing performed by a qualified agency.

1.5 SUBMITTALS

A. Product Data:

1. Submit manufacturer's datasheet for specified product.

2. Submit manufacturer's installation guidelines for specified product.

3. Submit manufacturer's literature indicating pre-consumer and post-consumer percentages of recycled content in the context of LEED MR Credit 4.1 and/or MR Credit 4.2.

4. Submit manufacturer's literature indicating compliance with the

5. American Recovery & Reinvestment Act (ARRA), Section 1605.

B. Shop Drawings:

1. Submit shop drawings indicating project layout and elevations, fastening and anchoring methods, dimensions of individual components and profiles, detail and location of joints, sealants and gaskets, flashing and accessories.

C. Samples:

1. Submit two (2) samples 3" x 5" of each product specified.
2. Submit two (2) samples 3" x 5" of each finish specified.

D. Test Reports:

1. Submit test reports indicating compliance of products with specified performancerequirements from an independent testing agency.

E. Warranty:

1. Submit manufacturer's warranty meeting the requirements of this section.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer:
   a. Manufacturer shall have a minimum of ten (10) years experience in the manufacture of this product, shall be an ISO 9001:2008 Registered Company, and shall be located within the United States of America.

2. Installer:
   a. Installer shall be experienced in performing work of this section and in work of similar scope required by this project.

B. Pre-Installation Meeting:
1. Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Acceptance At Site:

1. Materials to be packaged to protect against transportation damage. Examine materials upon receipt to insure that no damage has occured during shipment.

B. Storage And Protection:

1. Storage:
   a. Materials should be stored horizontally on pallets or platforms, covered with a suitable ventiliated and weathertight covering. Do not store materials where accumulation of moisture may occur or in contact with materials that might cause staining, denting, or other damage.

2. Material Handling:
   a. Use care in unloading, storing, and erecting the materials to prevent bending, warping, and twisting. Protect finish and edges from damage. The protective film on the panel surface is to remain in place until installation and shall be removed immediately upon completion.

1.8 PROJECT CONDITIONS

A. Field Measurements:

1. Verify location and dimension of all elements related to the installation of the wall panel assembly. Indicate those measurements on the shop drawings.

B. Limitations:

1. Proceed with installation of the wall panel assembly only when existing site conditions comply with manufacturer's recommendations.

1.9 WARRANTY

A. Exterior Cladding Panel:

1. Panel:
   a. The integrity of the panel bond will remain intact for a minimum of five (5) years from the Date Of Substantial Completion.

2. Finish:
   a. Polyvinylidene Fluoride (PVDF):
      1) The finish will not have a Fade Differential of greater than 5E units.
      2) Testing shall be in accordance with ASTM D2244.
      3) The finish will not have a Chalk Rating of less than 8.

4) Testing shall be in accordance with ASTM D4214.
5) The finish will not check, peel, lose adhesion or fracture (other than minute fractures which may develop due to fabrication and which are acceptable by industry standards on the Date Of Substantial Completion).
6) Warranty period shall be thirty (30) years from the Date Of Substantial Completion.

b. Anodized:
1) The finish will not check, peel, lose adhesion or fracture (other than minute fractures which may develop due to fabrication and which are acceptable by industry standards on the Date Of Substantial Completion).
2) Warranty period shall be twenty (20) years from the Date Of Substantial Completion.

B. Installation System:

1. Fabricator and/or installer standard form in which they agree to repair or replace components of exterior cladding wall panel assemblies that fail in materials or workmanship within specified warranty period.

2. Weathertight warranties or other such guarantees regarding installation shall be the responsibility of the installing contractor.

C. Accessories:

1. Warranties or other such guarantees regarding accessories used during installation shall be the responsibility of the installing contractor.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:

1. Citadel Architectural Products, Inc.; 3131-A North Franklin Road; Indianapolis, IN 46226 ph: (800) 446-8828; fax: (800) 247-2635; www.citadelap.com; info@citadelap.com

B. Substitutions:

1. Not permitted without approval of the architect 10 days prior to bid.
2. Items being submitted for consideration must be of the same function and meet the performance requirements set forth in this section.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

1. Product Data:
   a. Submit product data including testing performed by a qualified agency indicating compliance with performance requirements specified in this section.

2. Samples:
   a. Submit two (2) samples 3" x 5" of each proposed product substitution.

2.2 WALL PANEL ASSEMBLY

A. Exterior Cladding Panel:

1. Panel:
2. Panel 20® as manufactured by Citadel Architectural Products, Inc.
   a. Composition:
      1) Face: .024" (min) prefinished smooth aluminum
      2) Core: .075" thermoset phenolic resin Back: .024" primed smooth aluminum b. Thickness: 1/8" (nominal)
   b. Weight: 1.28 lbs/ft²
   c. Tolerance:
   d. Thickness: ±1/32"
   e. Length / Width: +0, -1/8" Squareness: 1/64" per lineal ft
   f. Performance:
      1) Surface Burning Characteristics:
      2) Panel shall have a Class A rating with a Flame Spread Index less than 25, and a Smoke Developed Index less than 450.
      3) Testing shall be in accordance with ASTM E84.

3. Finish:
   a. Polyvinylidene Fluoride (PVDF):
      1) Type:
      2) Kynar 500® coating using 70% resin.
      3) Finish shall be in conformance with AAMA 2605.
      4) Color:
         a) As selected by Architect from manufacturer's color guide.
         b) Custom color to match Architect's standard.
      5) Composition:
         a) Two-Coat Colors:
            (1) 2-mil primer coat, 0.8-mil color coat
         b) Three-Coat Colors:
            (1) 0. 2-mil primer coat, 0.8-mil color coat, 0.7-mil clear coat 4)
         c) Performance:

d) Gloss:
(1) Finish shall have a gloss value of 20-35 at 60°. Testing shall be in accordance with ASTM D523.
(2) Solar Reflectance:

4. Finish shall have a value of >25% initial, >15% after 3 years for Steep Slope and a value of >65% initial, >50% after 3 years for Low Slope.
   a. Testing shall be in accordance with ASTM E903.
      1) Emissivity:
      2) Finish shall have a value of 0.80 (80%) min. Testing shall be in accordance with ASTM C1371.
      3) Pencil Hardness:
      4) Finish shall have a value of F-2H.
      5) Testing shall be in accordance with ASTM D3363.
      6) Flexibility:
      7) Finish shall have a value of 0-2 T-bend, no pick off.
      8) Testing shall be in accordance with ASTM D4145.
      9) Adhesion:
   b. Finish shall have a value of No Adhesion Loss. Testing shall be in accordance with ASTM D3359.
   c. Reverse Impact:
      1) Finish shall have a value of No Cracking Or Adhesion Loss.
   d. Testing shall be in accordance with ASTM D2794.
   e. Abrasion:
      1) Finish shall have a value of 65-85 l/mil. Testing shall be in accordance with ASTM D968.
   f. Mortar Resistance:
      1) Finish shall have a value of No Effect. Testing shall be in accordance with ASTM C267.
   g. Detergent Resistance:
      1) Finish shall have a value of No Effect using 3% detergent
      2) @ 100 F° (72 hrs).
      3) Testing shall be in accordance with ASTM D2248.
   h. Acid Resistance:
      1) Finish shall have a value of No Effect using 10% muriatic acid (24 hrs) and No Effect using 20% sulfuric acid (18 hrs).
      2) Testing shall be in accordance with ASTM D1308.
   i. Acid Rain:
      1) Finish shall have a value of No Objectionable Color Change after 15 cycle min.
      2) Testing shall be in accordance with Kesternich SO2, DIN 50018.
   j. Alkalai Resistance:
      1) Finish shall have a value of No Effect using 10%, 25%
      2) NaOH (1 hr).
      3) Testing shall be in accordance with ASTM D1308.
   k. Salt Spray Resistance:

1) Finish shall have a value of No Face Blistering; Max average 1/16" scribe creep, passes 4000 hrs using 5% salt fog @ 95° F.
2) Testing shall be in accordance with ASTM B117.

l. Humidity Resistance:
1) Finish shall have a value of Passes 4000 hrs, No #8 blisters using 100% relative humidity @ 95° F.
2) Testing shall be in accordance with ASTM D714, ASTM D2247.

m. Exterior Exposure:
1) Finish shall have a value of Max 5 fade and Max 8 chalk at 10 yrs @ 45°, south Florida.
2) Testing shall be in accordance with ASTM D2244, ASTM D4214.

n. Anodized:
1) Type:
a) AA-C22-A21 (clear) AA-C22-A23 (colored)
2) Color:
a) As selected by Architect from manufacturer's color guide.
3) Composition:
a) Anodized (clear): barrier, aluminum oxide, nickel/hydrate seal ii. Anodized (colored): barrier, aluminum oxide, colorant, nickel/hydrate seal
4) Performance:
b) Salt Spray Resistance: Testing shall be in accordance with ASTM B117.
c) Acid Dissolution: Testing shall be in accordance with ASTM B680.
d) Gloss: Testing shall be in accordance with ASTM D523.
e) Coating Mass: Testing shall be in accordance with ASTM B137.

B. Installation System:
1. Two Piece Molding System:
a. Description:
b. Field-assembled installation system consisting of exterior cladding panels, trim moldings, silicone sealant, and accessories to provide a barrier system. b. Trim Moldings:
1) C20-401 Horizontal / Vertical
2) R20-401 Receiver
3) C20-402 Horizontal / Vertical
4) R20-401 Receiver
5) C20-403 Perimeter J
6) R20-403 Receiver
7) C20-404 Inside Corner
8) R20-404 Receiver
9) C20-405 Outside Corner
10) R20-405 Receiver
11) C20-406 Horizontal / Vertical (Reveal)

12) R20-406 Receiver
13) C20-407 Perimeter J (Reveal)
14) R20-407 Receiver

C. Accessories:

1. Extrusions:
   a. Shall conform with ASTM B211 and the manufacturer's recommendations.
   b. Shall be applied in accordance with the panel manufacturer's installation guidelines.
2. Sealants:
   a. Selected from the panel manufacturer's approved list of sealants.
   b. Shall be applied in accordance with both the panel manufacturer's installation guidelines and the sealant manufacturer's recommendations.

3. Fasteners:
   a. Selected by contractor to suit project requirements.
   c. Shall be applied using the recommended fastener schedule in accordance with panel manufacturer's installation guidelines.
   b. Shall be coated to prevent corrosion and/or reaction with other materials.
   c. Shall be concealed except where unavoidable. Exposed fasteners shall be finished to match adjoining metal.

4. Flashing:
   a. Selected by contractor to suit project requirements.
   d. Shall be installed in such a manner to maintain the integrity of the wall system against moisture intrusion.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrate to receive the work of this section to verify that the conditions are acceptable for installation.

1. Substrate to receive panels shall be even, smooth, sound, clean, dry, and free from defects detrimental to work. Notify contractor in writing of conditions detrimental to proper and timely completion of the work.

2. Substrate to receive panels shall be in vertical and horizontal alignment with no more deviation than 1/4" in 20'.

B. Proceed with installation only after all unsatisfactory conditions have been corrected in a manner acceptable to installer. Starting work within a particular area will be construed as installer's acceptance of surface conditions.

3.2 PREPARATION

A. Verify dimensions as required.

B. Protect adjacent work areas and finished surfaces to prevent damage that otherwise might occur during the work of this section.

3.3 INSTALLATION

A. Wall panel assembly shall be installed in accordance with the manufacturer's written installation guidelines and the approved set of shop drawings.

B. Erect wall panel assembly level and true to the intended plane.

C. Maximum deviation from vertical and horizontal alignment of erected wall panel assembly shall be no more than 1/4" in 20'-0".

D. Maximum deviation in panel flatness shall be 0.6% of the assembled units.

E. Seal all joints as required using methods and materials as recommended by the panel manufacturer.

3.4 CLEANING

A. Remove panel masking immediately after installation. Delay will result in difficulty with removal and possibly residue on the panel surface.

B. Remove temporary coverings and protection to adjacent work areas.

C. Remove and legally dispose of construction debris from project site.

END OF SECTION

SECTION 07 42 16

CONCEALED FASTENER METAL SOFFIT/WALL PANEL SYSTEM

PART 1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The drawings and provisions of the General Conditions, Supplementary Conditions and the sections included under Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

A. This section includes concealed fastener flush metal [soffit] and/or [wall] panels to be used as exterior and/or interior [soffit] and/or [wall] cladding.

1.3 PERFORMANCE REQUIREMENTS

A. Structural performance: provide exterior/interior wall cladding assemblies capable of withstanding the effects of load and stresses from dead loads, wind loads, snow loads and normal thermal movement without evidence of permanent defects of assemblies or components.

1. Dead load: As required by applicable building code.
2. Live Load: As required by applicable building code.
3. Wind Load: Uniform pressure (velocity pressure) of (Insert Design Criteria) lb/sq ft. (Insert Design Criteria), acting inward or outward.
4. Thermal Movements: Provide assemblies that allow for thermal movements resulting from the following maximum changes (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components and other detrimental effects:
    a. Temperature Change (range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Sealed joints shall allow free and silent movement of panels during expansion and contraction while preventing uncontrolled penetration of moisture.

C. Manufacturing and installation shall prevent deformation of exposed surfaces.

D. Design panel system to accommodate substructure tolerance of +0 to -1/8 inch.

E. Not Permitted: Vibration harmonics; wind whistles; noises caused by thermal movement; thermal movement transmitted to other building elements; loosening, weakening or fracturing of attachments or components of system.

F. Structural Performance / Uniform Load Deflection Test: Provide panel system which has been tested in accordance with both ASTM E330 and ASTM E1592 structural testing. Maximum allowable deflection of span: L/180. Installer to provide self-tapping screws at mounting flange and side lap joints designed to withstand building design loads.

G. Air Infiltration: Panel system shall not have air infiltration rate more than 0.06 cfm per sq. ft. of fixed wall area when tested in accordance with ASTM E283 at static air pressure differential of 6.24 psf.

H. Static Water Penetration: Panel system shall have no water penetration as defined by in test method when tested in accordance with ASTM E331. The ASTM E331 test shall be conducted at inward static pressure differential of not less than 15.0 psf.

I. Dynamic Water Penetration: Panel system shall have been tested in accordance with AAMA 501 and shall have passed with no uncontrolled water leakage at 15.00 psf dynamic pressure differential, with water application rate of 5 gallons/hr/sqft.

1.4 SUBMITTALS

A. Product Data: Manufacturer's product literature for the concealed fastener metal panel system as specified.

B. Shop Drawings: For exterior/interior concealed fastener metal panels and accessories. Include plans; elevations; sections and details.

C. Quality Assurance Submittals: Submit the following:

1. Certificates: Product certificates signed by manufacturer certifying materials comply with the specified performance characteristics and criteria, and physical requirements.

D. Samples for initial selections: Manufacturer’s color charts showing the full range of colors available for units with factory-applied color finishes.

E. Samples for verification: Provide color samples of selected color. Samples shall involve normal color and texture variations, include sample sets showing the full range of variations expected.

F. Affidavit certifying that the material meets the requirements specified.

1.5 QUALITY ASSURANCE

A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the project is located and who is experienced in providing engineering services of kind indicated.

B. Manufacturer Qualifications: Minimum of 5 years' experience in manufacturing concealed fastener metal panel systems similar to those specified.

C. Installer Qualifications: Acceptable to manufacturer.

1.6 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

B. Ordering: Comply with manufacturer's ordering instructions, and lead-time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

1. Store materials in accordance with manufacturer's recommendations.
2. Handle materials carefully to avoid damage to materials and finishes.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual supporting and adjoining construction by field measurements before fabrication, and indicate recorded measurements on final shop drawings. Coordinate construction to ensure that panels fit properly to supporting and adjoining construction and coordinate schedule with construction progress to avoid delaying the work.

1. Established dimensions: Where field measurements can not be made without delaying the work, guarantee dimensions and proceed with fabrication of panels corresponding to the established dimensions.

1.8 WARRANTY

A. Project warranty refers to Conditions of the Contract for project warranty provisions. Manufacturer's warranty: submit, for Owner's acceptance, manufacturer's standard warranty documents executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights owner may have under Contract Documents.

B. The Contractor shall warrant the materials to be free of faults and defects in accordance with the General Conditions, except that the warranty shall be extended by paint manufacturer's standard multi-year warranty. The warranty shall be in writing and shall be signed by the manufacturer.

C. Materials Manufacturers: Repair or replace defective materials for a period of two (2) years.

D. Panel System Installer: Repair or replace products or components which fail due to faulty workmanship for a period of two (2) years.

E. Painted Finish: Coatings Manufacturer and applicator to warrant paint for a period of twenty (20) years after the Effective Date, the factory applied finish applied by the applicator.

1. WILL NOT chip, crack or peel (lose adhesion) but does not include minute fracturing which may occur in proper fabrication of building parts.

2. WILL NOT chalk in excess of ASTM D-4214-89 number eight (8) rating, determined by the procedure outlined in ASTM D-4214-89 specification test.

3. WILL NOT change color more than five (5) Delta-E Hunter units (square roof/wall of the sum of square Delta L, Delta a, and Delta b) as determined by ASTM method D-2244. It is acknowledged that fading or color changes may not be uniform if the surfaces are not equally exposed to the sun and elements.

F. Coil Anodized Finish: Coatings Manufacturer and applicator to warrant coil anodized finish for a period of twenty (20) years after the Effective Date, the factory applied finish applied by the applicator.

1. No visible peeling or cracking for a period of twenty years. This excludes any cracking due to brake bends or other forming operations performed on components after the anodized finish has been applied.

2. No chalking for a period of twenty years. This only applies to any powdery residue formed by the breakdown of the anodized finish. It does not apply to any foreign residue deposited on the surface of the anodized finish by the surrounding atmosphere (soot, dust, etc.).

3. No significant visible fading for a period of twenty years.

PART 2 PRODUCTS

2.1 CONCEALED FASTENER SOFFIT/WALL PANELS

A. General: Provide factory-formed metal wall panels designed to be field assembled by engaging interlocking side edges of adjacent panels and mechanically attaching panels to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

2.2 MANUFACTURER

A. Manufacturers: Subject to compliance with requirements, provide products manufactured by:

1. Firestone Building Products, 1001 Lund Blvd., Anoka, MN 55330
   a. UC-500 Soffit/Wall Panels

b. Alternate systems by other manufacturers/fabricators are to be submitted to the architect not less than 7 working days prior to bid.

2.3 MATERIALS

A. Aluminum Face Sheet: ASTM B209, Aluminum Association specification sheet [3003-H14/3105-H14 for painted finish][5005-H34 for anodized finish].
1. Thickness: [0.032][0.040] inch.

B. Steel Panels: ASTM A653, G90 (lock-forming quality), extra smooth, tension-leveled, galvanized steel, minimum spangle.
1. Thickness: [22][24][26] gauge.

C. Copper Panels: ASTM B370
1. Thickness: [16][20] ounce.
2. Thickness: [.028”][.032”] [.040”] inch.

2.4 FABRICATION

A. Form panels in longest practical lengths, true to shape, accurate in size, square, and free from distribution or manufacturing defects.
1. Panel Depth: 1 inch.
2. Panel Width: [8][12][16][20] inches.
3. Fabricate panels with an interlocking leg (male/female interlocking joint design).

B. Tolerances
1. Form panels in longest practical lengths, true to shape, accurate in size, square, and free from distribution or manufacturing defects.
2. Bend lines, breaks, and angles shall be sharp and true, and surfaces shall be free from warp or buckle.

C. Material surfaces shall be free of scratches or marks caused during fabrication.

D. Ensure that entire project is manufactured from single color coil paint run to ensure color uniformity.

E. Provide factory applied strippable plastic film for protection during fabrication and installation.

2.5 ACCESSORIES

A. All fasteners shall be non-corrosive type, as recommended by the panel manufacturer. Provide self-tapping screws at mounting flange and side lap joints designed to withstand building design loads.

B. Weather Resistant Membrane: As specified in section [insert specification section].

C. Flashing: Unless noted otherwise, shall be same material and gauge as for panel where exposed.

D. Panel Sealants:

1. Perimeter Joint Sealant: ASTM C90; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacture.

2. Panel Joint Sealant Non-Skinning Butyl Sealant: ASTM C734 Non-hardening, non-drying, non-oxidizing butyl rubber-based sealant.

E. Subgrits: Provide G90 galvanized steel of gauge and spacing required for panel structural requirements, as recommended by the panel manufacturer and in accordance with approved shop drawings. To avoid galvanic reaction, separate dissimilar metals.

F. Backing Plates: Provide metal backing plates at end splices, fabricated from material recommended by manufacture.

G. Closure Strips: Closed-cell, expanded, cellular, rubber or cross-linked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1 inch (25mm) thick, flexible closure strips; provide closure strips where indicated or necessary to ensure weathertight construction.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's Metal Finishes Manual for architectural metal products for recommendations for applying and designating finishes.

2.7 FINISHES

A. Panel Finishes:

1. Coating shall be Coil-Coated Fluorocarbon Resin utilizing 70% Kynar 500 resins. Color as selected by owner/consultant from manufacturer's standard colors.

2. Number of Coats: 2-coat [3-coat]. Coating shall be factory applied on a continuous process paint line. Coating shall consist of a 0.2 mil prime coat, a 0.75 mil barrier coat, a 0.75 mil metallic/color coat containing 70% Kynar resins, and a 0.5 mil clear coat containing 70% Kynar resins (Note mil thickness is approximate.)

3. Relevant to the color selected, material to be painted in accordance with either AAMA specification 2605 or 2604.

4. Provide factory applied strippable plastic film for protection during fabrication and installation

B. Finish Performance:

1. Pencil Hardness – ASTM D3352-74
2. Shall be HB-H minimum (Eagle Turquoise).
3. Impact Adhesion – ASTM D294-84
   a. Coating shall show no cracking and no loss of adhesion
4. Cure Test – NCCA 11-18
   a. Coating shall withstand 50+ double rubs of MEK.
5. Humidity Resistance – ASTM D2247-87
   a. Coating shall show no blisters after 3000 hours of 100% humidity at 95 degrees Fahrenheit.
6. Salt Spray Resistance – ASTM B117-85
   a. After 3000 hours of exposure to 5% salt fog, at 95 degrees Fahrenheit, scored sample shall show none or few #8 blisters, and less then 1/8" average creepage from scribe.
7. Weatherometer Test – ASTM D882-86/G23-88 Coating shall show no cracking, peeling, blistering or loss of adhesion after 2000 hours.
   a. Chalking Resistance – ASTM D659-86
   b. No chalking greater than #8 after 10 years Florida exposure at 45`S.
   c. Color Change – ASTM D2244-74
   d. Color change shall not exceed 5 NBS units after 10 years Florida exposure at 45 degrees south.
   e. After 5000 hours in Atlas Weatherometer coating shall show no objectionable chalking or color change.
8. Abrasion Resistance – ASTM D968-81 Coating shall resist 65+/- 15 liters/mil minimum of falling sand.

C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

D. Class I, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I integrally colored or electrolytically deposited color coating 0.018 mm (or thicker) complying with AAMA 606.1 or AAMA 608.1.

1. Color: Selected by Architect/Engineer from manufacturer's standard colors.
2. Color: Match Architect's sample.

PART 3 EXECUTION

3.1 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation. Panel substructure shall be level and plumb. Coordinate delivery of such items to project site.

3.2 INSTALLATION

A. General: Install metal wall panels according to manufacture's written instructions in orientation, sizes and locations indicated on drawings.

B. Erect panel level and plumb, in proper alignment in relation to substructure framing and established lines; follow SMACNA Architectural Sheet Metal manual and standard practices.

C. Panels shall be erected in accordance with approved shop drawings.

D. Panel anchorage shall be structurally sound and per engineering recommendations.

E. Where aluminum materials come in contact with dissimilar materials, an isolation shim or tape shall be installed at fastening locations.

F. Install weather resistant membrane in accordance with manufacturer's instructions.

G. Completed system shall be free from over bending, deforming, stretching and buckles. [See note to specifier below]

H. Apply panels and associated items for neat and weathertight enclosure.

I. Locate and space fasteners in uniform vertical and horizontal alignment. Provide self-tapping screws at mounting flange and side lap joints designed to withstand building design loads.

J. At panel splices, nest panels with minimum 4-inch (100mm) end lap, sealed with butyl rubber sealant and fastened together as recommended by metal wall panel manufacture.

K. Install gaskets, joint fillers and sealants where indicated and where required for weathertight performance of metal assemblies. Provide types of gaskets, fillers and sealants indicated or if not indicated, types as recommended by metal panel manufacture.

L. Seal side joints as recommended by metal wall panel manufacture.

M. Prepare perimeter joints and apply sealants to comply with the requirements in Division07 Section "Joint Sealants".

3.3 CLEANING AND PROTECTING

A. Clean exposed surfaces of panels that are not protected by temporary covering to remove fingerprints and soil during construction period.

B. Clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Protect panels from damage during construction. Use temporary protective coverings where needed as approved by the panel manufacturer.

D. Clean and touch up minor abrasions in finish with air-dried coating that matches color and gloss, and is compatible with, factory–applied finish coating.

E. Remove panels damaged beyond repair and replace with new panels to match adjacent undamaged panels.

F. Remove protective film immediately after installation.

END OF SECTION

SECTION 07 50 00

AIR SEALING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Conform to Sections of Division 1 as applicable.

1.2 SECTION INCLUDES

A. Provide labor, materials, products, equipment and services for the following:

B. Air sealing to supplement and provide continuity of the main or primary and secondary air barrier assemblies and components specified in other sections, including the bridging, sealing and/or filling of all penetrations of a) complete exterior building envelope including all exterior wall, soffits, foundations and ceiling/roof envelope assemblies; b) all unit common wall assemblies, and c) all unit to common area wall assemblies to restrict air movement through systems to the maximum building envelope leakage levels specified in Section 01 45 23 Blower Door Testing.

1.3 RELATED SECTIONS

A. 01 45 23 Blower Door Testing
B. 03 30 00 Cast-In-Place Concrete
C. 06 10 00 Rough Carpentry
D. 07 21 00 Miscellaneous Building Insulation
E. 07 21 13 Board Insulation
F. 07 21 19 Foamed in Place Insulation
G. 07 21 29 Sprayed Cellulose Insulation
H. 07 26 00 Vapor Retarders
I. 07 27 00 Air Barriers
J. 07 84 00 Firestopping
K. 07 92 00 Joint Sealants
L. 09 21 00 Plaster and Gypsum Board Assemblies
M. 21 13 13 Automatic Fire Protection
N. 22 00 00 Plumbing
O. 23 30 00 Ductwork and Accessories
P. 26 00 00 Electrical

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product data for materials, providing descriptions sufficient for Identification at the Project site. Include manufacturer's printed instructions for installation.

1.5 QUALITY ASSURANCE

A. Provide the work of this Section using competent installers, experienced in the application of the materials and systems being used, approved and accredited by the material or system manufacturer.

B. Provide weather-stripping and seal products of industrial design, strength and quality as that used by professional builders and trade contractors, sourced via leading manufacturers of original products supplying the construction and automotive industries.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable local building codes for fire resistance ratings and surface burning characteristics.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

1.7 PRE-INSTALLATION CONFERENCE

A. Convene at least one week prior to commencing work of this Section, under provisions of Section 01 30 00.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when temperature or weather conditions deviate from manufacturer's recommendations.

B. Comply with manufacturer's recommended requirements for temperatures, relative humidity, and substrate moisture content during application and curing of materials.

C. Ensure proper ventilation in areas to receive solvent and moisture cured materials, and in enclosed spaces when installing two-component foam sealant. Alternatively, appropriate breathing apparatus should be worn.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store materials in original wrappings and containers with manufacturer's seals and labels intact. Protect from damage and environmental conditions in accordance with manufacturer's recommendations.

1.10 SEQUENCING AND SCHEDULING

A. Do not install work of this Section until work of other trades having an effect on this Section of work has been completed.

B. Schedule work of other trades so that foam sealants can be inspected prior to being covered by Subsequent construction.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Refer to referenced specification sections.

2.2 MATERIALS

A. Foamed-in-Place Insulation, for air sealing of attic ceiling and wall penetrations, Re: Section 07 21 19 Foamed-in-Place Insulation.

B. Non-Expansive Spray Foam Insulation, for air sealing of attic ceiling and wall penetrations, Re: Section 07 21 00 Miscellaneous Building Insulation, item 2.1.A Non-Expansive Spray Foam Insulation.

C. Substrate Cleaner: Non-corrosive type recommended by foam sealant manufacturer.

D. Primer: As recommended by foam sealant manufacturer per item 2.2.A in Section 07 21 19 Foamed-in-Place Insulation.

E. Overcoat – As recommended by foam sealant manufacturer at exposed locations per items 2.2 B and C in Section 07 21 19 Foamed-in-Place Insulation.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine sizes and conditions of voids to be air sealed to establish thicknesses and installation of materials.

B. Verify that surfaces are ready to accept the work of this Section and penetrating elements are securely fixed, properly located and with the required space allowance between penetrants and openings.

C. Do not proceed with work of this Section until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate surfaces to remove dirt, dust, grease, oil, loose material, or other matter which may affect bond of foam sealant or air seal material. Ensure surfaces are dry before proceeding with installation.

B. Remove incompatible materials which may affect bond.

C. Install backing and damming materials for air seal if required to arrest material leakage and for support.

D. Mask, using masking tape, where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces. Remove tape as soon as possible without disturbing air seal or air seal with substrates.

3.3 INSTALLATION

A. Air seal (air barrier systems)

1. Install materials in accordance with manufacturer's instructions and acceptable to authorities having jurisdiction and the Consultant to provide required air seal.

2. Apply sealants within recommended application temperature ranges. Consult manufacturer when sealants cannot be applied within specified ranges.

3. Avoid overfilling restricted spaces.

4. Install foam sealants in accordance with authorities having jurisdiction and all other applicable regulations pertaining to sealing materials.

5. To provide continuity with the air barrier and a) complete exterior building envelope including all exterior wall, soffits, foundations and ceiling/roof envelope assemblies; b) all unit common wall assemblies, and c) all unit to common area wall assemblies, seal all penetrations to restrict air movement through systems to the maximum building envelope leakage levels specified in Section 01 45 23 Blower Door Testing.

3.4 FIELD QUALITY CONTROL

A. Notify Architect when completed installations are ready for inspection prior to concealing or enclosing an area containing air sealing materials.

B. Arrange for inspections by the Owner's independent inspection and testing company, appointed and paid for by Owner.

C. Following field inspections, provide all repair as required to ensure compliance with the Contract Documents.

3.5 CLEANING AND PROTECTION

A. Upon completion of this work, remove all materials, equipment and debris from the site.

B. Leave work area and adjacent surfaces in a condition acceptable to the Consultant.

C. Remove excess sealant with recommended solvent.

D. Leave installed work with sufficient protection to enable it to remain untouched until project turnover.

END OF SECTION

SECTION 07 53 03

ELASTOMERIC MEMBRANE ROOFING – **FULLY ADHERED**

PART 1 GENERAL

1.1 SUMMARY

A. Section includes insulation and membrane roofing, base flashings and Counter flashings.

B. Related Sections:

1. Section 06 10 53 - Miscellaneous Rough Carpentry: Wood nailers.
2. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1specification sections, apply to work of this section.

1.2 REFERENCES

A. ASTM International:
1. ASTM C79/C79M - Standard Specification for Gypsum Sheathing Board.
2. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
3. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board.
4. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.
5. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
6. ASTM C728 - Standard Specification for Perlite Thermal Insulation Board.
7. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
8. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
9. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
10. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
11. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
12. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
13. ASTM D822 - Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
14. ASTM D1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
15. ASTM D4434 - Standard Specification for Poly(Vinyl Chloride) Sheet Roofing.
16. ASTM D4637 - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane.
17. ASTM D5019 - Standard Specification for Reinforced Non-Vulcanized Polymeric Sheet Used in Roofing Membrane.
18. ASTM D6878 - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing.
19. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

20. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
21. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings.
22. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
23. ASTM E408 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
24. ASTM E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
25. ASTM E1918 - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
26. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

B. FM Global:
   1. FM DS 1-28 - Wind Loads to Roof Systems and Roof Deck Securement.
   2. FM 4450 - Approval Standard for Class 1 Insulated Steel Deck Roofs.

C. Intertek Testing Services (Warnock Hersey Listed):
   1. WH - Certification Listings.

D. National Roofing Contractors Association:
   1. NRCA - The NRCA Roofing and Waterproofing Manual.

E. Single Ply Roofing Institute:
   1. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.

F. Underwriters Laboratories Inc.:
   1. UL - Fire Resistance Directory.
   2. UL 790 - Tests for Fire Resistance of Roof Covering Materials.
   3. UL 1256 - Fire Test of Roof Deck Construction.
   4. UL 1897 - Uplift Tests for Roof Covering Systems.

G. U.S. Environmental Protection Agency:
   1. ENERGY STAR - ENERGY STAR Voluntary Labeling Program.

1.3 SYSTEM DESCRIPTION

A. Elastomeric Sheet Membrane Conventional Roofing System: One ply membrane system with insulation, and adhesive applied membrane.

1.4 DESIGN REQUIREMENTS

A. Low Slope Membrane Roof Edge Securement: Conform to SPRI ES-1 for wind speeds determined from applicable code.

1.5 PERFORMANCE REQUIREMENTS

A. Roof Assembly Classification: FM Class 1 Construction, windstorm classification of 1-90, in accordance with FM DS 1-28.

1.6 SUBMITTALS

A. Section 01 33 23 – Shop Drawings, Product Data and Samples: Submittal procedures.

B. Shop Drawings: Indicate setting plan for tapered insulation, joint and termination detail conditions, conditions of interface with other materials. Indicate membrane layout and seam locations.

C. Product Data: Submit characteristics on membrane materials, adhesives, seaming materials, flashing materials, insulation, vapor retarders.

D. Manufacturer's Installation Instructions: Submit special precautions required for seaming membrane.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with NRCA Roofing and Waterproofing Manual.

B. Roof Assembly Fire Classification: Minimum Class A when tested in accordance with ASTM E108 or UL 790.
   1. Roof Assembly with Foam Insulation: Passes FM 4450 or UL 1256.

C. Surface Burning Characteristics:
   1. Foam Insulation: Maximum 75/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

D. Apply label from agency approved by authority having jurisdiction to identify each roof assembly component.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum 10 years experience.

B. Applicator: Company specializing in performing Work of this section with minimum 10 years documented experience.

1.9 PRE-INSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Preinstallation meetings.

B. Convene minimum one week prior to commencing Work of this section.

C. Review preparation and installation procedures and coordinating and scheduling required with related Work.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Deliver products in manufacturer’s original containers, dry, undamaged, with seals and labels intact.

C. Store products in weather protected environment, clear of ground and moisture.

D. Protect foam insulation from direct exposure to sunlight.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

B. Do not apply roofing membrane during inclement weather or when ambient temperatures are below manufacturer’s standard recommendations without proper weather protection.

C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

1.12 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate Work with installation of associated roof penetrations and metal flashings, as Work of this section proceeds.

1.13 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.

B. Furnish 20 year manufacturer's warranty including coverage of materials and installation and resulting damage to building resulting from failure to resist penetration of moisture.

PART 2 PRODUCTS

2.1 SINGLE PLY ROOFING - FULLY ADHERED

A. Manufacturers:
1. Carlisle SynTec Systems
2. Firestone Building Products Co.
3. or approved equal
4. Substitutions: Refer to Section 01 60 00 - Product Requirements

2.2 COMPONENTS

A. Membrane: ASTM D4637, Type I EPDM 0.060 inch thick, reinforced.

B. Seaming Materials: As recommended by membrane manufacturer.

C. Washer Disc: Membrane material with adhesive backing.

D. Adhesive Materials:

1. Surface Conditioner: Type and recommended by manufacturer and as compatible with manufacturer's membrane.
2. Membrane Adhesives: As recommended by membrane manufacturer.
3. Thinner and Cleaner: As recommended by adhesive manufacturer, compatible with sheet membrane.

E. Insulation: ASTM C1289, Type II, Class I, faced rigid cellular polyisocyanurate roof insulation, with the following characteristics:
1. Board Size: 4'x8'
2. Board Thickness: Insulation Thickness: Provide a minimum of R-24 of insulation at roof drains tapered over 24 inches to an insulation system based on insulation thickness indicated on the remainder of the entire roof surface with a minimum of R-49. Provide tapered insulation system as indicated on the drawings. In areas of tapered insulation, the minimum insulation thickness shall be R=49 as indicated above. (Note: At roof locations where the roofing insulation system above the roof sheathing does not achieve R-49 (such as roof drains) the delinquent R value will be achieved by applying 07 21 19 Foamed-in-Place Insulation to the underside of the roof deck.)
3. Board Edges: square.
4. Thermal Conductivity: R-Value 6.5 per inch
5. Compressive Strength: Minimum 25 psi.
6. Separation sheets as recommended by manufacturer.

F. Flexible Flashings: Same material as membrane and as recommended by the manufacturer.

G. Counterflashings: Metal, as specified in Section 07 62 00.

2.3 ACCESSORIES

A. Insulation Joint Tape: Asphalt treated glass fiber reinforced; 6 inches wide; self adhering.

B. Roofing Nails: Hot Dipped Galvanized size as required to suit application.

C. Insulation Fasteners: Appropriate for purpose intended and approved by system manufacturer; length required for thickness of material with metal washers.

D. Sealants: As recommended by membrane manufacturer.

E. Walkway Pads: 24x24 inch size.

F. Stack Boots: Flexible boot and collar for pipe stacks through membrane.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify surfaces and site conditions are ready to receive Work.

C. Verify deck is supported and secure.

D. Verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped to drains and valleys, and suitable for installation of roof system.

E. Verify deck surfaces are dry and free of snow or ice.

F. Confirm dry deck by moisture meter with moisture content acceptable to roofing manufacturer.

G. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set.

3.2 INSTALLATION

A. Insulation Application:
1. Mechanically fasten insulation to deck.
2. Place second layer of insulation with joints staggered minimum 6 inches from joints of first layer.
3. Place no less than the minimum number of fasteners per insulation board/sq ft. As required to meet wind uplift requirements.
4. Place constant thickness first layer and tapered thickness insulation second layer to required slope pattern.
5. Minimum Total Insulation Thickness: 7 inch.
6. Place boards perpendicular to deck flutes with edges over flute surface for bearing support.
7. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
8. Lay tapered boards for distance of 24 inches back from roof drains for positive drainage.
9. Apply no more insulation than can be covered with membrane in same day.
10. Tape joints of insulation.

B. Membrane Application:
1. Apply primer.
2. Apply adhesive at rate recommended by manufacturer.
3. Roll out membrane, free from air pockets, wrinkles, or tears. Firmly press sheet into place without stretching.
4. Bond sheet to substrate except those areas directly over or within 3 inches of control or expansion joint.
5. Overlap edges and ends and seal by solvent welding or contact adhesive, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
6. Seal membrane around roof penetrations.

C. Flashings And Accessories:

1. Apply flexible flashings to seal membrane to vertical elements.
2. Secure to nailing strips at 4 inches oc.
3. Coordinate installation of roof drains and related flashings.
4. Seal flashings and flanges of items penetrating membrane.
5. Install walkway pads. Space pad joints to permit drainage.

3.3 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

3.4 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

B. In areas where finished surfaces are soiled by Work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.

C. Repair or replace defaced or disfigured finishes caused by Work of this section.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.

B. Protect building surfaces against damage from roofing Work.

C. Where traffic must continue over finished roof membrane, protect surfaces.

END OF SECTION

SECTION 07 84 00

FIRESTOPPING

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:
1. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.
2. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.
3. Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:
a. Section 03 30 00 - Cast-In-Place Concrete
b. Section 04 20 19 - Unit Masonry
c. Section 07 90 00 - Joint Protection
d. Section 09 21 00 - Plaster and Gypsum Board Assemblies
e. Section 21 00 00 - Fire Suppression
f. Section 22 00 00 - Plumbing
g. Section 23 00 00 - Heating, Ventilating, and Air Conditioning
h. Section 26 00 00 – Electrical

1.2 SECTION INCLUDES

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in, or construction joints between, fire rated wall and floor assemblies.

1.3 SYSTEM DESCRIPTION

A. Firestop all interruptions to fire rated assemblies, materials and components. Only tested firestop systems shall be used in specific locations as follows:

1. Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.
2. Safing slot gaps between edge of floor slabs and curtain walls.
3. Openings between structurally separate sections of wall or floors.
4. Gaps between the top of walls and ceilings or roof assemblies.
5. Expansion joints in walls and floors.
6. Openings and penetrations in fire-rated partitions or walls containing fire doors.
7. Openings around structural members which penetrate floors or walls.

1.4 REFERENCES

A. Test Requirements: ASTM E 814, "Standard Method of Fire Tests of Through Penetration Fire Stops"

B. Test Requirements: UL 1479, “Fire Tests of Through-Penetration Firestops”

C. Test Requirements: UL 2079, “Tests for Fire Resistance of Building Joint Systems”

D. Underwriters Laboratories (UL) of Northbrook, IL publishes tested systems in their "FIRE RESISTANCE DIRECTORY" that is updated annually.
   1. UL Fire Resistance Directory:
      a. Firestop Devices (XHJI)
      b. Fire Resistance Ratings (BXRH)
      c. Through-Penetration Firestop Systems (XHEZ)
      d. Fill, Voids, or Cavity Material (XHHW)
      e. Forming Materials (XHKU)
      f. Joint Systems (XHBN)
      g. Perimeter Fire Containment Systems (XHDG)
   2. Alternate Systems: “Omega Point Laboratories Directory” (updated annually).

E. Test Requirements: ASTM E 1966, “Standard Test Method for Fire Resistive Joint Systems”

F. Test Requirements: ASTM E 2307, “Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus”

G. Inspection Requirements: ASTM E 2174, “Standard Practice for On-site Inspection of Installed Fire Stops”

H. ASTM E 84, “Standard Test Method for Surface Burning Characteristics of Building Materials”

I. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments

J. All major building codes: ICBO, SBCCI, BOCA, and IBC.

K. NFPA 101 - Life Safety Code

L. NFPA 70 - National Electric Code

1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide through-penetration fire stop systems and fire-resistive joint systems that comply with specified requirements of tested systems.

B. Fire stop System installation must meet requirements of ASTM E 814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.

C. Proposed fire stop materials and methods shall conform to applicable governing codes having local jurisdiction.

D. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

E. For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment documents must follow

F. Requirements set forth by the International Firestop Council.

1.6 SUBMITTALS

A. Submittal Procedures: Submit manufacturer's specifications and technical data for each material including the composition and limitations, documentation of qualified tested firestop systems to be used and manufacturer's installation instructions to comply with Section 01 33 00.

B. Material Safety Data Sheets: Submit material safety data sheets provided with product delivered to job-site.

C. Manufacturer's Installation Instructions: Submit procedure for preparation and installation.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements. Submit Manufacturer's engineering judgment identification number and document details when no qualified tested system is available for an application. Engineering judgment must include both project name and contractor's name who will install firestop system as described in document.

E. Schedule: Provide a schedule of openings and penetrations requiring firestopping and firesafing. Correlate with products submitted, fire ratings, and testing agency test results.

F. Installer Qualifications: Submit firestopping manufacturer's qualification of installer.

1.7 INSTALLER QUALIFICATIONS

A. Engage an experienced Installer who is qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A supplier's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

E. Do not use damaged or expired materials.

1.9 PROJECT CONDITIONS

A. Do not use materials that contain flammable solvents.

B. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 PRODUCTS

2.1 FIRESTOPPING, GENERAL

A. A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

B. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

C. Firestopping Materials are either “cast-in-place” (integral with concrete placement) or “post installed.” Provide cast-in-place firestop devices prior to concrete placement.

2.1 FIRESTOPPING MATERIALS

A. Manufacturers:
1. Hilti USA
2. Isolatek International (Cafco Products).
3. Specified Technologies Inc.
4. 3M Fire Protection Products.
5. United States Gypsum Co.
6. Substitutions permitted.

B. Firestopping Material: Mineral fiber stuffing insulation.
1. USG Thermafiber Safing Insulation.
a. Density: 4.0 lb/cu ft.

C. Firestopping Material: Single component mortar compound.
1. Hilti CP 637 Firestop Mortar
2. Cafco TPS Mortar.
3. SpecSeal Fire Rated Mortar SSM
4. USG Firecode Compound.

D. Firestopping Material: Single component elastomeric compound.
1. Cafco TPS Type C.
2. Hilti FS-One High Performance Sealant
3. SpecSeal Latex Sealant LC150
4. 3M Fire Barrier CP 25WB+ Caulk.
5. USG Smoke-Seal Compound.

E. Firestopping Material: Intumescent Compound, fire rating as indicated on drawings. Intumescent putty compound which expands on exposure to surface heat gain.
1. Cafco TPS Type C.
2. Hilti FS-One High Performance Sealant
3. SpecSeal Latex Sealant LC150
4. 3M Fire Barrier CP 25WB+ Caulk.
5. USG Smoke-Seal Compound.

F. Firestopping Material: Expansion Joint Sealant, Hilti CP672 2" expansion joint sealant or equal.
   1. Cafco TPS Type C.
   2. Hilti FS-One High Performance Sealant
   3. SpecSeal Latex Sealant LC150
   4. 3M Fire Barrier CP 25WB+ Caulk.
   5. USG Smoke-Seal Compound.

G. Provide additional firestopping materials as required to provide a complete building firestopping application of all fire rated assemblies.

2.2 ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.

B. Dam Material: Permanent:
   1. As required by manufacturer to meet system listing.

C. Installation Accessories: Clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify openings are ready to receive the work of this section.

B. Clean substrate surfaces of matter which may affect bond of firestopping material.

C. Install backing materials to arrest liquid material leakage.

3.2 APPLICATION

A. Apply primer and materials in accordance with manufacturer's instructions.

B. Apply firestopping material in sufficient thickness to achieve rating, in manner consistent with tested and listed assemblies.

C. Install material at openings and edge of floor slabs requiring firestopping.

D. Install material at walls or partition openings which contain penetrating sleeves, piping, duct work, conduit and other items, requiring firestopping.

E. Protect installed firestopping from damage during construction operations.

END OF SECTION

SECTION 07 90 00

JOINT PROTECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes sealants and joint backing, and accessories.

B. Related Sections:
1. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.
2. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.
3. Section 07 26 00 - Vapor Retarders: Sealants required in conjunction with vapor retarders.
4. Section 07 27 00 - Air Barriers: Sealants required in conjunction with air barriers.
5. Section 07 50 00 – Air Sealing
6. Section 07 84 00 - Firestopping: Firestopping sealants.
7. Section 09 21 16 - Gypsum Board Assemblies: Acoustic sealant.

1.2 REFERENCES

A. ASTM International:
1. ASTM C834 - Standard Specification for Latex Sealants.
2. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.
3. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
4. ASTM C1193 - Standard Guide for Use of Joint Sealants.
5. ASTM D1056 - Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
6. ASTM D1667 - Standard Specification for Flexible Cellular Materials-Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam).
7. ASTM D2628 - Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.

B. South Coast Air Quality Management District:
1. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Products Data: Submit data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

C. Samples: Submit two samples illustrating sealant colors for selection.

D. Manufacturer's Installation Instructions: Submit special procedures, surface preparation, and perimeter conditions requiring special attention.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

F. Warranty: Include coverage for installed sealants and accessories failing to achieve airtight seal, watertight seal, exhibit loss of adhesion or cohesion, and sealants which do not cure.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with State and Municipality standards.

B. Maintain one copy of each document on site.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Applicator: Company specializing in performing Work of this section with minimum three years documented experience, and approved by manufacturer.

1.6 MOCKUP

A. Section 01 40 00 - Quality Requirements: Requirements for mockup.

B. Construct mockup of sealant joints in conjunction with window, wall, mockups specified in other sections.

C. Construct mockup with specified sealant types and with other components noted.
   1. Determine preparation and priming requirements based on manufacturers recommendations; take action necessary for correction of failure of sealant tests on mock-up.
   2. Verify sealants, primers, and other components do not stain adjacent materials.

D. Locate where directed by Architect/Engineer. where indicated on Drawings.

E. Incorporate accepted mockup as part of Work.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Maintain temperature and humidity recommended by sealant manufacturer during and after installation.

1.8 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate Work with sections referencing this section.

PART 2 PRODUCTS

2.1 JOINT SEALERS AND SEALANT SCHEDULE

A. Manufacturers:
1. Dow Corning Corp.
2. GE Silicones.
3. Pecora Corp.
4. Sika Corp. .
5. Tremco Sealants & Waterproofing.
6. Substitutions: Section 01 60 00 - Product Requirements Permitted.

B. Type A - General Purpose Exterior Sealant: Polyurethane; ASTM C 920, Grade NS, Class 25, Uses NT, M, G, A and O; single component; Sonneborn Sonolastic NP 1, or equal.
1. Color as selected.
2. Applications: Use for:
a. Joints between concrete and other materials.
b. Joints between brick and other materials.
c. Joints between metal frames and other materials.
d. Joints between siding and other materials.
e. Joints between exterior wall wood framing members, including studs, plates, band joists.
f. Other exterior joints for which no other sealant is indicated.

C. Type B - Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, ASTM C 1311, nondrying, non-skinning, non-curing; DAP Butyl-Flex, or equal.
1. Applications: Use for:
a. Concealed sealant bead in sheet metal work.
b. Bedding for door thresholds.

D. Type C - General Purpose Interior Sealant: Siliconized Acrylic emulsion latex; ASTM C834, single component, paintable; DAP Alex Plus, or equal.
1. Colors as selected.
2. Applications: Use for:
a. Interior wall and ceiling control joints.
b. Interior joints between door and window frames and wall surfaces.
c. Other interior joints for which no other type of sealant is indicated.

E. Type D - Bathtub/Tile Sealant: White silicone; ASTM C920, Uses NT, G and A; single component, mildew resistant; Sonneborn Sonolastic Omniplus, or equal.
1. Applications: Use for:
a. Joints between plumbing fixtures and floor and wall surfaces.
b. Joints between kitchen and bath countertops and wall surfaces.

F. Type E - Acoustical Sealant: Butyl or acrylic sealant; ASTM C920, Grade NS, Class 12-1/2, Uses M and A; single component, solvent release curing, non-skinning.
1. Applications: Use for concealed locations only:
a. Sealant bead between top stud plate and structure and between bottom stud plate and floor.

G. Type F - Interior Floor Joint Sealant: Polyurethane, self-leveling; ASTM C920, Grade P, Class 25, Uses T, M and A; single component; Sonneborn Sonolastic SL1, or equal.

1. Colors as selected.
2. Applications: Use for:
    a. Expansion joints in floors.

H. Type G - Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C920, Class 25, Uses T, M and A; single component; Sonneborn Sonolastic SL1, or equal.
1. Color as selected.
2. Applications: Use for:
    a. Joints in sidewalks and vehicular paving.

I. Type H – Insulating Foam Sealant: Latex foam sealant, non expanding, paintable; DAPtex Plus, or equal.
1. Applications: Use for concealed locations only:
    a. Joints around windows and doors in exterior walls.

J. Type I – Elastomeric Latex Sealant: Acrylic polymer sealant, ASTM C 920, Type S, Grade NS, Class 25, low odor, mildew resistant, paintable; DAP Dynaflex 230, or equal.
1. Applications: Use for concealed locations only:
    a. Joints between exterior extruded polystyrene insulation boards.

2.2 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
1. Interior Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant; ASTM D1056, sponge or expanded rubber D1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify substrate surfaces and joint openings are ready to receive work.

C. Verify joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

A. Remove loose materials and foreign matter impairing adhesion of sealant.

B. Clean and prime joints.

C. Perform preparation in accordance with ASTM C1193.

D. Protect elements surrounding Work of this section from damage or disfiguration.

3.3 INSTALLATION

A. Perform installation in accordance with ASTM C1193.

B. Perform acoustical sealant application work in accordance with ASTM C919.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

D. Install bond breaker where joint backing is not used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

G. Tool joints concave. as detailed.

H. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.

I. Compression Gaskets: Avoid joints except at ends, corners, and intersections; seal joints with adhesive; install with face 1/8 to 1/4 inch below adjoining surface.

3.4 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

B. Clean adjacent soiled surfaces.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.

B. Protect sealants until cured.

3.6 SCHEDULE

A. Provide Sealants where indicated on drawings and as per 2.1 JOINT SEALERS AND SEALANT SCHEDULE (above).

END OF SECTION

08 10 00

DOOR OPENING, DOOR AND FRAME SCHEDULE

NOTE: REFER TO NOTES AT END OF SCHEDULE

		Inches											
No.	**Location**	**W**	**H**	**T**	**Door Material**	**Door Type**	**Frame Type**	**Lock Function**	**Electric Function**	**Door and Frame Hardware**	**Closer Type**	**Label**	**Notes**
100	MECH (100)	36	84	1 3/4	Insulated Steel Door w/Glazed Transom	TBMD	TBMF	Storeroom 1	No	Weatherstripping, Kickplate, Threshold 1, Closer	1	-	Exterior Threshold 1 - see dwg for Jamb and head detail.
101A	RETAIL A/B (101)	(2) 3'-0"	7'-0"	1 3/4	Full Glass Aluminum Pair - Kawneer 560 Series w/ 1" insulated glazing.	AL2	SF-G	Exit Devise 1 Consealed Vertical Rod at both leafs.	Y	Threshold 1, Credential Reader, consealed vertical rods. Hinge 2.	2	-	Notes 10 and 11. Closer 2 at inactive leaf. Door Operator at active leaf.- coordinate electronic function with tenant
101B	RETAIL A/B (101)	(2) 3'-0"	7'-0"	1 3/4	Full Glass Aluminum Pair - Kawneer 560 Series w/ 1" insulated glazing.	AL2	SF-K	Exit Devise 1 Consealed Vertical Rod at both leafs.	Y	Threshold 1, Credential Reader, consealed vertical rods. Hinge 2.	2	-	Notes 10 and 11. Closer 2 at inactive leaf. Door Operator at active leaf.- coordinate electronic function with tenant
101C	RETAIL A/B (101)	36	84	1 3/4	Insulated Steel Door w/Glazed Transom	TBMD	TBMF	Electric Stike for FOB (by Tennant)	Y	Weatherstripping, Kickplate, Threshold 1, Closer	2	-	Exterior Threshold 1 - see dwg for Jamb and head detail - coordinate electronic function with tenant
102A	RETAIL C (102)	(2) 3'-0"	7'-0"	1 3/4	Full Glass Aluminum Pair - Kawneer 560 Series w/ 1" insulated glazing.	AL2	SF-D	Exit Devise 1 Consealed Vertical Rod at both leafs.	No	Threshold 1, Credential Reader, consealed vertical rods. Hinge 2.	2	-	Notes 10 and 11. Closer 2 at inactive leaf. Door Operator at active leaf.
102B	RETAIL C (102)	(2) 3'-0"	7'-0"	1 3/4	Full Glass Aluminum Pair - Kawneer 560 Series w/ 1" insulated glazing.	AL2	SF-E	Exit Devise 1 Consealed Vertical Rod at both leafs.	No	Threshold 1, Credential Reader, consealed vertical rods. Hinge 2.	2	-	Notes 10 and 11. Closer 2 at inactive leaf. Door Operator at active leaf.
103A	RETAIL 1 (103)	3'-0"	7'-0"	1 3/4	Full Glass Aluminum Pair - Kawneer 560 Series w/ 1" insulated glazing.	AL1	SF-F	Exit Devise 2 Rim Latch	No	Threshold 1	2	-	Note 11.
103B	RETAIL 1 (103)	3'-0"	7'-0"	1 3/4	Full Glass Aluminum Pair - Kawneer 560 Series w/ 1" insulated glazing.	AL1	SF-F	Exit Devise 2 Rim Latch	No	Threshold 1	2	-	Note 11.
104A	RETAIL 2 (104)	3'-0"	7'-0"	1 3/4	Full Glass Aluminum Pair - Kawneer 560 Series w/ 1" insulated glazing.	AL1	SF-F	Exit Devise 2 Rim Latch	No	Threshold 1	2	-	Note 11.
104B	RETAIL 2 (104)	3'-0"	7'-0"	1 3/4	Full Glass Aluminum Pair - Kawneer 560 Series w/ 1" insulated glazing.	AL1	SF-F	Exit Devise 2 Rim Latch	No	Threshold 1	2	-	Note 11.
105A	RETAIL 3 (105)	3'-0"	7'-0"	1 3/4	Full Glass Aluminum Pair - Kawneer 560 Series w/ 1" insulated glazing.	AL1	SF-F	Exit Devise 2 Rim Latch	No	Threshold 1	2	-	Note 11.
105B	RETAIL 3 (105)	3'-0"	7'-0"	1 3/4	Full Glass Aluminum Pair - Kawneer 560 Series w/ 1" insulated glazing.	AL1	SF-F	Exit Devise 2 Rim Latch	No	Threshold 1	2	-	Note 11.
106A	RETAIL 4 (106)	3'-0"	7'-0"	1 3/4	Full Glass Aluminum Pair - Kawneer 560 Series w/ 1" insulated glazing.	AL1	SF-F	Exit Devise 2 Rim Latch	No	Threshold 1	2	-	Note 11.
106B	RETAIL 4 (106)	3'-0"	7'-0"	1 3/4	Full Glass Aluminum Pair - Kawneer 560 Series w/ 1" insulated glazing.	AL1	SF-F	Exit Devise 2 Rim Latch	No	Threshold 1	2	-	Note 11.

08 10 00

DOOR OPENING, DOOR AND FRAME SCHEDULE

NOTE: REFER TO NOTES AT END OF SCHEDULE

		Inches											
No.	**Location**	**W**	**H**	**T**	**Door Material**	**Door Type**	**Frame Type**	**Lock Function**	**Electric Function**	**Door and Frame Hardware**	**Closer Type**	**Label**	**Notes**
107A	RETAIL 5 (107)	3'-0"	7'-0"	1 3/4	Full Glass Aluminum Pair - Kawneer 560 Series w/ 1" insulated glazing.	AL1	SF-F	Exit Devise 2 Rim Latch	No	Threshold 1	2	-	Note 11.
107B	RETAIL 5 (107)	3'-0"	7'-0"	1 3/4	Full Glass Aluminum Pair - Kawneer 560 Series w/ 1" insulated glazing.	AL1	SF-F	Exit Devise 2 Rim Latch	No	Threshold 1	2	-	Note 11.
108	MECH (108)	36	84	1 3/4	Insulated Steel Door	TBMD	TBMF	Storeroom 1	No	Weatherstripping, Kickplate, Threshold 1, Closer	1	-	Exterior Threshold - see dwg A###, Jamb and head detail - see dtl ## and ##

Notes:
1. Provide concave wall mounted door stops at all doors opening against an adjacent wall or door. Ives No. 406 1/2 or equal.
2. Provide a door mounted roller bumper at all doors opening against an opposite hand door (1 per pair). Ives No. 471 or equal.
3. Provide floor stops at all doors where wall stops or roller stops are not appropriate. Ives No. 436 or 438.
4. Provide solid wood blocking at all locations of wall mounted door stops.
5. Undercut interior wood doors without a threshold 3/8" AFF, unless schedule otherwise.
6. Provide specified hinges and frame silencers for all interio swinging doors, unless scheduled/specified to be provided with gaskets.
7. Reference Room Finish Schedule for door finishes, kick plate finish & sizes.
8. Provide the indicated kick plate on push sides of the door, unless noted otherwise.
9. Actuate Fire-alarm tied electronic locking as fail SAFE in alarm condition.
10. Electronic Card Reader. Reference Electrical drawings for more information regarding Security System with Electronic Card Reader Control. Contractor shall provide hardware to integrate with electronic locking devices as specified and to provide a complete functioning system.
11. Door Hardware and construction cyliders in doors located in Curtain Wall system provided by Curtain Wall manufacturer. Door Hardware supplier to provide permanant cyliders, keys and coordination.
12. Conform to Section 01 81 13 - Sustainable Design Requirements and provide LEED Submittals, Manufacturer's Certificates and Product Cost Data for the following targeted LEED Credits: MRc4 Recycled Content – Pre and

SECTION 08 12 14

STEEL DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes fire rated, non-rated, and thermally-broken and insulated steel frames.
   1. Provide frames for interior and exterior openings.

B. Related Sections:
   1. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.
   2. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.
   3. Section 01 33 23 - Submittal Procedures: Shop Drawings, Product Data, and Samples;
   4. Section 06 10 00 - Miscellaneous Rough Carpentry;
   5. Section 08 71 00 - Door Hardware: Hardware, silencers, and weatherstripping.
   6. Section 08 80 00 - Glass and Glazing
   7. Section 09 90 00 - Painting and Coating, Site finishing of frames.

1.2 REFERENCES

A. American National Standards Institute:
   1. ANSI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.

B. ASTM International:
   1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   2. ASTM A366 Standard Specification for Commercial Steel (CS) Sheet, Carbon (0.15 Maximum Percent) Cold-Rolled.

C. National Fire Protection Association:
   1. NFPA 80 - Standard for Fire Doors, Fire Windows.
   2. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.

D. Underwriters Laboratories Inc.:
   1. UL 10B - Fire Tests of Door Assemblies.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate frame elevations, reinforcement, anchor types and spacing, location of cut-outs for hardware, and finish.

C. Product Data: Submit frame configuration and finishes.

D. Manufacturer's Installation Instructions: Submit special installation instructions.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Conform to requirements of ANSI A250.8.

B. Fire Rated Frame Construction: Conform to NFPA 252, UL10B.

C. Installed Fire Rated Frame Assembly: Conform to NFPA 80 for fire rated class same as fire door.

D. Smoke and Draft Control Door Frames: Tested in accordance with UL 1784 and installed in accordance with NFPA 105.

E. Attach embossed label from agency approved by authority having jurisdiction to identify each fire rated door frame.

F. Perform Work in accordance with City of Bangor and State Historic Preservation standards.

G. Maintain one copy of each document on site.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Accept frames on site in manufacturer's packaging. Inspect for damage.

C. Break seal on-site to permit ventilation.

1.7 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate Work with frame opening construction, door, and hardware installation.

C. Sequence installation to accommodate required door hardware electric wire connections.

PART 2 PRODUCTS

2.1 STANDARD STEEL FRAMES

A. Manufacturers:
1. Amweld Building Products.
2. Brockway Smith Co.
3. Ceco Door Products.
4. Curries Co., Thermally broken steel frames.
5. Fleming Door Products.
6. Republic Builders Products.
7. Steelcraft Manufacturing

8. Steelcraft Manufacturing
9. Substitutions: Section 01 60 00 - Product Requirements

B. Product Description: Standard shop fabricated steel frames, thermally broken, and fire rated and non-rated types.

1. Exterior Frame Systems:
   a. Curries, 16 gauge, galvannealed steel, thermally broken, closed cell polyethylene foam, weather stripping, and threshold. Where indicated to receive insulated glazing, prep frame for insulated glazing specified in 08 80 00 Glass and Glazing.

2. Interior Frame Systems:
   a. Rediframe, 18 gauge steel frames, profiles indicated to receive finished gypsum drywall.
   b. Knock-down hollow metal frame, 18 gage cold rolled steel. Frame shall be knock-down, double return back bend, flush hairline miter at corner of head and jamb, corner reinforced with concealed clip.

3. Exterior Door Systems:
   a. Curries, 18 gauge, galvannealed steel, Polyurethane core - (U-factor of 0.15 or less), glass as indicated, refer to drawings for door style.

2.2 ACCESSORIES

A. Primer: ANSI A250.10 rust inhibitive type.

B. Silencers: Resilient rubber fitted into drilled hole

C. Weatherstripping: Specified in Section 08 80 00. Resilient rubber set in aluminum retainer.

2.3 FABRICATION

A. Fabricate frames for knock down field assembly for gypsum board slip on type.

B. Mullions for Double Doors: Fixed type, of same profiles as jambs.

C. Transom Bars for Glazed Lights: Fixed type, of same profiles as jamb and head. Re: 08 80 00 Glass and Glazing

D. Fabricate frames with hardware reinforcement plates welded in place.

E. Reinforce frames wider than 48 inches with roll formed steel channels fitted tightly into frame head, flush with top.

F. Prepare frames for silencers. Provide three single silencers for single doors and mullions of double doors on strike side. Provide two single silencers on frame head at double doors without mullions.

G. Attach embossed fire rated label to each fire rated frame.

2.4 SHOP FINISHING

A. Steel Sheet: Interior Frames galvanized to ASTM A653/A653M A40.

B. Steel Sheet: Exterior Frames galvanized to ASTM A653/A653M G60.

C. Primer: Air dried.

D. Site Finish: Color to be selected. Section 09 90 00 - Painting and Coating

E. Coat inside of frame profile with bituminous coating to minimum thickness of 1/16 inch.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify opening sizes and tolerances are acceptable.

3.2 INSTALLATION

A. Install frames in accordance with ANSI A250.8.

B. Coordinate with masonry and gypsum board wall construction for anchor placement.

C. Coordinate installation of frames with installation of hardware specified in Section 08 71 00 and doors in Division 08.

D. Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.

3.3 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edges, crossed corner to corner.

3.4 SCHEDULE

A. Refer to Door and Frame Schedule appended to this section.

END OF SECTION

SECTION 08 31 13

ROOF HATCHES, ACCESS DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes fire resistive rated and non-rated access doors and panels with frames.
   1. Provide for access to controls, valves, traps, dampers, cleanouts, and similar items requiring operation behind inaccessible finished surfaces.
   2. Coordinate exact locations with various trades to assure proper placement of access doors and panels.

1.2 Related Sections:

A. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.

B. Section 01 33 23—Submittal Procedures: Shop Drawings, Product Data, and Samples;

C. Section 01 62 00—Product Options;

D. Section 01 66 00—Storage and Handling Requirements;

E. Section 01 71 00—Examination and Preparation;

F. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.

G. Section 03 10 00 - Concrete Forming and Accessories: Placement of access frame unit anchors in concrete;

H. Section 06 10 00 - Miscellaneous Rough Carpentry;

I. Section 09 90 00 - Painting and Coating: Field paint finish.

J. Section 23 33 00 - Air Duct Accessories: Access doors in ductwork.

1.3 REFERENCES

A. ASTM International:
   1. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

B. Intertek Testing Services (Warnock Hersey Listed):
   1. WH - Certification Listings.

C. National Fire Protection Association:
   1. NFPA 80 - Standard for Fire Doors, Fire Windows.
   2. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.

3. NFPA 288 - NFPA 288: Standard Method of Fire Tests of Floor Fire Door Assemblies Installed Horizontally in Fire Resistance-Rated Floor Systems.

D. Underwriters Laboratories Inc.:
1. UL 10B - Fire Tests of Door Assemblies.
2. UL 263 - Standard for Safety for Fire Tests of Building Construction and Materials.

1.4 DESIGN REQUIREMENTS

A. Fabricate floor access assemblies to support live load of 100 lb/sq ft with deflection not to exceed 1/180 of span.

1.5 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on product characteristics, performance criteria and limitations.

C. Manufacturer's Installation Instructions: Submit procedure for preparation and installation.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.6 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of access units.

1.7 QUALITY ASSURANCE

A. Fire Rated Access Door Construction: Conform to one of the following:
1. Wall Access Doors: NFPA 252 or UL 10B.
2. Ceiling Access Doors: ASTM E119 or UL 263.

B. Installed Fire Rated Access Door Assembly: Conform to NFPA 80 for fire rated class;

C. Attach label from agency approved by authority having jurisdiction to identify each fire rated access door.

D. Perform Work in accordance with City of Bangor and State Historic Preservation standards.

E. Maintain one copy of each document on site.

1.8 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate Work with work requiring controls, valves, traps, dampers, cleanouts, and similar items requiring operation being located behind finished surfaces.

PART 2 PRODUCTS

2.1 ACCESS DOORS AND PANELS

A. Manufacturers:
1. J. L. Industries. Model
2. Larsen's Manufacturing Co. (Basis of Design – Access Panels)
3. Substitutions: Section 01 60 00 - Product Requirements.

B. Flush Framed Access Doors (Type 1): Frames and nominal 1 inch wide exposed flanges of 16 gage steel and door panels of 14 gage steel.

C. Gypsum Board Access Doors (Type 2): Frames and nominal 1 inch wide flanges of 16 gage steel and door panels of 14 gage steel. Design flanges to be concealed by gypsum board joint finishing compound specified in Section 09 21 16.

D. Fire Rated Access Doors (Type 3): Frames and nominal 1 inch wide exposed flanges of minimum 16 gage steel and door panels of 20 gage steel. Provide self closing and latching doors with keyed lock.

E. Gypsum Board Fire Rated Access Doors (Type 4): 16 gage steel frames with minimum 22 gage galvanized steel drywall bead flanges and door panels of 20 gage steel. Design flanges to be concealed by gypsum board joint finishing compound specified in Section 09 21 16. Provide self closing and latching doors with keyed lock.

F. Roof Access Hatch (Type 5): Furnish and install where indicated on plans metal roof hatch Type NB-50T, size width: 2'6" (762mm) x length: 4'6" (1372mm). Length denotes hinge side. The roof hatch shall be single leaf. The roof hatch shall be pre-assembled from the manufacturer, The BILCO Company, P.O. Box 1203, New Haven, CT 06505, 1-203-934-6363, Fax: 1-203-933-8478, Web: www.bilco.com to the manufacturers published performance characteristics and warranty. Install per manufacturer's instructions. Coordinate installation with steel decking and roofing system.

2.2 FABRICATION

A. Fabricate units of continuous welded construction; weld, fill, and grind joints to assure flush and square unit.

B. Wall and Ceiling Access Door and Panel Hardware:
1. Hinge: Standard continuous or concealed spring pin type, 175 degree steel hinges.
2. Lock: Self-latching lock. Screw driver slot for quarter turn cam lock.

C. Size Variations: Obtain acceptance of manufacturer's standard size units which vary slightly from sizes shown or scheduled.

2.3 SHOP FINISHING

A. Base Metal Protection: Prime coat units with baked on primer.

B. Finish: Site finish, painted (spray-applied) to match adjacent wall or ceiling.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify rough openings for access doors and panels are correctly sized and located.

3.2 INSTALLATION

A. Secure frames rigidly in place, plumb and level in opening, with plane of door and panel face aligned with adjacent finished surfaces.
   1. Set concealed frame type units flush with adjacent finished surfaces.

B. Position unit to provide convenient access to concealed work requiring access.

C. Install fire rated units in accordance with NFPA 80 and requirements for fire listing.

END OF SECTION

SECTION 08 41 13

ALUMINUM-FRAMED STOREFRONT WINDOW SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Section includes aluminum-framed storefronts including, frames, glass, and infill panels.

B. Related Sections:
1. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.
2. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.

1.2 SYSTEM DESCRIPTION

A. Aluminum-Framed Storefront System: Painted tubular aluminum sections with supplementary internal support framing, factory fabricated, factory finished, glass and insulated metal panel infill, related flashings, anchorage and attachment devices.

B. System Assembly: Site assembled.

C. System Design: Provide for expansion and contraction within system components caused by temperature cycling. Design and size members to withstand loads caused by pressure and suction of wind.

D. Air Infiltration: Limit air leakage through assembly to 0.06 cfm/min/sq ft (0.003 cu m/s/sq m) of wall area, measured at reference differential pressure across assembly of 1.57 psf (75 Pa) as measured in accordance with ASTM E283.

E. Water Leakage: None when measured in accordance with ASTM E331.

F. System Internal Drainage: Drain water entering framing system to exterior.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on product characteristics, performance criteria and limitations.

C. Manufacturer's Installation Instructions: Submit procedure for preparation and installation.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with AAMA SFM-1 and AAMA MCWM-1 - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

B. Surface Burning Characteristics:
1. Foam Insulation: Maximum 75/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

C. Apply label from agency approved by authority having jurisdiction to identify each foam plastic insulation board.

D. Maintain one copy of each document on site.

E. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.

F. Installer: Company specializing in performing Work of this section with minimum three years documented experience approved by manufacturer.

G. Design wind loading under direct supervision of Professional Engineer experienced in design of this Work and licensed at Project location.

1.5 WARRANTY

A. Furnish five year manufacturer warranty for insulated glass and factory finishes.

PART 2 PRODUCTS

2.1 ALUMINUM-FRAMED STOREFRONTS

A. Manufacturers:
1. Kawneer Co., Inc.
2. Vistawall Architectural Products.
3. EFCO Corp.
4. Traco.
5. Tubelite.
6. US Aluminum.
7. Substitutions: Permitted subject to compliance with requirements.

B. Product Description: Aluminum-framed storefronts, extruded aluminum, with glazing, and hardware.

2.2 COMPONENTS

A. Frames: Thermally broken extruded aluminum; flush glazing stops. Frames for interior glazing need not to be thermally broken. Glazing profiles as indicated on drawings.

B. Reinforced Mullion: Profile of extruded aluminum with internal reinforcement of shaped structural steel section.

C. Doors: Wide Stile 2” inches thick, stile and rail width as detailed, square glazing stops.

D. Glass and Glazing: Specified in Section 08 80 00.

E. Glass and Glazing Materials:
1. Glass in Exterior Lights: PPG SOLARBAN 60(2) Clear + Clear Solar Control Low-E Glass with argon gas, or equal. Performance Characteristics: VLT=70%; Winter U-Value=0.29; SHGC=0.39; LSG Ratio=1.79.
2. Glazing Materials: Storefront manufacturer’s standard types to suit application and to achieve weather, moisture, and air infiltration requirements.

F. Flashings: Minimum 0.040 inch (1.0 mm) thick aluminum, to match mullion sections where exposed.

G. Steel Sections: ASTM A36/A36M, Structural shapes to suit mullion sections; galvanized.

H. Fasteners: Stainless steel.

I. Perimeter Sealant and Backing Materials: Specified in Section 07 90 00.

J. Provide Deflection Control Slip Track at all storefront head details.

2.3 FABRICATION

A. Fabricate doors and frames allowing for minimum clearances and shim spacing around perimeter of assembly.

B. Accurately and rigidly fit and secure joints and corners, flush, hairline, and weatherproof.

C. Arrange fasteners, attachments, and jointing to ensure concealment from view.

D. Prepare components with internal reinforcement for door hardware and door operator hinge hardware.

2.4 SHOP FINISHING

A. Painted Aluminum Surfaces: AA-M12C12R1x non-specular as fabricated mechanical finish, chemically cleaned, and prepared for applied coating; with organic coating.
   1. High Performance Organic Coating: Fluoropolymer coating system complying with AAMA 2604 or 2605 minimum two-coat, with minimum 70 percent polyvinylidene fluoride resin.
   2. Color: to be selected by Architect from manufacture’s standard colors.

B. Concealed Steel Items: Galvanized to ASTM A123/A123M; minimum 2.0 oz/sq ft coating thickness; galvanize after fabrication.

C. Apply bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar metals.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.2 INSTALLATION

A. Install frames, glazing and flashings in accordance with AAMA MCWM-1 - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

B. Use anchorage devices to securely attach frame assembly to structure.

C. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

D. Coordinate attachment and seal of air and vapor retarder materials. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

F. Install infill panels using method required to achieve performance criteria.

G. Install glass in accordance with Section 08 80 00; separate glass from metal surfaces.

H. Install perimeter sealants in accordance with Section 07 90 00.

I. Tolerances:
   3. Variation from Plane: 1/8 inch per foot (3 mm/m) maximum, or 1/4 inch per 30 feet (6 mm/m); whichever is less.

END OF SECTION

08 70 00

DOOR HARDWARE SCHEDULE

Item/function	Manufacturer	Model No.	Finish	Remarks
Retail Entrance	Kawneer	Push - Pull w/ Double Cylinder Deadbo	To be Selected	Style CP (inteior) and C)-12 (exterior) with
Storeroom	Schlage	L9080	To be Selected	Lever 42 - knurled lever at mechanical rooms ONLY
Closer 1	Dorma	7600	630	ADA-compliant
Closer 2	Kawneer	LNC 2030	To be Selected	Concealed Overhead/Single Acting
Threshold 1	Pemko	273x292_FG	Mill Fin Alum	ADA compliant - maximum 1/2" height - Commercial Thermally Broken Latching Threshold
Hinges - Steet Doors/Framess	Hager	Full mortise	630	1 1/2 Pair, Provide ball bearing hinges at all exterior steel doors.
Kickplate	Ives	8400	Stainless Steel	34" x 8"
Knox Box	Knox	3200	Dark Bronze	Install where approved by Municiple Fire Officials
Combination Key Box	Kidde	Access Point 001015	Gray	Mount in Mech 100
Door edge sealing system	National Guard	5050	Color selected by Arch.	Provide at all exterior steel doors

Notes

1) Provide masterkey system, with construction keying system. Consult with Owner for instructions on keying. Provide key removable core at all hardware with locking function.
2) Products of one or more manufacturers are listed to establish quality and performance characteristics. Products of other manufacturers may be accepted subject to review by Architect.
3) Provide online controller and power supply as required at all wall mounted creditial readers. Coordinate electrical supply requirements as required.
4) Provide 100 user credentials, one primary controller, required software and training for electronic keying system.

Acceptable Manufacturers

Locksets:	Schlage, Sargent, Corbin, Kawneer
Closers:	Sargent, Dorma, LCN, Norton, Rixson, Kawneer
Hinges:	Hager, Stanley
Thresholds:	National Guard Products, Pemko, Reese, Zero
Accessories:	Ives, Rockwood, Hiawatha

SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.1 SUMMARY

A. Section includes hardware for wood doors.
   1. Provide door gaskets, including weatherstripping and seals, and thresholds, viewers, and protection plates.
   2. Door operator and controls

1.2 Related Sections:

A. Drawings and general provisions of contract including General and Supplementary Conditions and Division 1 specification sections apply to Work of this section.

B. Section 01 33 23—Submittal Procedures: Shop Drawings, Product Data, and Samples

C. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.

D. Section 06 20 00 - Finish Carpentry: Wood door frames.

E. Section 08 12 14 - Steel Doors and Frames: Silencers integral with steel frames

F. Section 08 12 14 – Steel Doors and Frames: Silencers integral with steel frames.

G. Section 08 14 16 - Flush Wood Doors.

H. Section 08 14 33 - Stile and Rail Wood Doors.

I. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Power supply to electric hardware devices.

J. Section 28 31 00 - Fire Detection and Alarm: Electrical connection to activate door closers and release magnetic holders.

1.3 PERFORMANCE REQUIREMENTS

A. Fire Rated Openings: Provide door hardware listed by UL or Intertek Testing Services (Warnock Hersey Listed), or other testing laboratory approved by applicable authorities.
   1. Hardware: Tested in accordance with NFPA 252.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on product characteristics, performance criteria and limitations.

C. Manufacturer's Installation Instructions: Submit procedure for preparation and installation.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of installed cylinders and their master key code.

C. Operation and Maintenance Data: Submit data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

D. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with the following requirements:
1. ANSI A156 series.
2. NFPA 80.
3. UL 305.

B. Maintain one copy of each document on site.

1.7 QUALIFICATIONS

A. Hardware Supplier: Company specializing in supplying commercial door hardware with minimum five years documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Package hardware items individually with necessary fasteners, instructions, and installation templates, when necessary; label and identify each package with door opening code to match hardware schedule.

C. Deliver keys only to the Owner.

1.9 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate Work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware and recessed items.
1. Provide templates or actual hardware as required to ensure proper preparation of doors and frames.

C. Sequence installation to accommodate required utility connections.

D. Coordinate Owner's keying requirements during the submittal process.

1.10 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Furnish five year manufacturer warranty for locksets and door closers.

1.11 MAINTENANCE MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements: Maintenance materials.

B. Furnish special wrenches and tools applicable for each different and for each special hardware component.

1.12 EXTRA MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Furnish (20) extra key lock cylinders for each master keyed group as attic stock.

PART 2 PRODUCTS

2.1 DOOR HARDWARE SUPPLIERS

A. Suppliers: Products of one or more manufacturers are listed in the Hardware Schedule to establish quality and performance characteristics. Products of other manufacturers may be accepted subject to review by Architect:
   1. Manufacturers of Locksets:
      a. Corbin
      b. Sargent.
      c. Schlage.

   2. Manufacturers of closers:
      a. LCN.
      b. Norton.
      c. Sargent.

   3. Manufacturers of hinges:
      a. Hager.
      b. McKinney.
      c. Stanley.

   4. Manufacturers of thresholds and weatherstripping:
      a. National Guard Products.
      b. Pemko.

   5. Manufacturers of panic sets:
      a. Sargent.
      b. Von Duprin

6. Manufacturers of door trim and accessories:
   a. Ives.
   b. Rockwood.

7. Manufacturers of automatic door operators:
   a. Horton
   b. LCN
   c. Sargent.

2.2 COMPONENTS

A. Keying
   1. Keying: Master keyed with high security keying system;
   2. Include construction keying.
   3. Supply 3 change keys for each lock and 5 master keys, each tagged. Provide keys of nickel silver only.
   4. Provide 1 Key Cabinet: Sheet steel construction, enameled finish, hinged door with key lock, internal hooks for 50 keys minimum, identification labeling.
   5. Finish: Baked enamel finish, color as selected by owner/architect.

2.3 MATERIALS AND FABRICATION

A. Provide products complying with ANSI A 156.1 standards;

B. Name Plates: Do not provide products with manufacturers name or trade name displayed in a visible location except in conjunction with required UL labels;

C. Provide hardware manufactured to conform to templates with machine screw installation. Do not provide hardware prepared for self-tapping screws;

D. Fasteners: Provide Phillips flat head screws except as otherwise indicated. Finish screws to match adjacent hardware finish;

E. Provide key removable cores at all door hardware with lock functions

F. Lock Trim: Furnish levers with rose plate as indicated in Schedule.
   1. Do not permit through bolts on solid wood core doors.

2.4 FINISHES

A. Finishes: ANSI A156.18; Finishes are identified in the Hardware Schedule at end of this section

2.5 DOOR OPERATORS

A. Manufacturers:
   1. Dor-O-Matic, Senior-Swing Door Operator
   2. Besam, SW100 Low Energy Swing Door

B. Components
   1. Electromechanical low-energy powered door operators, opening force not exceeding 14 lb-force (62N).
      a. ANSI/BHMA A156.19 – American National Standard for Power Assist & Low-Energy Power Operated Doors; and UL 325.

b. Electrical: 115 VAC (15-amp circuit breaker, one per unit) single-phase, 15 amp fused circuit to door headers, two 24-VAC Class II wires between door headers and remote activation devices, ½" (12mm) conduit and electrical boxes at activators.

2. Operation:
   a. Push button/push plate switches (both sides of door 123 and interior side only of door 119) and electric power assisted Push 'N' Go opening with Power Boost closing and holding;
   b. Key-switch activated (exterior of door 119) and electric power assisted Push 'N' Go opening with Power Boost closing and holding; coordinate key switch cylinder with hardware supplier to be keyed with the master keying system.

3. Finish: Kynar finish, color to be selected by the Architect from available colors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify doors and frames are ready to receive door hardware and dimensions are as instructed by manufacturer.

C. Verify electric power is available to power operated devices and is of correct characteristics.

3.2 INSTALLATION

A. Coordinate mounting heights with door and frame manufacturers. Use templates provided by hardware item manufacturer.

B. Install hardware at fire rated doors in accordance with NFPA 80;

C. Adjust hardware and door control devices for proper operation, and to comply with ADA requirements

END OF SECTION

SECTION 08 80 00

GLASS AND GLAZING

PART 1 GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.
B. 06 10 53 Miscellaneous Rough Carpentry
C. 08 44 13 Glazed Aluminum Curtain Walls
D. 09 21 00 Plaster and Gypsum Board Assemblies

1.2 SUMMARY:

A. Extent of glass and glazing work is indicated on drawings and schedules.

B. Types of work in this section include glass and glazing for:
1. Interior borrowed lites, not indicated as "preglazed".
3. Entrances and other doors, not indicated as "preglazed".
4. Glass Faced Infill Panels where indicated.
5. Frosted Glass Panels for use in custom interior guard/handrail system

C. Related Sections:
1. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.
2. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.

1.3 SYSTEM DESCRIPTION:

A. Provide glass and glazing that has been produced, fabricated and installed to withstand normal thermal movement, wind loading and impact loading (where applicable), without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glass and glazing materials and other defects in the work.

B. Normal thermal movement is defined as that resulting from an ambient temperature range of 120 deg. F (67 deg. C) and from a consequent temperature range within glass and glass framing members of 180 deg. F (100 deg. C).

C. Deterioration of insulating glass is defined as failure of hermetic seal due to other causes than breakage which results in intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coating, if any, resulting from seal failure, and any other visual evidence of seal failure or performance.

D. Interior Glass Deflection: Maximum differential deflection for two adjacent unsupported edges when 50 plf force is applied to one panel at any point up to 42 inches above finished floor less than thickness of glass.

E. Interior Glass Deflection: Maximum differential deflection for two adjacent unsupported edges when 50 plf force is applied to one panel at any point up to 42 inches above finished floor less than thickness of glass.

1.4 SUBMITTALS:

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on product characteristics, performance criteria and limitations.

C. Manufacturer's Installation Instructions: Submit procedure for preparation and installation.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

E. LEED Submittals - Product data as per Section 01 81 13, Sustainable Design and LEED Requirements.

1.5 QUALITY ASSURANCE:

A. Glazing Standards: Comply with recommendations of Flat Glass Marketing Association (FGMA) "Glazing Manual" and "Sealant Manual" except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or other referenced standards.

B. Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction or by Chapter 24 GLASS AND GLAZING of IBC 2003, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials.
   1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

C. Fire Resistance Rated Wire Glass: Provide wire glass products that are identical to those tested per ASTM E 163 (UL 9) and are labeled and listed by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

D. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component pane of units with appropriate certification label of inspecting and testing organization indicated below:
   1. Insulating Glass Certification Council (IGCC).
   2. Associated Laboratories, Inc. (ALI).

E. Single Source Responsibility for Glass: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and condition of glass indicated and composed of primary glass obtained from a single source for each type and class required.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Protect glass and glazing materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

1.7 PROJECT CONDITIONS:

A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes.

B. Install liquid sealants at ambient and substrate temperatures above 40 deg. F (4.4? C).

1.8 WARRANTY:

A. General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

B. Manufacturer's Special Project Warranty on Insulating Glass: Provide written warranty signed by manufacturer of insulating glass agreeing to furnish f.o.b. point of manufacture, freight allowed project site, within specified warranty period indicated below, replacements for those insulating glass units developing manufacturing defects. Manufacturing defects are defined as failure or hermetic seal of air space (beyond that due to glass breakage) as evidenced by intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coatings, if any, and other visual indications of seal failure or performance; provided the manufacturer's instructions for handling, installing, protecting and maintaining units have been complied with during the warranty period.
   1. Warranty Period: Manufacturer's standard but not less than 10 years after date of substantial completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include; but are not limited to, the following:

B. Manufacturers of Clear and Tinted Float Glass:
   1. AFG Industries, Inc.
   2. Ford Glass Division.
   3. Guardian Industries Corp.
   4. LOF Glass, Inc.
   5. PPG Industries, Inc.
   6. Saint-Gobain/Euroglass.
   7. Oldcastle Building Envelope
   8. PPG Industries, Inc.

C. Manufacturers of Wire Glass:
   1. AFG Industries, Inc.
   2. Guardian Industries Corp.
   3. Hordis Brothers, Inc.
   4. Pilkington Sales (North America) Limited.

D. Manufacturers of Heat-Treated Glass:
   1. AFG Industries, Inc.
   2. Cardinal IG.
   3. Environmental Glass Products.
   4. Falconer Glass Industries.
   5. Ford Glass Division.
   6. Guardian Industries Corp.
   7. Hordis Brothers, Inc.

8. LOF Glass, Inc.
9. PPG Industries, Inc.
10. Saint-Gobain/Euroglass.
11. Spectrum Glass Prod. Div., H. H. Robertson Co.
12. Viracon, Inc.

E. Manufacturers of Fire and Impact Rated Glazing:
1. Specialty Architectural & Fire Technology International.
2. Technical Glass Products.

2.2 GLASS PRODUCTS, GENERAL:

A. Not all scheduled products included in scope. Provide products indicated in documents not indicated as pre-glazed.

B. Primary Glass Standard: Provide primary glass which complies with ASTM C 1036 requirements, including those indicated by reference to type, class, quality, and, if applicable, form, finish, mesh and pattern.

C. Heat-Treated Glass Standard: Provide heat-treated glass which complies with ASTM C 1048 requirements, including those indicated by reference to kind, condition, type, quality, class, and, if applicable, form, finish, and pattern.

D. Sizes: Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer. Provide thicknesses indicated or, if not otherwise indicated, as recommended by glass manufacturer for application indicated.

2.3 PRIMARY GLASS PRODUCTS:

A. Clear Float Glass: Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select).

B. Wired Glass: Type I (transparent and wired glass, flat), Class 1 (clear), Quality q8 (glazing); complying with ANSI Z97.1; 1/4" thick; of form and mesh pattern indicated below:
1. Polished Wire Glass: Form 1 (wired, polished both sides), Mesh m2 (square).

2.4 HEAT-TREATED GLASS PRODUCTS:

A. Manufacturing Process: Manufacture heat-treated glass as follows:

B. By vertical (tong-held) or horizontal (roller hearth) process, at manufacturer's option, except provide horizontal process where indicated as "tongless" or "free of tong marks".

C. Uncoated Clear Heat-Treated Float Glass: Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), kind as indicated below.
1. Kind FT (fully tempered) where indicated.
2. Kind FT Sandbalsted (fully tempered with sandblasted finish one side) where indicated integral with custom interior guard/handrail system. ¼” with 3/8” mounting holes as indicated on the drawings.

D. Provide as indicated and in locations required by code.

2.5 FIRE AND IMPACT RATED GLAZING:

A. Clear Glazing Material: ASTM C 1036, Type 1.

1. Impact Rating: Complying with ANSI Z97.1 and CPSC 16CFR1201.
2. Fire Rating: Tested under UL 10b, 60 minutes.

2.6 SEALED INSULATING GLASS UNITS:

A. General: At exterior insulated glazed openings other than in operable traditional window openings, provide insulated glass as indicated in each applicable fenestration system specifications. Provide preassembled units consisting of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space and complying with ASTM E 774 for performance classification indicated as well as with other requirements specified for glass characteristics, air space, sealing system, sealant, spacer material, corner design and desiccant.

Product Schedule:
1. PPG SOLARBAN 60(2) Clear + Clear Solar Control Low-E Glass with argon gas, or equal. Performance Characteristics: VLT=70%; Winter U-Value=0.29; SHGC=0.39; LSG Ratio=1.79.

B. For properties of individual glass panes making up units, refer to product requirements specified elsewhere in this section applicable to types, classes, kinds and conditions of glass products indicated.

C. Provide heat-treated panes of kind and at locations indicated or, if not indicated, provide heat-strengthened panes where recommended by manufacturer for application indicated and tempered where indicated or where safety glass is designated or required.
1. Performance Classification per ASTM E 774: Class A.
2. Thickness of Each Pane: 1/4".
3. Air Space Thickness: 1/2".
4. Sealing System: Manufacturer's standard.
5. Spacer Material: Manufacturer's standard metal.
6. Desiccant: Manufacturer's standard; either molecular sieve or silica gel or blend of both.
7. Corner Construction: Manufacturer's standard corner construction.

D. Low Emissivity-Coated Insulating Glass Units: Manufacturer's standard units with one pane of glass coated with a durable, neutral-colored, low-emissivity metallic coating, of type and on surface indicated, and complying with the following requirements:
1. Exterior Pane: Clear float glass, coated on second surface.
   a. Kind: As indicated.

2. Interior Pane: Clear float glass, uncoated.
   a. Kind: As indicated.

2.7 GLASS FACED INFILL PANELS:

A. Infill Panels:
1. Insulated Panels: Manufacturer’s standard insulated panel construction with glass outer and aluminum inner faces and special insulating core; 1 inch thick, Viracon “Spandrel” panel or equal. Color: Subdued Bronze V905.

2.8 ELASTOMERIC GLAZING SEALANTS AND PREFORMED GLAZING TAPES:

A. General: Provide products of type indicated and complying with the following requirements:

B. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials with which they will come into contact, including glass products, seals of insulating glass units, and

glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.

C. Suitability: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealants and tapes which have performance characteristics suitable for applications indicated and conditions at time of installation.

D. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those for Type, Grade, Class and Uses.
   1. Colors: Provide color of exposed sealants indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.

2.8 GLAZING GASKETS:

A. Dense Elastomeric Compression Seal Gaskets: Molded or extruded gaskets of neoprene or EPDM, complying with ASTM C 864, of profile and hardness required to maintain watertight seal:

2.9 MISCELLANEOUS GLAZING MATERIALS:

A. Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

C. Setting Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealants, 80 to 90 Shore A durometer hardness.

D. Spacers: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape and hardness recommended by glass and sealant manufacturers for application indicated.

E. Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealant, of size and hardness required to limit lateral movement (side-walking) of glass.

2.10 FIRE RATED CLEAR CERAMIC GLAZED FRAMES

A. FireLite Heat Barrier Series ‘Fireframes’, 120 minute fire-rated glazed frame with Pilkington Pyrostop glass in factory painted finish K-D frame meeting UL 10C. Sizes and locations as indicated on drawings.

PART 3 EXECUTION

3.1 EXAMINATION:

A. Require Glazier to inspect work of glass framing erector for compliance with manufacturing and installation tolerances, including those for size, squareness, offsets at corners; for presence and functioning of weep system; for existence of minimum required face or edge clearances; and for effective sealing of joinery. Obtain Glazier's written report listing conditions detrimental to performance of glazing work. Do not allow glazing work to proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Clean glazing channels and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are indicated for use.

3.3 GLAZING, GENERAL:

A. Comply with combined printed recommendations of glass manufacturers, of manufacturers of sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.

B. Protect glass from edge damage during handling and installation; use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass with flares or bevels along one horizontal edge which would occur in vicinity of setting blocks so that these are located at top of opening. Remove from project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants.

3.4 GLAZING:

A. Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but with edge nearest corner not closer than 6" from corner, unless otherwise required. Set blocks in thin course of sealant which is acceptable for heel bead use.

B. Provide spacers inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger than 50 united inches (length plus height), except where gaskets or glazing tapes with continuous spacer rods are used for glazing. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.

C. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.

D. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.

E. Provide compressible filler rods or equivalent back-up material, as recommended by sealant and glass manufacturers, to prevent sealant from extruding into glass channel weep systems and from adhering to joint back surface as well as to control depth of sealant for optimum performance, unless otherwise indicated.

F. Force sealants into glazing channels to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.

G. Tool exposed surfaces of sealants to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.

H. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when installation is subjected to movement.

I. Miter cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent pull away at corners; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.5 PROTECTION AND CLEANING:

A. Protect glass from breakage immediately upon installation. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.

C. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

D. Wash glass on both faces not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Wash glass by method recommended by glass manufacturer.

END OF SECTION

SECTION 09 10 00
INTERIOR FINISH LEGEND

CODE	MATERIAL	MANUFACTURER	PRODUCT, STYLE AND COLOR	FINISH	REMARKS / NOTES
SC	Sealed Concrete	Re: Structural Specificaition	Re: Structural Specificaition	FACTORY	MECH 100, 108
FRP	Fiberglass Reinforeced Plastic Panels	Kemlite Company, Inc.	Pebbled Embossed Glasbord	As Selectedd	MECH 108

GENERAL NOTES:
1. REFER TO SPECIFICATION FOR MATERIAL SPECS.

SECTION 09 21 00

PLASTER AND GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes gypsum board with joint treatment; metal stud wall framing; metal channel ceiling framing; fire rated shaft liner panel systems and acoustic insulation.

B. Related Sections:
1. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.
2. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.
3. Section 07 21 19 Foam in Place Insulation

1.2 SYSTEM DESCRIPTION

A. Acoustic Attenuation for Identified Interior Partitions: 50 STC in accordance with ASTM E90.

1.3 SUBMITTALS

A. Product Data: Submit data on metal framing, gypsum board, joint tape; acoustic accessories and joint compound.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C840, GA-201 - Gypsum Board for Walls and Ceilings, GA-214 - Recommended Specification: Levels of Gypsum Board Finish, GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board, GA-600 - Fire Resistance Design Manual.

B. Furnish framing materials in accordance with SSMA - Product Technical Information.

C. Fire Rated Construction: Rating as indicated on Drawings.
1. Tested Rating: Determined in accordance with ASTM E119.
2. Fire Rated Partitions: Listed assembly by UL, WH, GA File.
3. Fire Rated Ceilings and Soffits: Listed assembly by UL, WH, GA File.
4. Fire Rated Structural Column Framing: Listed assembly by UL, WH, GA File.
5. Fire Rated Structural Beam Framing: Listed assembly by UL, WH, GA File.
6. Fire Rated Shaft Wall Requirements: two hour in accordance with UL listed assembly.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

A. Manufacturers:
1. Celotex Building Products

2. Domtar Gypsum, Inc.
3. G-P Gypsum Corp
4. National Gypsum Co

2.2 COMPONENTS

A. Studs and Tracks: ASTM C645, GA-216 and GA-600; galvanized sheet steel. Shaft Wall Tracks and components required to achieve listed UL fire rated assemblies.

B. Furring, Framing, and Accessories: ASTM C645, GA-216 and GA-600.

C. Gypsum Board Materials: ASTM C1396/C1396M [; Type X fire resistant where indicated on Drawings].
1. Standard Gypsum Board: 5/8 inch thick, maximum available length in place; ends square cut, tapered edges, where indicated
2. Moisture Resistant Gypsum Board: 5/8 inch thick, maximum available length in place; ends square cut, tapered edges, at all wall and ceiling surfaces within bathrooms and other locations prone to moisture, where indicated on drawings.
4. Gypsum Shaft Liner: ASTM C442, 1 inch thick, maximum available size in place; square edges, ends square cut and system channel framing system to achieve indicated fire ratings.
5. Exterior Gypsum Sheathing Board: 5/8 inch thick, glass faced rated for exterior applications, maximum available size in place; ends square cut, square edges; water repellent paper faces. Fire rated as indicated in drawings.

D. Tile Backer Boards:
1. Cementitious Backing Board: High density, glass fiber reinforced, 1/2 inch thick; 2 inch wide, coated glass fiber tape for joints and corners.

2.3 ACCESSORIES

A. Acoustic Insulation: ASTM C665, preformed glass fiber, friction fit type, unfaced, refer to drawings for insulation thickness.

B. Rock Fiber Thermal Insulation: ASTM C 553-92 Type VII, foil faced rock fiber blanket insulation conforming to the requirements of specified UL Fire Rating Assemblies.

C. Gypsum Board Accessories: ASTM C1047; metal; corner beads, shaft wall assemblies, edge trim, or as otherwise indicate.
1. Metal Accessories: Galvanized steel.
2. Plastic Accessories: PVC plastic.
3. Edge Trim: Type LC, L bead.

D. Joint Materials: ASTM C475, GA-201 and GA-216, reinforcing tape, joint compound, adhesive, and water.

D. Fasteners: ASTM C1002; Type S; length to suit application.

E. Adhesive: ASTM C557, GA-216.

F. Gypsum Board Screws: ASTM C954, ASTM C1002; length to suit application.
1. Screws for Steel Framing: Type S.
2. Screws for Wood Framing: Type W.

G. PLITEQ “GenieClip” @ 48” O.C. installed over 7/8” 25 gauge drywall furring channel, PLITEQ. Inc., or equal www.pliteq.com.

H. Sakrete surface bond cement or equal.

I. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions are ready to receive work.

3.2 INSTALLATION

A. Ceiling Framing:
   1. Install in accordance with ASTM C754, GA-216.
   2. Coordinate location of hangers with other work. Install ceiling framing independent of walls, columns, and above ceiling work.
   3. Reinforce openings in ceiling suspension system interrupting main carrying channels or furring channels, with lateral channel bracing.
   4. Laterally brace entire suspension system.

B. Acoustic Accessories:
   1. Install resilient channels at maximum 16 inches o.c. [Locate joints over framing members.]
   2. Place acoustic insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.
   3. Install acoustic sealant within partitions.

C. Gypsum Board:
   1. Install gypsum board in accordance with GA-216 and GA-600.
   2. Fasten gypsum board to furring or framing with screws.
   3. Place control joints consistent with lines of building spaces as recommended by gypsum board manufacturer and as directed by Architect/Engineer.
   4. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.
   1. Seal cut edges and holes in moisture resistant gypsum board and exterior gypsum soffit board with sealant.

D. Joint Treatment:
   1. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   2. Feather coats onto adjoining surfaces so camber is maximum 1/32 inch.

E. Tolerances: Maximum Variation from Flat Surface:1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 77 00

FIBERGLASS REINFORCED PLASTIC PANELS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Special wall surfaces, including fiberglass reinforced plastic panels.

B. Related Sections: Section(s) related to this section include:
1. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.

1.2 REFERENCES

A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation

B. ASTM International:
1. ASTM D2583 Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
2. ASTM D5420 Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact).
3. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 SYSTEM DESCRIPTION

A. Performance Requirements: Provide fiberglass reinforced plastic (FRP) panels which have been manufactured and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on product characteristics, performance criteria and limitations.

C. Manufacturer's Installation Instructions: Submit procedure for preparation and installation.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Qualifications:
1. Installer Qualifications: Installer should be experienced in performing work of this section and should have specialized in installation of work similar to that required for this project.
a. Certificate: When requested, submit certificate indicating qualifications.

1.6 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery:
   1. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Package sheets on skids or pallets for shipment to project site.
   2. Deliver no components to project site until areas are ready for installation for duration of project.

D. Storage and Protection:
   1. Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
   2. Store panels indoors in a dry place at the project site.

E. Handling:
   1. Remove foreign matter from face of panel by using a soft bristle brush, avoiding abrasive action.
   2. Handle materials to prevent damage to prevent damage to finished surfaces. Provide protective covering to prevent physical damage or staining following installation for duration of project.

1.7 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Installation shall not begin until building is enclosed, permanent heating and cooling equipment is in operation, and residual moisture from plaster, concrete or terrazzo work has dissipated.
   2. During installation, and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of adhesive manufacturer.
   3. Provide ventilation to disperse fumes during application of adhesive as recommended by adhesive manufacturer.

B. Field Measurements: Verify actual measurements/openings by field measurements before fabrication. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.8 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

1.9 MAINTENANCE

A. Extra Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 1 Closeout Submittals (Maintenance Materials) Section.
   1. Quantity: Furnish quantity of units equal to 5% of amount installed.

2. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra materials.

PART 2 PRODUCTS

2.1 FIBERGLASS REINFORCED PLASTIC (FRP) PANELS

A. Manufacturer:
   1. Kemlite Company, Inc.
   2. Or Equal approved by Architect

B. Proprietary Product(s)/System(s): (Crane) Kemlite Fluted 0.32" | 0.40" Double-Sided Fiberglass Reinforced Plastic (FRP) Panels.
   1. Kemply Panels:
      a. FXE Glasbord
         1) Class A embossed Factory Mutual approved identified by trademarked blue and red threads manufactured into the back of the panel and trademarked dual blue fluorescent embedded threads on the front of the panel (visible only under UV light).
         2) Color selected by Owner/Architect: Architect to select from available colors - 85 white, 83 colonial white, 70 soft beige, 48 pearl gray, 66 silver, 84 ivory, 1201 black.
         4) Surface: 0.09" (2.3mm) Pebbled Embossed Glasbord
         5) Size: Standard sizes are 4 feet × 8 feet, 4 feet × 9 feet, 4 feet × 10 feet and 4 feet × 12 feet; or as indicated on drawings.

      b. Moldings: Provide harmonizing PVC (polyvinyl chloride) moldings.
         1) Color selected by Owner/Architect: Architect to select from available colors.

      c. Rivets: Specify optional rivets in harmonizing colors (by color name and number) in areas where there are large fluctuations in temperature and/or humidity, where the substrate is unusually uneven, and in all low temperature or cold storage applications. Refer to manufacturer's Installation Guide for rivet pattern and installation instructions.

   3. *Surfaseal* Surface Protection: Provide Kemlite *Surfaseal* surface protection for fiberglass reinforced plastic (FRP) panels.
   4. Division Bars, Corner Trim: Panel manufacturer's standard length extruded vinyl pieces; longest length possible to eliminate end joints.
   5. Fasteners: Noncorrosive drive rivets.

2.2 PRODUCT SUBSTITUTIONS

A. Substitutions: No substitutions permitted.

2.3 ACCESSORIES

A. Adhesive: Provide panel adhesive as recommended by panel manufacturer for substrate location and materials.

2.4 SOURCE QUALITY

A. Source Quality: Obtain fiberglass reinforced plastic (FRP) panels from a single manufacturer. Provide panels and molding only from manufacturer specified to ensure warranty and color harmonization of accessories.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

3.2 EXAMINATION

A. Site Verification of Conditions: Verify that substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.
   1. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails are countersunk and joints and cracks are filled flush and smooth with the adjoining surface.
   2. Do not begin installation until backup surfaces are in satisfactory condition.

3.3 INSTALLATION

A. Fiberglass Reinforced Panel (FRP) Installation:
   1. Cut and drill panels with carbide tipped saw blades or drill bits, or cut with snips.
   2. Install panels with manufacturer's recommended gap for panel field and corner joints.
   3. Predrill fastener holes in panels with 1/8 inch (3.2 mm) oversize.
   4. For trowel type and application of adhesive, follow adhesive manufacturer's recommendations.
   5. Use products acceptable to panel manufacturer and install FRP system in accordance with panel manufacturer's printed instructions. Comply with panel manufacturer's *Installation Guide*.

B. Site Tolerances: 1/8" in 8 feet of any direction

C. Related Products Installation: Refer to other sections listed in Related Sections paragraph herein for related materials installation.

3.4 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace products that have been installed and are damaged. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project site and legally dispose of debris.
   1. Remove any adhesive or excessive sealant from panel face using solvent or cleaner recommended by panel manufacturer.

3.5 PROTECTION

A. Protection: Protect installed product and finish surfaces from damage during construction.

END OF SECTION

SECTION 09 90 00

PAINT SYSTEMS SCHEDULE

A. Not all products listed below required.
B. Provide products where indicated and at all new or modified work locations.
C. Refer to Interior and Exterior Paint System Specificaiton for additional product and execution requirements.
D. Refer to Manufacturer's product data sheets and comply with manufacturer's instructions, methods and recommendations.
E. Test selected system applied to specified substrate, prepared as specfied and recommended, for conformance of system performance priort to installing specified products.

INTERIOR SURFACES

Surface	Finish	System	Product	Coats
Metal	Semigloss	Primer	S-W Pro Cryl Universal Primer B66-310	1
		Finish	S-W Pro Industrial 0 VOC Acrylic Semi-Gloss B66-650	2

EXTERIOR SURFACES				
Surface	**Finish**	**System**	**Product**	**Coats**
Metal	Gloss	Primer	S-W Pro Cryl Universal Primer B66-310	1
		Finish	S-W Pro Industrial 0 VOC Acrylic Gloss B66 Series	2
PVC	Satin	Primer	S-W Multi-Purpose Latex Primer B51 Series	1
		Finish	S-W SuperPaint Exterior Acrylic Latex A89 Series	2
Galvanized Steel	Gloss	Primer	S-W Pro Cryl Universal Primer B66-310	1
		Finish	S-W SuperPaint Exterior Acrylic Latex A84 Series	2

SECTION 09 91 13

EXTERIOR PAINTING

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:
1. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.

1.2 SECTION INCLUDES

A. Existing paint surface treatment and removal methods.

B. Surface preparation and field application of paints and coatings.

1.3 SYSTEM DESCRIPTION

A. Conform to applicable code for flame and smoke rating requirements for products and finishes.

1.4 SUBMITTALS

A. Product Data: Provide data on all finishing products.

B. Samples: Submit coating samples for selection, illustrating range of colors and textures available for each surface finishing product scheduled.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Store and apply materials in environmental conditions required by manufacturer's instructions.

1.6 EXTRA MATERIALS

A. Provide minimum of two (2) gallons of each type and color of coating specified.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturers: Products of one or more manufacturers are listed in Finish Schedules to establish appearance, performance and quality characteristics. Products of other manufacturers may be accepted subject to review by Architect.
1. ICI Paint Stores
2. Benjamin Moore and Co.
3. PPG Industries: Pittsburgh Paints
4. Pratt and Lambert
5. Sherwin Williams
6. Sonneborn

B. Coatings: Ready mixed (except field catalyzed) coatings of good flow and brushing properties, capable of drying or curing free of streaks or sags.

C. VOC Content: Provide coatings with low or zero VOC content to the greatest extent possible. As a minimum, comply with requirements of Green Seal GX-11:
   1. Non flat 150 g/l.
   2. Flat 50 g/l.

D. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials required to achieve the finishes specified, as recommended by coating manufacturer.

2.2 FINISHES

A. Refer to exterior finish schedule at end of section for surface finish schedule.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Examine the condition of all existing painted wood and metal portions of existing structures. Determine the Class of paint surface conditions (Class I, Class II or Class III) at each paint location based on the standards outlined in Preservation Brief 10 - Exterior Paint Problems on Historic Woodwork.

B. Provide treatment for each Class of existing paint surface as recommended in Preservation Brief 10 - Exterior Paint Problems on Historic Woodwork.

C. Secure loose or damaged pieces to substrate wherever possible. Remove and replace damaged, missing or deteriorated wood pieces only where necessary.

D. Verify that substrate conditions are ready to receive Work.

E. Measure moisture content of porous surfaces using an electronic moisture meter. Do not apply finishes unless moisture content is less than 12 percent.

F. Correct minor defects and clean surfaces which affect work of this section.

G. Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

H. Gypsum Board Surfaces: Fill minor defects with exterior grade latex compounds. Spot prime defects after repair.

I. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

J. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove foreign matter. Remove oil and grease with a solution of tri-sodium phosphate, rinse well and allow to dry.

K. Uncoated Ferrous Surfaces: Remove scale by wire brushing, sandblasting, clean by washing with solvent. Apply treatment of phosphoric acid solution. Prime paint after repairs.

L. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust, hand or power tool clean, clean surfaces with solvent. Prime bare steel surfaces.

M. Exterior Wood Scheduled to Receive Paint Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied.

3.2 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Back prime new exterior woodwork scheduled to receive paint finish with primer paint.

C. Minimum Coating Thickness: As recommended by manufacturer.

D. Prime Coats: Prime material as recommended by manufacturer. Recoat primed surfaces as required to cover suction spots or unsealed areas.

E. Pigmented Surfaces: Completely cover to achieve an opaque, smooth surface of uniform finish, color and appearance. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other imperfections will not be accepted.

3.3 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Paint shop primed equipment.

B. Remove unfinished louvers, grilles, covers, and access panels and paint separately. Paint dampers exposed behind louvers, grilles, convector and baseboard cabinets to match face panels.

C. Prime and paint insulated and exposed pipes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are prefinished.

D. Paint exposed conduit and electrical equipment except prefinished surfaces.

E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

A. As work proceeds, promptly remove finishes where spilled, splashed, or spattered.

3.5 SCHEDULE - EXTERIOR SURFACES

A. Refer to Section 09 90 00 Paint System Schedule.

END OF SECTION

SECTION 09 91 23

INTERIOR PAINTING

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:
1. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.
2. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.

1.2 SECTION INCLUDES

A. Surface preparation and field application of paints and coatings.

1.3 SYSTEM DESCRIPTION

A. Conform to applicable code for flame and smoke rating requirements for products and finishes.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on product characteristics, performance criteria and limitations.

C. Manufacturer's Installation Instructions: Submit procedure for preparation and installation.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Store and apply materials in environmental conditions required by manufacturer's instructions.

1.6 EXTRA MATERIALS

A. Provide minimum of two (2) gallons of each type and color of coating specified.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturers: Products of one or more manufacturers are listed in Finish Schedules to establish appearance, performance and quality characteristics. Products of other manufacturers may be accepted subject to review by Architect.
1. Benjamin Moore and Co.
2. Dulux/Glidden Professional
3. PPG Industries: Pittsburgh Paints
4. Pratt and Lambert
5. Sherwin Williams Co.

B. Coatings: Ready mixed except field catalyzed coatings of good flow and brushing properties, capable of drying or curing free of streaks or sags.

C. VOC Content: Provide coatings with low or zero VOC content to the greatest extent possible. As a minimum, comply with requirements of Green Seal GS-11:
   1. Non flat: 150 g/l.
   2. Flat: 50 g/l.

D. Quality: Manufacturer's best quality of each type of product specified.

E. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials required to achieve the finishes specified, as recommended by coating manufacturer..

2.2 FINISHES

A. Refer to schedule at end of section for surface finish schedule.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that substrate conditions are ready to receive work.

B. Measure moisture content of porous surfaces using an electronic moisture meter. Do not apply finishes unless moisture content is less than 12 percent.

C. Correct minor defects and clean surfaces which affect work of this section.

D. Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

E. Gypsum Board Surfaces: Fill minor defects with latex compounds. Spot prime defects after repair.

F. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

G. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove foreign matter. Remove oil and grease with a solution of tri-sodium phosphate, rinse well and allow to dry.

H. Uncoated Ferrous Surfaces: Remove scale by wire brushing, sandblasting, clean by washing with solvent. Apply treatment of phosphoric acid solution. Prime paint after repairs.

I. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust, hand or power tool clean, clean surfaces with solvent. Prime bare steel surfaces.

J. Interior Wood Items Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.

K. Interior Wood Items Scheduled to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats.

L. Exterior Wood Items Scheduled to Receive Paint Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior caulking compound after prime coat has been applied.

M. Exterior Wood Items Scheduled to Receive Transparent Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes with tinted exterior caulking compound after sealer coat has been applied.

3.2 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Sand transparent finishes lightly between coats to achieve required finish.

C. Back prime interior and exterior woodwork scheduled to receive paint finish with primer paint.

D. Back prime interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.

E. Minimum Coating Thickness: As recommended by manufacturer.

F. Prime Coats: Prime material as recommended by manufacturer. Recoat primed surfaces as required to cover suction spots or unsealed areas.

G. Pigmented Surfaces: Completely cover to achieve an opaque, smooth surface of uniform finish, color and appearance. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other imperfections will not be accepted.

H. Transparent Finishes: Provide smooth surface of uniform luster, free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes or other imperfections.

3.3 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Refer to Division 15 and Division 16 sections for schedule of color coding, identification banding of equipment, ductwork, piping, and conduit.

B. Color code items in accordance with requirements indicated. Color band and identify with flow arrows, names, and numbering.

C. Paint shop primed equipment.

D. Remove unfinished louvers, grilles, covers, and access panels and paint separately. Paint dampers exposed behind louvers, grilles, convector and baseboard cabinets to match face panels.

E. Prime and paint insulated and exposed pipes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are prefinished.

F. Paint interior surfaces of air ducts, and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to limit of sight line.

G. Paint exposed conduit and electrical equipment occurring in finished areas except prefinished surfaces.

H. Paint both sides and edges of plywood backboards.

I. Finish paint door top and bottom edge with finish to match door facing.

J. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

A. As work proceeds, promptly remove finishes where spilled, splashed, or spattered.

3.5 SCHEDULE - INTERIOR SURFACES

A. Refer to Section 09 90 00 Paint System Schedule.
B. Refer to Interior Finish Legend for color selections.

END OF SECTION

SECTION 10 00 00

SPECIALTIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 specification sections apply to Work of this section.

1.2 SECTION INCLUDES

A. Fire extinguishers and Fire extinguisher cabinets.

1.3 SUBMITTALS

A. Product Data: Provide data on Product, and accessories.

B. Operating and Maintenance Instructions: Include relevant instructions. Include maintenance information.

1.4 QUALITY ASSURANCE

A. Fire Extinguishers: Conform to NFPA 10.

B. Postal Specialties: Comply with 2006 USPS Standard 4C requirements.

PART 2 PRODUCTS

2.1 FIRE EXTINGUISHERS

A. Manufacturers:
1. Allenco.
2. Amerex.
3. Ansul Fire Protection
4. Bobrick Washroom Equipment.
5. JL Industries.
6. Larsen’s Manufacturing Co.
7. Potter-Roemer/Div. Smith Industries Inc.
8. Walter Kidde/Div. Kidde Inc.

B. Multi-Purpose Dry Chemical Type: Enameled steel tank, with pressure gage, 2A:10BC rating.

C. Cabinets [FEC]: Semi-recessed type, steel cabinet, full glass door with baked enamel finish. Comply with Fire Department requirements for lettering, locations and installation. Provide fire rated units where installed at fire rated walls.

D. Brackets [FE]: Manufacturer’s standard surface mounted bracket for extinguishers not indicated to have a cabinet.

E. Schedule:
   1. Provide Fire Extinguisher in Cabinets [FEC] and Fire Extinguishers in Brackets [FE] at each location indicated on building floor plans.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that surfaces and internal wall blocking are ready to receive work and opening dimensions are as instructed by the manufacturer.

3.2 INSTALLATION - FIRE EXTINGUISHERS

B. Install extinguishers in accordance with manufacturer's instructions.

C. Mount units to conform to ADA requirements, with center of door 48” above floor.

D. Install units level and plumb in wall openings.

END OF SECTION

SECTION 211313

AUTOMATIC FIRE PROTECTION

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. The work covered by this Section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections and incidentals and the performing of operations required to design, install and test a pressurized, fully supervised, wet or dry pipe fire protection system for full building protection in accordance with NFPA, IBC, and the Owner's insurance underwriter. Areas subject to freezing shall have a dry pipe system, dry pendent or sidewall heads, or glycol-and-water loop per NFPA.

B. The building sprinkler system design shall be based on NFPA13 requirements.

1.2 RELATED DOCUMENTS

A. The drawings and the specifications including Section 23 05 00 "Supplemental Mechanical General Requirements" are hereby made a part of the work of this section.

B. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.

1.3 QUALIFICATIONS

A. The Fire Protection Work shall be performed by a qualified Contractor primarily engaged in the design and installation of Fire Protection Systems. The fire protection system design shall be performed under the direction of, and sealed by, a professional engineer registered in the State of Maine or with NICET Level III (minimum) Certification.

B. Welding qualifications of individuals installing welded piping shall be certified by the National Certified Welding Bureau for the type(s) of weld(s) proposed for use in piping assembly.

1.4 SUBMITTALS

A. Items for which the submittal requirements of section 23 05 00, Supplemental Mechanical General Requirements, apply are as Follows:

1. Hydrant flow test.
2. System components.
3. Hydraulic calculations.
4. Piping layout, details and control diagram.
5. Flushing and testing records.
6. Certificate of installation.
7. Copy of Fire Protection Contractors License.
8. Welding certificates of individual welding technicians.
9. Sprinkler heads.
10. Alarm valve(s).
11. Fire department connection(s).
12. Firestopping materials and methods.

Submit hydrant flow test, equipment descriptive data, hydraulic calculations and system layout for review by the Owner's Insurance Underwriter. Submit the system layout to the Architect for review. The Architect's review will be limited to checking for conformance with

the design concept of the project and general compliance with the contract documents and will in no way assume liability for review for compliance with codes, standards and laws.

B. Section 01330 - Submittal Procedures: Submittal procedures.

C. Product Data: Submit data on product characteristics, performance criteria and limitations.

D. Manufacturer's Installation Instructions: Submit procedure for preparation and installation.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 SPRINKLER COVERAGE

A. Sprinkler head coverage shall conform with NFPA 13 requirements for the use of the building. Coverage shall be increased accordingly where required by the Authority having jurisdiction.

B. If the requirements of the inspection agency or the Owner's insuring agent are more rigorous than those stated herein, then the more rigorous requirements shall govern.

PART 2 PRODUCTS

2.1 SYSTEM COMPONENTS AND HARDWARE

A. Pipe, Fittings, Joints, Hangers, Valves, Fire Department Connections, Alarms: Conform to NFPA 13, Installation of Sprinkler Systems.

B. Sprinkler Heads:

1. Interior Heated Spaces: Conform to NFPA 13, commercial quick response type. Sprinkler heads in acoustical tile or GWB ceilings shall be “semi-recessed” type with recessed escutcheon to match the ceiling finish. Dry pendent or sidewall heads, where allowed by the Architect, may be standard response type.

2. Provide a spare head cabinet with wrenches, the amount of spare heads for each orifice size, finish, temperature classification, pattern and length furnished in the project shall be in accordance with the following schedule:

Sprinkler Heads on Project	Number of Spare heads of each type.
Less than 300	6
300-999	12
1000 or more	24

3. Provide head protection guards where required.

4. Sprinkler heads in unheated areas shall be dry pendent or sidewall type, or served by a glycol and water loop or separate dry-pipe system.

C. Fire Department Connection: Provide a 4" Storz connection (as verified with the local fire department) at a location coordinated with the local fire department and the Architect.

2.2 WATER SUPPLIES

A. The sprinkler water service shall be cement-lined ductile iron and conform to the requirements of NFPA 13, Installation of Sprinkler Systems.

2.3 DEVICES

A. Detection devices and associated wiring both within the fire protection system and to the building Fire Alarm System shall be the responsibility of the Sprinkler Contractor.

2.4 BACKFLOW PREVENTER

A. Provide AMES MODEL 2000.

2.5 PIPING SYSTEM IDENTIFICATION

A. Piping system and valve identification and color coding shall be in accordance with ANSI.

2.6 SPRINKLER SYSTEM ZONING

A. Each tenant space shall be a separate zone. Each zone shall have its own flow switch with an exterior strobe light labeled with the zone name. See Architectural and Electrical Drawings for additional information.

PART 3 EXECUTION

3.1 PIPING LAYOUT AND DESIGN

A. System requirements, installation requirements, design, plans, and calculations: Conform to NFPA 13, Installation of Sprinkler Systems.

B. Sprinkler piping shall be run concealed above ceilings / soffits in occupied areas. Piping in other areas may be run exposed. Piping shall not be exposed in occupied spaces unless indicated on the drawings.

C. Pipe penetrations through walls and floors shall be in accordance with Section 23 05 00 - Supplemental Mechanical General Requirements. Traverse points of piping shall be escutcheoned with split chrome floor and ceiling plates and spring anchors, where visible to occupancy. Penetrations through walls shall be sleeved in accordance with Section 23 05 00. Sleeves shall be provided by the Fire Protection Contractor.

D. Coordinate design and layout with building structure and building systems. The work shown in the contract documents has precedence for space requirements. Work of other trades may be modified or moved only with permission of the trade involved. Costs associated with modifications or relocations shall be the same as for "Substitutions" Section 23 05 00.

E. The Architect shall review proposed system layout and reserve the right to relocate heads, revise sprinkler head type and location and in general review the final layout for components visible in occupied spaces.

3.2 SYSTEM ACCEPTANCE

A. Approval, flushing, hydrostatic testing, instructions, and certificates of installation: Conform to NFPA 13, Installation of Sprinkler Systems.

B. Disinfect the water piping in accordance with AWWA C601. Fill the piping systems with solution containing a minimum of 50 parts per million of available chlorine and allow solution to stand for minimum of 24 hours. Repeat disinfection if chlorine residual is less than 10 parts per million after 24 hours. Flush the solution from the systems with clean water until maximum residual chlorine contents is not greater than 0.2 parts per million.

C. Closing in Work:

1. General: Cover up or enclose work after it has been properly and completely reviewed.

2. No additional cost to the Owner will be allowed for uncovering and recovering, work that is covered or enclosed prior to required review and acceptance.

D. Cleanup and Corrosion Prevention:

1. Upon completion of the work thoroughly clean and flush piping systems to the sewer with water.

2. Piping and equipment shall be thoroughly cleaned. Dirt, dust, and debris shall be removed and the premises left in a clean and neat condition.

3. Before uncovered piping is permitted to be concealed, corrosion and rust shall be wire brushed and cleaned and in the case of iron products, a coat of approved protective paint applied to these surfaces. When corrosion is from the effects of hot solder paste, the areas shall be cleaned and polished and a wash of bicarbonate of soda and water used to neutralize the acid condition.

E. Instructions: On completion of the project, provide a technician familiar with the system to thoroughly instruct the Owner's representative in the care and operation of the system. The total period of instruction shall not exceed four (4) hours. The time of instruction shall be arranged with the Owner.

F. Warranty: For a period of one (1) year after completion of the installation repair or replace any defective materials or workmanship. Upon completion of the installation, the system shall be turned over to the Owner fully inspected and tested, and in operational condition.

3.3 FIRESTOPPING

A. Firestopping shall be performed in accordance with Specification Section 07841 “Firestopping”. All penetrations of fire-rated assemblies including walls and floors by mechanical system components (piping, ductwork, conduits, etc.) shall be firestopped as specified.

* END OF SECTION *

SECTION 22 00 00

PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The drawings and the specifications including Section 23 05 00 “Common Work Results for HVAC” are hereby made a part of the work of this section.

1.2 DESCRIPTION

A. The work covered by this Section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections, and incidentals and the performing of operations required to provide a complete and functional plumbing system.

B. Work shall be in accordance with the current edition of the Maine Internal Plumbing Rules and applicable local ordinances.

1.3 SUBMITTALS

A. Substitutions: Your attention is directed to Section 23 05 00-"Substitutions", relative to competition and the (ONLY) notation. Familiarity with this section shall be achieved before reading the PRODUCTS section of this specification.

B. The items for which the submittals paragraph in Section 23 05 00 “Common Work Results for HVAC”, apply are as follows:

1. Piping materials.
2. Valves.
3. Pipe hangers.
4. Miscellaneous equipment.
5. Piping, valves and equipment identification.
6. Piping insulation and vapor barrier coating.
7. Firestopping materials and methods.
8. Backwater valves

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Soil and Waste (Sanitary), Condensate Drains and Vent Piping: Schedule 40. “Vents thru roof” shall be service weight cast iron.

B. Domestic Water Piping and Condensate Drain Piping: Type L hard copper tubing and cast bronze or wrought copper solder fittings, lead-free solder.

C. Exposed Water and Waste Piping at Fixtures: I.P.S. copper with cast brass fittings chrome plated finish, with deep one piece escutcheon plates at traverse points.

D. Solder: Lead-free (ONLY), Englehard Silvabrite 100, 440^{o}F melting point, ASTM B32.

E. Piping located in masonry construction: Piping shall be protected from contact with concrete (masonry) by use of pipe sleeves or other methods approved by the local plumbing inspector.

2.2 NO HUB COUPLINGS

A. For above grade DWV piping, couplings shall be Clamp-All HI-TORQ125, shall maintain 15 PSI hydrostatic seal, constructed with a 304SS housing and ASTM C-564 neoprene gasket. Couplings shall meet FM 1680, IBC and local codes and requirements.

2.3 VALVES AND ACCESSORIES

A. General Service Ball Valves: Apollo Model 77-100 (threaded) or 77-200 (solder), bronze full port, or Nibco, copper alloy with stationary seat ring and chromium plated or stainless steel floating ball per Federal Specification WW-V-35B. Blowout proof stem, reinforced PTFE seal. Sizes 2" and larger shall have threaded ends. Provide lever or tee handle with stem extension as required to allow operation without interfering with pipe insulation.

B. Automatic Trap Primers: Zurn Model Z-1022, Josam or Smith,“Sani-Guard” Trap Primer, all-bronze body with integral vacuum breaker, union connection and supply manifold as required to serve floor drain traps. Trap primers shall comply with ANSI/ASSE Standard 1018. Connect to each floor drain.

2.4 PIPE HANGERS

A. Adjustable Swivel Hangers:

1. Pipe sizes 2" and less: Carpenter and Paterson Fig. 800, oversize for insulated piping systems.

2. Pipe sizes larger than 2": Carpenter and Paterson Fig. 100, oversize for insulated piping systems.

B. Riser Clamp: Carpenter and Paterson Fig. 126 CT copper plated for copper piping, Fig. 126 for iron and PVC piping.

C. Insulation Shields: 18 ga. galvanized steel, 180^{o} wrap, Carpenter and Paterson Fig. 265P, Type H.

2.5 MISCELLANEOUS EQUIPMENT

A. Floor Drains (FD): Zurn Z-415S, Josam, or Smith, cast iron body with 2" or 3" bottom or side outlet, as indicated, combination invertible membrane clamp and adjustable collar. Floor drains shall have “deep seal” traps and trap primer connection.

1. Strainer: 7"x7” square Zurn "Type S", polished nickel-bronze.
2. For floor drains receiving indirect wastes, provide a funnel receptor.

B. Floor Cleanout (FCO): Zurn Z-1400, Josam, or Smith, adjustable floor cleanout, cast iron body, with gas and watertight ABS tapered thread plug. Provide size equal to piping served with maximum size of 4".

1. Concrete floor finishes: Scoriated round polished bronze top.

2. Sheet tile finishes: Scoriated square polished bronze top recessed to receive tile.

3. Carpeted finishes: Scoriated round polished bronze top and carpet marker.

4. Ceramic tile finishes (Main Street): Square cover, Brushed stainless steel.

C. Wall Cleanout (**WCO**): Sanitary tee with threaded raised nut or countersunk-nut cleanout plug located behind Zurn Z-1468, Josam or Smith, round stainless steel wall access cover.

D. Strainer: Watts Series 777, MIL-S-16293, epoxy-coated or bronze body wye-type, 200 WOG rating, screwed end connections, 20 mesh stainless steel, monel, or bronze screen.

E. Backflow Preventers (**BFP**): Conforming to AWWA C506, FCCHR-USC Manual Section 10, and UL listed. Types, sizes and capacities scheduled. Manufacturers shall be Apollo, Zurn, or Watts.

1. Reduced Pressure Zone (RPZ): Reduced pressure principle type; bronze body with stainless steel internals. Provide bronze body ball valves or NRS gate valves, test cocks, strainer and air gap fittings.

2. Double Check (DC): Double check backflow assembly with test ports, bronze body with stainless steel springs, corrosion resistant internals, strainer, stop and waste ball valves.

3. Atmospheric Double Check (DCA): Double check continuous pressure type with atmospheric port for low hazard applications, 250^{o}F maximum water temperature, bronze body, strainer, stainless steel internals with rubber seals and integral strainer.

F. Pressure Gauges: Tel-Tru or Ashcroft Type 1005, Grade B, 3-1/2" dial, ANSI B40.1, drawn steel case, white background dial with black figures, clear glass window, brass movement, beryllium copper bourdon tube, 0 to 100 PSI range, accuracy shall be within 2% over middle half of scale and 3% over the remainder. Provide with shut off petcock and restrictor.

2.6 BACKWATER VALVES

A. Shall be RectorSeal “CleanCheck” Model 96926, extendable backwater valve, direct-buried with cleanout plug, or approved equal. Access shall only be required from ground level for inspection, service and maintenance. Provide for each building sewer exit location per the City of Portland requirements.

2.1 PIPING INSULATION

A. Fiberglass: Heavy density preformed fiberglass with thermal conductivity of 0.29 Btu-in/hr-ft^{2}-^{o}F at 150^{o}F mean temperature. Insulation shall conform to ASTM C547 Class I and shall be suitable for 450^{o}F service. Fitting insulation shall be of same material used for pipe.

1. Insulation Jacket: All service (ASJ) type conforming to Fed. Spec. HH-B-100B Type I. Jacket permeability shall not exceed 0.02 perms (ASTM E96). Pipe fitting jacket shall be factory premolded, one-piece, PVC covers with pressure sensitive taped joints. Jackets in exposed locations shall have a white surface suitable for field painting. Provide vapor barrier as required by service.

B. Flexible Unicellular: Flexible unicellular with thermal conductivity of 0.27 Btu-in/hr-ft^{2}-^{o}F at 75^{o}F mean temperature. Insulation shall conform to ASTM C534, Type I, Tubular and shall be suitable for 200^{o}F service. Fitting insulation shall be of same material used for pipe. Permeability shall not exceed 0.10 perms (ASTM E96). Insulation adhesive shall conform to Mil. Spec. MIL-A-24179A, Type II, Class 1.

C. Fittings, Flanges, and Valves: Provide insulation for fittings, flanges, and valves premolded, precut, or job fabricated of the same thickness and conductivity as used on adjacent piping.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:

1. Prior to work of this Section, carefully inspect the installed work of other trades and verify that such work is complete to the point where this installation may properly commence.

2. Verify that plumbing may be installed in strict accordance with pertinent codes and regulations and the reviewed Shop Drawings.

3.2 INSTALLATION OF PIPING

A. Provide and erect in accordance with the best practice of the trade piping shown on the drawings and as required to complete the intended installation. Make offsets as shown or required to place piping in proper position to avoid other work and to allow the application of insulation and finish painting to the satisfaction of the Architect.

B. The size and general arrangements, as well as the methods of connecting piping, valves, and equipment, shall be as indicated, or so as to meet the requirements of the Architect.

C. Piping shall be erected so as to provide for the easy and noiseless passage of fluids under working conditions.

D. Install unions to facilitate removal of equipment.

1. Unions are not required in installations using grooved mechanical joint couplings. (The couplings shall serve as unions and disconnect points.)

E. Copper pipe shall be reamed to remove burrs.

F. Connections between copper and steel piping shall be made with brass fittings.

G. Solder joints shall be made with lead free solder. Clean surfaces to be soldered and use a paste flux. Wash joints with sodium bicarbonate and water to remove corrosive effects of heated solder paste. Caution: Lead-bearing solder is not permitted.

H. Push-to-Connect Joints: Install Permalynx joints in accordance with the manufacturer’s latest published installation instructions. Prepare and mark tubing ends using a tool supplied by the manufacturer and in accordance with the manufacturer’s instructions.

J. Pipe penetrations through walls, floors and ceilings shall have pipe sleeves and shall be in accordance with Section 23 05 00 "Common Work Results for HVAC". Traverse points of piping shall be escutcheoned with split chrome floor and ceiling plates and spring anchors, where visible to occupancy.

K. Provide a cleanout in the vertical position at the base of each sanitary and storm (roof) drain riser. Locate “Vent-thru-Roof” terminations a minimum distance of thirty (30) feet from outside air intakes.

L. Sanitary and vent piping shall be sized and installed at 1/4" per foot slope or as indicated and in no case less than 1/8" per foot.

3.3 PIPE HANGERS

A. Impact driven studs are prohibited.

B. Copper Tubing: supported at intervals with rod sizes as follows, double nuts on hangers and on beam clips.

Copper Size	Hanger Intervals	Rod Sizes
1/2"	5'	3/8"
3/4"	6'	3/8"
1"	6'	3/8"

C. Cast Iron Pipe: Supported at intervals with rod sizes as follows, double nuts on hangers and on beam clips.

Cast Iron Size	Hanger Intervals	Rod Sizes
1-1/2"	5'	3/8"
2"	5'	3/8"
2-1/2"	5'	1/2"
3"	6'	1/2"
4"	7'	5/8"

D. PVC Pipe: Supported at 4-foot intervals.

E. Verticals: Supported by use of clamp hangers at every story height, and at not more than 6 feet intervals for copper piping 1-1/4" and smaller size.

3.4 PIPING INSULATION

A. Pipe Insulation (Fiberglass): Place sections of insulation around the pipe and joints, tightly butt into place. Draw jacket laps tight and smooth. Secure jacket with fire resistant adhesive, or factory applied self sealing lap. Cover circumferential joints with butt strips, not less than 3-inches wide, of material identical to the jacket material. Overlap longitudinal laps of jacket material not less than 1-1/2 inches. Adhesive used to secure the butt strip shall be the same as used to secure the jacket laps.

B. Flanges, Unions, Valves and Fittings Insulation (Fiberglass): Factory fabricated removable and reusable insulation covers. Place factory pre-molded, precut or field-fabricated segmented insulation of the same thickness and conductivity as the adjoining pipe insulation around the flange, union, valve, and fitting abutting the adjoining pipe insulation. Install factory premolded one-piece PVC fitting covers over the insulation and secure by stapling or with metal or plastic tacks made for securing PVC fitting covers and secure with PVC vapor barrier tape.

C. Pipe Insulation (Flexible Unicellular): Bond cuts, butt joints, ends, and longitudinal joints with adhesive. Miter 90-degree turns and elbows, tees, and valve insulation. Insulate flanges, unions, valves, and fittings.

D. Where penetrating roofs and exterior walls, insulate piping to a point flush with the underside of the deck or wall and seal with a vapor barrier coating.

E. Hangers and Anchors: Pipe insulation shall be continuous through pipe hangers. Where pipe is supported by the insulation, provide MSS SP-58, Type 40 galvanized steel shields (16 gage maximum). For fiberglass insulation systems on pipe sizes 2 inches through 3",

provide insulation inserts at points of hangers and supports. Insulation inserts shall be of molded glass fiber (minimum 12 pcf). Insulation inserts shall cover the bottom half of the pipe circumference, 180 degrees, and be not less than 4" long. Vapor-barrier facing of the insert shall be of the same material as the facing on the adjacent insulation. Seal inserts into the insulation. Insulation inserts for pipe sizes 4" and larger shall be welded pipe saddles. Install insulation in void area of saddle of same material used on adjacent insulation. For pipe sizes 2" and smaller, insulation inserts for flexible unicellular insulation systems shall be wooden doweling set on end of length equal to insulation thickness. Seal dowel to insulation with adhesive.

F. PVC or Metal Jackets: Provide over insulation. Machine cut jacket to smooth edge of circumferential joints. Overlap metal jacket not less than 2 inches at longitudinal and circumferential joints and secure with metal bands at not more than 9 inch centers. Overlap longitudinal joints down to shed water. Seal circumferential joints with a coating recommended by insulation manufacturer for weatherproofing. Solvent weld PVC jacket system to provide continuous watertight seal.

3.5 INSULATION APPLICATION SCHEDULE

SERVICE	THICKNESS	MATERIAL/JACKET
PIPING:		
Domestic Cold Water Piping	1/2"	Fiberglass w/ASJ or Flexible Unicellular
Rainwater Leaders (RWL) and Roof Drain Sump Bodies	1/2”	Flexible Unicellular

3.6 CLOSING IN UNINSPECTED WORK

A. General: Cover up or enclose work after it has been properly and completely reviewed.

B. If any of the work is covered or enclosed prior to required inspections and review, uncover the work as required for the test and review. After review, tests and acceptance, repairs and replacements shall be made by the appropriate trades with such materials as necessary for the acceptance by the Architect and at no additional cost to the Owner.

3.7 CLEANUP AND CORROSION PREVENTION

A. Upon completion of the work thoroughly clean and flush piping systems to the sewer with water.

B. Fixtures, piping and equipment shall be thoroughly cleaned. Dirt, dust, and debris shall be removed and the premises left in a clean and neat condition.

C. Caulk around fixtures at floor and wall.

D. Before covering is applied to piping systems, clips, rods, clevises and other hanger attachments, and before uncovered piping is permitted to be concealed, corrosion and rust shall be wire brushed and cleaned and in the case of iron products, a coat of approved protective paint applied to these surfaces. When corrosion is from the effects of hot solder paste, the areas shall be cleaned and polished and a wash of bicarbonate of soda and water used to neutralize the acid condition.

3.8 DISINFECTING

A. After the entire potable water system is completed, cleaned and tested, and just before the building is ready to be occupied, disinfect the system as follows: After flushing the mains, introduce a water and chlorine solution for a period of not less than three hours before final flushing of the system.

3.9 TESTS

A. Sanitary soil, waste and vent piping: Fill with water to top of vents, and test as required by Code.

B. Water piping shall be tested to a pressure of 100 lbs. per square inch for at least 30 minutes. Pressure drop in this period shall not exceed two pounds per square inch. Leaks shall be repaired and system retested. Notify Architect 24 hours before test is to be performed.

3.10 INSTRUCTIONS

A. On completion of the project, provide a competent technician to thoroughly instruct the Owner's representative in the care and operation of the system. The total period of instruction shall not exceed four (4) hours. The time of instruction shall be arranged with the Owner.

3.11 FIRESTOPPING

A. Firestopping shall be performed in accordance with Specification Section 07 84 00 “Firestopping”. All penetrations of fire-rated assemblies including walls and floors by mechanical system components (piping, ductwork, conduits, etc.) shall be firestopped as specified.

* END OF SECTION *

SECTION 230000

HVAC SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work covered by this Section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections and incidentals and the performing of operations required to install the heating, ventilating and air conditioning systems indicated.

1.2 RELATED DOCUMENTS

A. The drawings and the specifications including SECTION 230500 "SUPPLEMENTAL MECHANICAL GENERAL REQUIREMENTS" are hereby made a part of the work of this section.

1.3 SUBMITTALS

A. Substitutions: Your attention is directed to Section 230500-"Substitutions", relative to competition and the (ONLY) notation. Familiarity with this section should be achieved before reading the PRODUCTS section of this specification.

B. The items for which the submittals paragraph in Section 230500, Supplemental Mechanical General Requirements, apply are as follows:

1. Packaged Rooftop Air Handlers.
2. Automatic Temperature Controls.
3. Electric wall heaters.
4. Gas piping system

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION

A. Equipment Identification:

1. Provide laminated plastic nameplates for boilers, pumps, and air handling units. Laminated plastic shall be 0.125-inch thick melamine plastic conforming to Fed. Spec. L-P-387, black with white center core. Surface shall be a matte finish, corners shall be square. Accurately align lettering and engrave into the white core. Minimum size of nameplates shall be 1.0 inch by 2.5 inches. Lettering shall be minimum of 0.25-inch high normal block lettering.

2.2 GAS PIPING SYSTEM

A. Rigid Gas Piping: Schedule 40 carbon steel pipe conforming to ASTM 120 or A53, with threaded joints and malleable iron fittings (exposed above grade).

B. Ball Valves for Gas Service: Copper alloy with chromium plated floating ball per Federal Specification WW-V-35B, Type II, Class 3. Blowout-proof stem, reinforced teflon seats, threaded ends, quarter turn on-off, 600 WOG rating, 250 psi rating for natural gas, UL-listed as a natural gas shutoff valve, Apollo Model 80-100 series.

C. Flexible Gas Piping: OmegaFlex TracPipe (concealed above grade no joints). Provide appropriate grounding if used.

D. Gas Pressure Regulators: Maxitrol 325 Series, lever acting, vent limiting device.

2.3 PACKAGED ROOFTOP AIR CONDITIONING UNITS

A. Provide high efficiency packaged rooftop air conditioning units and coils of manufacturer, model and performance indicated, Trane model as scheduled or approved equal.

B. The air conditioning units shall consist of a fan section, gas-fired furnace, coil sections, coils, and filter/mixing box section with economizer dampers and barometric relief. Performance shall be ARI 430 certified. Provide access doors in each section. Furnish unit in vertical discharge/return configuration with roof curb, stainless steel heat exchanger and high static pressure drive. Furnish with unit-mounted disconnect switch and powered GFCI electrical receptacle.

C. Cabinet Construction: Steel reinforced and braced with steel angle framework, factory-assembled, sectionalized fan and coil sections, removable access panels to internal parts. Metal parts galvanized steel or chemically cleaned, phosphatized, primed and finished with enamel topcoat.

D. Fans: Shall be as scheduled, multiblade centrifugal type, statically and dynamically balanced and tested. Bearings shall be self-aligning, grease lubricated ball type. Fan motor shall be 1800 RPM, open drip-proof or TEFC type, with greasable ball bearings, variable pitch sheave and mounted on an adjustable base. Provide extended grease lines. The fan drive shall have a 1.5 service factor for the maximum rated horsepower. Motors shall be premium high efficiency with minimum motor efficiency conforming to Section 230500 "Electric Motors and Motor Controls". Submit certificate of conformance for motor efficiency.

E. Coils: Capacities and pressure drops shall be rated in accordance with ARI 410. Coils shall be pressure tested at 300 psig and shall be suitable for 150 psig service.

1. Coils: Copper tubes, aluminum fins and copper headers. Casings shall be 16 gage galvanized steel.

F. Mixing box section: Outside air and return air dampers shall be "low leak" type. Blade seals shall be neoprene and jamb seals shall be compressible aluminum or stainless steel.

G. Filters: Provide Farr 30-30 pleated media, 25-30% efficient with two spare sets. Efficiencies shall be as tested in accordance with ASHRAE Standard 52-76.

H. Submit fan curves for each fan with the design operating point clearly marked.

I. The compressors shall be direct-drive, scroll or reciprocating hermetic type. Provide with a five (5) year warranty for parts and labor. Motors shall be suction gas cooled with crankcase heater, low pressure switches, internal temperature and current sensitive motor overloads. Provide with an anti-recycle timer. Refrigeration system shall be two stage.

J. The air-cooled condenser shall of a copper tube and aluminum finned heat exchanger and direct-drive, dynamically and statically balanced fans with permanently lubricated motors and built-in thermal overload protection.

K. The gas heating section shall be suitable for heating on natural-gas with corrosion-resistant stainless steel components.

L. Units shall include packaged automatic temperature controls including seven day programmable thermostat with four settings per day and allowing for different settings for each day of the week. The sequence of control shall be as follows:

1. Supply Fan: Shall run operate continuously during the occupied mode.

2. Outside Air Damper: Shall be open to the minimum position while the system is operating in the occupied mode.

3. Space temperature control: The unit controls shall operate the gas heating, dx-cooling and economizer cooling as necessary to maintain the space temperature setpoint.

4. Unoccupied Mode: The outside air damper shall be closed. The supply fan shall cycle and the gas heating/dx-cooling shall operate to maintain the unoccupied setpoint.

2.4 ELECTRIC WALL HEATER (WH-#)

A. Electric wall heaters shall be manufactured by the Berko Electric or approved equal, UL listed. Unit configuration shall be wall-mounted, inverted flow. Cabinet shall be 16 gauge cold rolled steel with hinged front access door for access to control panel and access panel for access to all other internal components. Heating element shall be warranted for five years and shall be a non-glowing design constructed of a steel sheath with steel fins and shall include a thermal cutout to directly interrupt power to the element in the case of overheating without the use of relays. Power and performance as scheduled. Provide with integral thermostat.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:

1. Prior to work of this Section, carefully inspect the installed work of other trades and verify that such work is complete to the point where this installation may properly commence.

2. Verify that the heating system may be installed in accordance with pertinent codes and regulations and the reviewed Submittals.

3.2 CLOSING IN WORK

A. Cover up or enclose work after it has been properly and completely tested and reviewed.

B. No additional cost to the Owner will be allowed for uncovering or recovering any work that is covered or enclosed prior to required test and review.

3.3 TEST AND ADJUST

A. After the installation is complete and ready for operation, test the system under normal operating conditions in the presence of the Architect and demonstrate that the system functions as designed.

B. Correct defects which develop in operational testing, conduct additional testing until defect free operation is achieved.

C. Provide balancing and adjusting of terminal devices in accordance with Specification Section 230593.

3.4 INSTRUCTIONS

A. On completion of the project, instruct the Owner's representative in the care and operation of the system. The total period of instruction shall not exceed four (4) hours. The time of instruction shall be arranged with the Owner. In addition to the prime Mechanical Contractor, the control system Contractor, Balancing Contractor, and Owner's representative shall be present and participate in the Owner's instruction.

* END OF SECTION *

SECTION 230500

SUPPLEMENTAL MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Conditions, Supplemental General Conditions and Instructions to Bidders shall apply to this work. Read these to be familiar with conditions related to the installation of the work.

1.2 WORK SHOWN ON DRAWINGS

A. The drawings accompanying this specification, as a part thereof, are working drawings indicating the location and arrangement of the increments of the systems of this section of work. Material deviation from this arrangement, process or means of application, shall bear the Engineer's review stamp before the change is made on the job or materials are ordered. Changes made without such review shall be ordered removed and items installed as specified shall be provided at no additional expense to the Owner.

B. The drawings are not intended to show in minute detail minor items of installation or materials such as specific fittings or findings.

1.3 MATERIALS AND LABOR

A. Furnish materials and labor necessary to deliver to the Owner a complete and operable system installed in accordance with the contract documents.

B. Materials shall be of the best quality. Workmanship shall be of highest grade and construction shall be done according to best practices of the trade.

C. Provide, when required, labeled samples of material or equipment specified herein or proposed to be used in this work.

D. Where words "furnish", "provide", or "install" are mentioned, either singly or in combination, these words are hereby interpreted to mean "furnish and install" or "provide and install", including materials complete with connections, supplemental devices, accessories and appurtenances, unless specifically otherwise noted. These words are likewise hereby interpreted as being prefixed to materials, equipment, and apparatus hereinafter mentioned, either in abbreviated or scheduled information or in the technical sections of the specifications.

1.4 EQUIPMENT INSTALLATION IN HEATING SEASON

A. The system shall be installed such that the construction area will have sufficient heat to maintain temperature above 40^{o}F throughout the construction period.

1.5 COOPERATION BETWEEN TRADES

A. Provide information sufficiently in advance of this work, so that work by the other trades may be coordinated and installed without delays. Furnish and locate sleeves, supports, anchors and necessary access panels.

B. Where work is concealed, assure it does not project beyond finished lines of floors, ceilings, or walls.

C. Equipment or piping requiring access found to be located above sheetrock ceilings shall be brought immediately to the attention of the Architect for resolution.

1.6 ORDINANCES, AUTHORITIES, PERMITS, AND FEES

A. Obtain necessary permits and licenses, give notices and comply with laws, ordinances, rules, regulations or orders affecting the work, and pay fees and charges in connection therewith.

B. The "authority having jurisdiction" is the organization, office, or individual responsible for "approving" equipment, an installation, or a procedure.

1.7 PROTECTION OF WORK AND MATERIALS

A. Protect and care for materials delivered and work performed until the completion of the work. Defective equipment or equipment damaged in the course of storage, installation or test shall be replaced or repaired to the satisfaction of the Engineer at no additional cost to the Owner.

1.8 INSURANCE

A. Purchase and maintain Public Liability and Property Insurance during the progress of the work and until completion and acceptance of the entire project by the Owner in the amounts as specified in the General Conditions.

1.9 APPLICABLE CODES

A. Work and materials shall conform to the latest rules and regulations listed below and these rules and regulations hereby are made part of this specification. They include, but are not necessarily limited to the following:

American Society for Testing and Materials (ASTM)
Underwriters' Laboratories, Inc. (UL)
Air Moving and Conditioning Assoc. (AMCA)
American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)
American Society of Mechanical Engineers (ASME)
National Electrical Manufacturers Association (NEMA)
Institute of Electrical and Electronics Engineers (IEEE)
American National Standards Institute (ANSI)
National Fire Protection Association (NFPA)
American Water Works Association (AWWA)
Local Fire Code
Local Plumbing Codes
American Welding Society
International Building Code (IBC)

1.10 SHOP DRAWINGS

A. Submit shop drawings, manufacturers' data and certificates for equipment, materials and finish, and pertinent details for each system where specified in each individual section, five (5) copies, to be submitted to the Architect. Shop drawings will be returned "No Exceptions Taken", "Make Corrections Noted", "Amend and Resubmit", "Submit Specified

Item", or "Rejected" less two (2) copies. Work shall progress in accordance with "Reviewed" shop drawings (ONLY).

B. Groups of similar shop drawings shall be submitted as individual bound documents with covers and indexes. Typical similar items would be "Diffusers and Registers", "Valves and Controls". Rejection of individual items shall not be cause for rejection of the entire document.

C. Clearly indicate item(s) to be reviewed on each submission by highlighting or underlining intended item(s). Submissions not clearly marked shall be returned "Amend and Resubmit".

D. Shop drawings must bear the Engineer's review stamp. In the event that the Engineer returns shop drawings "Amend and Resubmit" or "Rejected", the shop drawing must be revised and resubmitted for review.

E. Furnishing of the specified item must still produce the results and performance, dependability and quality reasonably to be expected within the spirit of the specifications, drawings, and the standard of good mechanical performance normal to the trade.

1.11 SUBSTITUTIONS

A. Where the specifications allow the substitution of a product, still this product is subject to review by the Engineer in accordance with the paragraph entitled "Shop Drawings". Review of a substitute item is an indication only that the substitute item is compatible with the specified item as a claim of the manufacturer. Insure dimensional propriety, performance, and quality of the substitute item.

B. Reference in the specifications or on the drawings to any product, material, fixture, form or type of construction, by proprietary name, manufacturer, make or catalog number, establishes a standard of quality or design and is not meant to limit competition. Use any equivalent substitute provided favorable written review by the Engineer is first obtained. The (ONLY) notation in the specification is an exception to this and leaves no option.

C. For materials or equipment which are supplied with integral or factory applied finish, the colors will be considered in evaluating substitutions.

D. For the purpose of avoiding conflicts with other trades, contracts, and adjoining work where more than one (1) article, device, material, fixture, form or proprietary name, manufacturer, make or catalog number, the first named shall be used as the basis of design and details. The cost of any changes because of substituted item shall be borne by the Contractor requesting such change.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 EQUIPMENT SUPPORTS

A. Furnish and install equipment supports for mechanical equipment as required. Supports shall be subject to review by the Engineer.

3.2 SLEEVES AND PREPARED OPENINGS

A. Coordinate cutting, patching and setting of sleeves, frames, framing and lintels for openings with other trades. Sleeves shall be furnished by the Contractor. All penetrations through concrete shall be sleeved as required by IBC. Penetrations of fire-rated assemblies shall be sleeved, sleeve material shall be the same as the component penetrating the assembly.

B. Failure to give timely notice of and to locate openings and furnish sleeves shall cause no additional expense to the Owner.

3.3 CONNECTION TO EQUIPMENT

A. Provide piping connections, supports, brackets, compensators or flexible connections to prevent application of excessive stresses to equipment.

B. Equipment shall be installed with flanges or unions in such a manner as to permit disconnecting for removal of tubes, coils, elements and other equipment for inspection, service and repairs.

3.4 ACCESS TO EQUIPMENT

A. The installation of work performed shall provide reasonable accessibility for operation, inspection, and maintenance of equipment and accessories. The Engineer shall determine the adequacy of such accessibility.

3.5 ACCESS PANELS

A. Access panels shall be provided where indicated on the drawings and as required for access to valves and other serviceable components.

B. Access panels installed in fire-rated assemblies shall have the same fire rating as the assembly.

3.6 PAINTING OF EQUIPMENT

A. Exposed ironwork, including steel supports and hangers in unfinished spaces, mechanical rooms, pits, and trenches shall be properly cleaned, prepared and painted with two (2) coats of black asphaltum varnish.

3.7 GUARDS

A. Exposed moving and rotating elements of mechanical equipment items shall be protected with suitable guards for personnel protection. Guards shall be of rigid construction, firmly positioned. Holes shall be provided in guards at shaft centers to facilitate tachometer readings.

3.8 LUBRICATION

A. Furnish and install grease fittings for points requiring lubrication. Furnish extension type fittings as required to provide easy access for maintenance lubrication.

B. Furnish initial charges of lubricants for equipment. Lubricants shall be in conformance with the manufacturer's requirements and recommendations.

3.9 ELECTRIC MOTORS AND MOTOR CONTROLS

A. Unless otherwise noted, motors, motor starters and other electrical accessories which are specified under Mechanical specifications shall be selected with characteristics as follows:

1/2 Horsepower and less - 120 volt, 1 phase, 60 Hz.
3/4 Horsepower and greater - 208 volt, 3 phase, 60 Hz.

B. Motors shall be built in accordance with the latest applicable NEMA, IEEE and ANSI Standards. Motors shall be of the latest type and quality specified under individual items of equipment.

C. Magnetic motor starters for mechanical items of equipment shall be furnished under Division 16 unless the starter is an integral part of a factory packaged item of equipment. Each starter furnished as an integral item of equipment shall be provided with overload heater elements. Starters shall have single phase protection or shall have relays installed to provide this feature. Starters shall be equipped with suitable step-down transformers to provide required control voltage.

D. Motors shall have a minimum continuous duty service factor of 1.15. Minimum motor efficiency shall be:

MOTOR HORSEPOWER	PERCENTAGE EFFICIENCY		
	(1200RPM)	(1800 RPM)	(3600 RPM)
1	80.0	82.5	-----
1-1/2	84.0	84.0	82.5
2	85.5	84.0	84.0
3	86.5	86.5	84.0
5	87.5	87.5	85.5
7.5	88.5	88.5	87.5
10	90.2	89.5	88.5

3.10 CLEANING OF SYSTEMS

A. Piping systems shall be thoroughly cleaned and flushed prior to initial operation.

B. Thoroughly clean exposed portions of the mechanical installation, removing labels and foreign substance.

C. Furnish detergents, solvents, cleaning compounds, and tools required for cleaning operations.

D. Keep the premises free from accumulation of waste material or rubbish and at the completion of the work, remove from the job site tools, scaffolding, surplus materials, and rubbish, leaving the work areas "broom" clean.

3.11 STARTING OF EQUIPMENT

A. Testing or starting of equipment shall be done in collaboration with trades concerned to insure safe and proper operation of the equipment.

B. Prior to starting equipment, provide lubrication at required points. Before starting any electrical or electric motor driven equipment, a check must be made to insure that proper heater coils are installed in the starters and that the equipment is rotating in the proper direction.

3.12 OPERATIONAL TESTING

A. Operate systems until successful operation is demonstrated to the Engineer. This initial operation shall be in addition to the testing of the system and shall be done after the system is cleaned and finished.

3.13 RECORD DRAWINGS

A. During construction, keep an accurate record of deviations to the installation of the work as indicated on the drawings. Upon completion of the work, furnish a copy of this record to the Engineer. **Submit record drawings before requesting final payment.**

3.14 MANUFACTURER'S REPRESENTATIVE

A. As indicated in the Technical Sections of this specification or as directed by the Engineer, provide the services of a factory trained Engineer or Technician to inspect, adjust, and place in proper operating condition the equipment or item involved. No additional compensation will be allowed for such service.

3.15 MANUFACTURER'S INSTRUCTIONS, OPERATION AND MAINTENANCE DATA

A. Provide for each item of equipment or apparatus furnished, a complete set of printed instructions obtained from the manufacturer covering proper operation, maintenance, lubrication, cleaning, servicing, adjustment, and safety instructions.

B. Manufacturer's data shall include performance data (curves are preferred where applicable) complete parts lists, recommended spare parts lists, piping, and wiring diagrams.

C. Arrange data in complete sets, properly indexed and marked.

D. Data shall include a complete set of shop drawings.

E. Material shall first be submitted in preliminary form for review by the Engineer. After review, submit two (2) copies in bound volumes to the Engineer for distribution.

3.16 GUARANTEES

A. An item becomes "defective" when it ceases to conform to the Contract Documents. Guarantees begin on the date of issuance of a certificate authorizing final payment or certificate of substantial completion with the Owner taking occupancy or beneficial use thereafter.

B. Upon completion of the work and before applying for final payment, furnish a written guarantee, stating that the work complies with the provisions of codes listed herein and the local enforcing authorities, and that it will be free from defects of material and workmanship for not less than one (1) year. Guarantee shall further state that the Contractor will, at his own expense, repair or replace any of his material and work which may become defective during the time of guarantee, together with other work damaged as a consequence of such defects.

C. Repeated malfunctioning or failure in service of any item or work of the system is sufficient cause for the Engineer to order the removal of the item, and its replacement with new item at the expense of the Contractor.

3.17 FIRESTOPPING

A. Firestopping shall be performed in accordance with Specification Section 07840 “Firestopping”. All penetrations of fire-rated assemblies including walls and floors by mechanical system components (piping, ductwork, conduits, etc.) shall be firestopped as specified.

* END OF SECTION *

SECTION 230700

INSULATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The drawings and the specifications including Section 230500 “Supplemental General Mechanical Conditions” are hereby made a part of the work of this section.

1.2 DESCRIPTION

A. The work covered by this Section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections and incidentals and the performing of operations required to insulate the heating, ventilating, air conditioning, and plumbing systems.

1.3 SUBMITTALS

A. Substitutions: Your attention is directed to Section 230500-"Substitutions", relative to competition and the (ONLY) notation. Familiarity with this section shall be achieved before reading the PRODUCTS section of this specification.

B. The items for which the submittals paragraph in Section 230500, Supplemental General Mechanical Requirements, apply are as follows:

1. Piping insulation.
2. Insulation application schedule.
3. Vapor barrier coating.

1.4 DEFINITIONS

A. Finished Spaces: Spaces other than furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels, unless specifically listed below as an unfinished space.

B. Unfinished Spaces: Mech/Elect Rooms and attic.

C. Unconditioned Spaces: Spaces exposed to near outside ambient temperatures and spaces not air conditioned.

C. Outside: Areas beyond the exterior side of walls or above the roof, unexcavated spaces, and crawl spaces.

D. Concealed: Not visible in finished or unfinished spaces. For example, above ceilings, below floors, between double walls, furred-in areas, pipe and duct shafts, and similar spaces.

E. Exposed: Visible from a finished or unfinished space.

1.5 MANUFACTURER'S STAMP OR LABEL

A. Packages or standard containers of insulation, jackets, cements, adhesives, and coatings delivered to the project site for use must have the manufacturer's stamp or label attached giving name of manufacturer, brand, and description of material. Insulation shall be asbestos-free.

1.6 FLAME SPREAD AND SMOKE DEVELOPED RATINGS

A. Materials shall have a flame-spread rating of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with NFPA 255, ASTM E84, or UL 723.

B. Provide materials with flame resistant treatments not subject to deterioration due to aging, moisture, high humidity, oxygen, ozone, or heat.

C. Materials Exempt From Fire-Resistant Rating: Nylon anchors for securing insulation to ducts or equipment.

PART 2 PRODUCTS

2.1 PIPING INSULATION

A. Fiberglass: Heavy density preformed fiberglass with thermal conductivity of 0.29 Btu-in/hr-ft^2-^{o}F at 150^{o}F mean temperature. Insulation shall conform to ASTM C547 Class I and shall be suitable for 450^{o}F service. Fitting insulation shall be of same material used for pipe.

1. Insulation Jacket: All service (ASJ) type conforming to Fed. Spec. HH-B-100B Type I. Jacket permeability shall not exceed 0.02 perms (ASTM E96). Pipe fitting jacket shall be factory premolded, one-piece, PVC covers with pressure sensitive taped joints. Jackets in exposed locations shall have a white surface suitable for field painting. Provide vapor barrier as required by service.

2. Aluminum Jackets: ASTM B 209M (ASTM B 209), Temper H14, minimum thickness of 27 gage (0.016 inch), with factory-applied polyethylene and kraft paper moisture barrier on inside surface. Provide smooth surface jackets for jacket outside diameters less than 8 inches. Provide corrugated surface jackets for jacket outside diameters 8 inches and larger. Provide 1/2" wide stainless steel bands. Provide factory prefabricated aluminum covers for insulation on fittings, valves, and flanges.

3. PVC Jacket: ASTM 1784, minimum thickness 0.030", over insulation and vapor barrier. Jacket shall be overlapped 2" minimum on down side.

B. Flexible Unicellular: Flexible unicellular with thermal conductivity of 0.27 Btu-in/hr-ft^2-^{o}F at 75^{o}F mean temperature. Insulation shall conform to ASTM C534, Type I, Tubular and shall be suitable for 200^{o}F service. Fitting insulation shall be of same material used for pipe. Permeability shall not exceed 0.10 perms (ASTM E96). Insulation adhesive shall conform to Mil. Spec. MIL-A-24179A, Type II, Class 1.

C. Fittings, Flanges, and Valves: Provide insulation for fittings, flanges, and valves premolded, precut, or job fabricated of the same thickness and conductivity as used on adjacent piping.

2.2 VAPOR BARRIER COATING

A. Raw (cut) ends of fiberglass pipe insulation shall be finished (protected) with the application of a suitable vapor barrier coating or finishing cement (mastic) to maintain the continuous visual and functional integrity of the insulation jacket. Mastic shall be Childers “Chil-Perm” CP-30, elastomeric resin, or approved equal, applied in accordance with the manufacturer’s recommendations.

2.3 EQUIPMENT INSULATION

A. Flexible Unicellular (Cold Equipment): Flexible unicellular with thermal conductivity of 0.27 Btu-in/hr-ft^2-^{o}F at 75^{o}F mean temperature. Insulation shall conform to ASTM C534, Type II, sheet and shall be suitable for 200^{o}F service. Permeability shall not exceed 0.10 perms (ASTM E96). Insulation adhesive shall conform to Mil. Spec. MIL-A-24179A, Type II, Class 1.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:

1. Prior to work of this Section, carefully inspect the installed work of other trades and verify that such work is complete to the point where this installation may properly commence.

2. Verify that the insulation systems may be installed in accordance with pertinent codes and regulations and the reviewed Submittals.

3.2 GENERAL

A. Insulate after system tests have been completed and surfaces to be insulated have been cleaned of dirt, rust, and scale and are dry.

B. Install insulation with jackets drawn tight and cement down longitudinal and end laps. Do not use scrap pieces where a full length section will fit. Insulation shall be continuous through sleeves, wall and ceiling openings, except at fire dampers in duct systems and pipe penetrations through fire rated assemblies. Extend surface finishes to protect ends, and raw edges of insulation. Apply coatings and adhesives at the manufacturer's recommended coverage per gallon. Individually insulate piping and ductwork. Keep insulation dry during the application of the finish. Bevel and seal the edges of exposed insulation.

C. Unless otherwise indicated, do not insulate the following:

1. Factory pre-insulated flexible ductwork.
2. Factory pre-insulated ductwork, plenums, casings, mixing boxes, and filter boxes.
3. Chrome plated pipes and fire protection pipes.
4. Vibration isolating connections
5. Adjacent insulation
6. ASME stamps, nameplates, access plates
7. Ductwork exposed to view in a normally occupied space.
8. Hydronic specialties: Low water cutoff, relief valves, relief valve discharge piping, pressure reducing valves, and expansion tanks.
9. Unions and flanges at equipment required for frequent service.

3.3 PIPING INSULATION

A. Pipe Insulation (Fiberglass): Place sections of insulation around the pipe and joints, tightly butt into place. Draw jacket laps tight and smooth. Secure jacket with fire resistant adhesive, or factory applied self sealing lap. Cover circumferential joints with butt strips, not less than 3-inches wide, of material identical to the jacket material. Overlap longitudinal laps of jacket material not less than 1-1/2 inches. Adhesive used to secure the butt strip shall be the same as used to secure the jacket laps.

B. Flanges, Unions, Valves and Fittings Insulation (Fiberglass): Factory fabricated removable and reusable insulation covers. Place factory premolded, precut or field-fabricated

segmented insulation of the same thickness and conductivity as the adjoining pipe insulation around the flange, union, valve, and fitting abutting the adjoining pipe insulation. Install factory premolded one-piece PVC fitting covers over the insulation and secure by stapling or with metal or plastic tacks made for securing PVC fitting covers and secure with PVC vapor barrier tape.

C. Pipe Insulation (Flexible Unicellular): Bond cuts, butt joints, ends, and longitudinal joints with adhesive. Miter 90-degree turns and elbows, tees, and valve insulation. Insulate flanges, unions, valves, and fittings.

D. Where penetrating roofs and exterior walls, insulate piping to a point flush with the underside of the deck or wall and seal with a vapor barrier coating.

E. Hangers and Anchors: Pipe insulation shall be continuous through pipe hangers. Where pipe is supported by the insulation, provide MSS SP-58, Type 40 galvanized steel shields (16 gage maximum). For fiberglass insulation systems on pipe sizes 2 inches through 3", provide insulation inserts at points of hangers and supports. Insulation inserts shall be of molded glass fiber (minimum 12 pcf). Insulation inserts shall cover the bottom half of the pipe circumference, 180 degrees, and be not less than 4" long. Vapor-barrier facing of the insert shall be of the same material as the facing on the adjacent insulation. Seal inserts into the insulation. Insulation inserts for pipe sizes 4" and larger shall be welded pipe saddles. Install insulation in void area of saddle of same material used on adjacent insulation. For pipe sizes 2" and smaller, insulation inserts for flexible unicellular insulation systems shall be wooden doweling set on end of length equal to insulation thickness. Seal dowel to insulation with adhesive.

F. PVC or Metal Jackets: Provide over insulation. Machine cut jacket to smooth edge of circumferential joints. Overlap metal jacket not less than 2 inches at longitudinal and circumferential joints and secure with metal bands at not more than 9 inch centers. Overlap longitudinal joints down to shed water. Seal circumferential joints with a coating recommended by insulation manufacturer for weatherproofing. Solvent weld PVC jacket system to provide continuous watertight seal.

3.4 EQUIPMENT INSULATION

A. General Procedures: Apply equipment insulation suitable for temperature and service to fit as closely as possible to equipment. Join sections of insulation with adhesive. Bevel insulation around name plates, ASME Stamp, and access plates. For insulation on equipment that must be opened periodically for inspection, cleaning, or repair, construct insulation to be removable and replaceable without damage. Provide vapor barrier seal at joints and seams for "cold" equipment.

B. Cold Equipment: Provide flexible unicellular sheet insulation, bond cuts, butt joints, longitudinal joints and ends with vapor barrier adhesive. Vapor seal exposed edges to equipment.

3.5 INSULATION APPLICATION SCHEDULE

SERVICE	THICKNESS	MATERIAL/JACKET
PIPING:		
Horizontal and Vertical Rain Leaders and Roof Drain Sump Bodies	1/2"	Flexible Unicellular
Domestic Cold Water Piping	1-1/2”	Fiberglass, ASJ
EQUIPMENT:		
Water Meter	1/2"	Flexible Unicellular
Backflow Preventer	1/2"	Flexible Unicellular

3.6 FIELD INSPECTION

A. Visually inspect to ensure that materials used conform to specifications. Inspect installations progressively for compliance with requirements.

* END OF SECTION *

SECTION 233000

DUCTWORK AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The drawings and the specifications including SECTION 230500 "SUPPLEMENTAL MECHANICAL GENERAL REQUIREMENTS" are hereby made a part of the work of this section.

1.2 DESCRIPTION OF WORK

A. The work covered by this Section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections and incidentals and the performing of operations required to install the ductwork systems indicated.

1.3 SUBMITTALS

A. Substitutions: Your attention is directed to Section 230500-"Substitutions", relative to competition and the (ONLY) notation. Familiarity with this section should be achieved before reading the PRODUCTS section of this specification.

B. The items for which the submittals paragraph in Section 230500, Supplemental General Mechanical Requirements, apply are as follows:

1. Ductwork.
2. Ductwork accessories.
3. Ductwork sealing products.

PART 2 - PRODUCTS

2.1 DUCTWORK

A. Classification of Ductwork: Low pressure ductwork: up to 2" W.G. static pressure.

B. Materials: Unless otherwise indicated low pressure ductwork shall be galvanized steel. Galvanized sheet metal shall be new galvanized steel sheets of lock forming quality with zinc coating that will not flake or peel under forming operation.

C. Construction for Low Pressure Round and Rectangular Ductwork:

1. Material: Galvanized steel conforming to ASTM A527, weight of galvanized coating shall be not less than 1-1/4 ounces total for both sides of one sq.ft. of a sheet. Construction, metal gage, and reinforcements shall conform with SMACNA "Duct Construction Standards" and NFPA 90A for 2" W.G. pressure class.

2. Fittings: Shall be constructed in accordance with SMACNA Standards and shall be of the types indicated (ONLY).

3. Longitudinal joints shall be Pittsburgh lockseam (ONLY). Button punch snap locks are not acceptable.

4. Joints shall be sealed to SMACNA seal class B.

2.2 DUCTWORK ACCESSORIES

A. Access Doors: Ruskin Model ADC2, 12"x12" size, 24 gauge galvanized steel, steel on both sides of door, foam gasket seals, 1" insulation, 2 cam locks, no hinge.

B. Turning Vanes: (Low Pressure):

1. Solid blade, mounted with the long edge down stream in accordance with duct construction details indicated. Submit a 12"x12" sample elbow for review prior to fabrication.

C. Joint Sealer:

1. Hardcast Two-Part II DT tape with RTA-50 indoor/outdoor activator.

2. Hardcast Duct-Seal 321 water based indoor/outdoor sealant.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:

1. Prior to work of this Section, carefully inspect the installed work of other trades and verify that such work is complete to the point where this installation may properly commence.

2. Verify that the duct systems may be installed in accordance with pertinent codes and regulations and the reviewed Submittals.

3.2 INSTALLATION OF DUCTWORK AND AIR DEVICES

A. Provide and erect in accordance with the best practice of the trade ductwork shown on the drawings and as required to complete the intended installation. Make offsets as shown or required to place ductwork in proper position to avoid conflicts with other work and to allow the application of insulation and finish painting to the satisfaction of the Architect. Sizes given are "inside - clear" dimensions and not necessarily that of sheet metal. Ducts shall be arranged to adjust to "field conditions". The Sheet Metal trades shall coordinate his work with other trades. Work shall conform to ASHRAE duct construction recommendations, SMACNA "Duct Construction Standards", NFPA, and the requirements of the IBC code.

B. Joint Sealing: See PRODUCTS section.

C. Longitudinal joints: See PRODUCTS section.

D. Turns shall be made with long radius elbows or, if physically impossible to use long radius elbows, shall be square turns with specified turning vanes. CAUTION: Turns not conforming to this requirement shall be ordered removed and replaced with properly built turns.

E. Access Doors: Provide access doors for concealed apparatus requiring service and inspection in the duct system including but not limited to dampers, sensors and motors, and upstream and downstream from duct coils.

F. Duct Sleeves and Prepared Openings: Install duct sleeves and prepared openings for duct mains, duct branches, and ducts passing through walls, roofs, and ceilings. Insure the

proper size and location of sleeves and prepared openings. Allow one-inch clearance between duct and sleeve or one-inch clearance between insulation and sleeve for insulated ducts, except at grilles, registers, and diffusers.

G. Duct Supports: Unless otherwise indicated, provide one-inch wide by 16 gage galvanized steel sheet metal strips on each side of ducts. Anchor risers in the center of the vertical run to allow ends or riser free vertical movements. Attach supports only to structural framing members. Do not anchor supports to metal decking unless a means is provided (architectural review required) for preventing the anchors from puncturing the metal decking. Where supports are required between structural framing members, provide suitable intermediate metal framing. Where C clamps are used, use retainer clips.

H. Flexible Collars and Connections: Provide flexible collars between fans and ducts or casings and where ducts are of dissimilar metals, as indicated or required. For round ducts, securely fasten flexible connections using stainless steel clinch-type draw-band. Nylon drawbands may be used if installed using the drawband manufacturer's lever-action tightening tool. For rectangular ducts, lock flexible connections to metal collars.

I. Flexible Ducts: Provide where indicated. No fiberglass shall be in contact with air flow. Flexible duct length shall not be more than 4'-0". Install with metal band hangers and without excess length, provide maximum extension of flex duct. Securely fasten flexible ducts to metal collars using a stainless steel or tool-tightened nylon drawband on the duct core and a second drawband on the insulation vapor barrier. If the duct exceeds 12 inches diameter, position the drawband behind a bead on the metal collar. Taping in lieu of drawbands is not allowed.

J. Any deviation in the duct system must be submitted as a shop drawing and stamped. CAUTION: Any deviation not submitted and favorably reviewed will be ordered removed from the system and replaced with that which is shown on the Drawings.

K. Discrepancies between actual field conditions and the Contract Documents shall be brought to the attention of the Architect prior to fabrication.

L. Field Changes to Ductwork: Field changes of ducts such as those required to suit the sizes of factory-fabricated equipment actually furnished shall be designed to minimize expansion and contraction. Use 4:1 transitions in field changes as well as modifications to connecting ducts.

M. Transitions with a slope greater than 4 to 1 shall be ordered removed from the system and replaced with a transition which meets this criteria.

N. Joints and seams at intake and exhaust plenums and joints on intake and exhaust ductwork for a distance of 3 feet from the plenum shall be sealed watertight on the bottom and side joints and seams.

O. Isolation dampers at intake and exhaust louvers and vent hoods shall be sealed to the ductwork to provide an airtight assembly with similar performance characteristics to the isolation damper.

3.3 CLOSING IN WORK

A. Cover up or enclose work after it has been properly and completely tested and reviewed.

B. No additional cost to the Owner will be allowed for uncovering or recovering any work that is covered or enclosed prior to required test and review.

3.4 TEST AND ADJUST

A. Before operating any system, the system shall be cleaned out to remove dust and foreign materials.

B. After the installation is complete and ready for operation, test the system under normal operating conditions in the presence of the Architect and demonstrate that the system functions as designed.

C. Correct defects which develop during the test period, conduct additional testing until defect free operation is achieved.

3.5 CLEANUP AND CORROSION PREVENTION

A. Ductwork and equipment shall be thoroughly cleaned. Dirt, dust, and debris shall be removed and the premises left in a clean and neat condition.

B. Before covering is applied to duct systems, clips, rods, clevises and other hanger attachments, and before uncovered piping is permitted to be concealed, corrosion and rust shall be wire brushed and cleaned and in the case of iron products, a coat of approved protective paint applied to these surfaces.

3.6 INSTRUCTIONS

A. On completion of the project, instruct the Owner's representative in the care and operation of the system. The total period of instruction shall not exceed four (4) hours. The time of instruction shall be arranged with the Owner. In addition to the prime Mechanical Contractor, the control system Contractor, Balancing Contractor, and Owner's representative shall be present and participate in the Owner's instruction.

3.7 FIRESTOPPING

A. Firestopping shall be performed in accordance with Specification Section 07840 “Firestopping”. All penetrations of fire-rated assemblies including walls and floors by mechanical system components (piping, ductwork, conduits, etc.) shall be firestopped as specified.

* END OF SECTION *

SECTION 260000

GENERAL ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Electrical Requirements specifically applicable to Divisions 26.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

B. ANSI C2 - National Electrical Safety Code.

C. ANSI/NFPA 101 - Life Safety Code.

1.03 RELATED REQUIREMENTS

A. Conditions of the Contract and Division 1 - General Requirements, apply to all work, including work of this Division. Examine all contract documents for requirements affecting this work.

1.04 SUBMITTALS

A. Submit under provisions of Division 01.

B. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.

C. Mark dimensions and values in units to match those specified.

D. Provide fixture schedule, lighting drawings, panelboard schedules and single line or risers diagram(s) to supplier for assistance in pricing as applicable. Contractor shall receive one set of black line drawings for reproduction from the engineer for this purpose.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable local, State and Federal Building Code for the State of Maine.

B. Electrical: Conform to NFPA 70, NFPA72, NFPA 99, NFPA 101, ANSI C2, 2 FM, UL, and applicable ASTM and ANSI Standards.

C. Contractor shall visit the site to become familiar with all existing conditions affecting this work. No claim shall be recognized for extra compensation due to failure of contractor to familiarize himself/herself with the conditions and extent of proposed work.

D. Obtain permits and request inspections by local authority having jurisdiction.

1.06 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on Drawings, unless prevented by Project conditions.

B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions,

including changes to Work specified in other Sections. Obtain permission of Engineer before proceeding.

1.07 TEMPORARY LIGHT AND POWER

A. Temporary light and power shall be installed and maintained by the Electrical Contractor for use by all trades for the duration of construction complete with all wiring, switches, protective devices and similar equipment as may be required. Arrangement for the temporary service with the Power Company is the responsibility of the Electrical Contractor. Power bills will be paid by the General Contractor. Provide 120/208 volt or 120/240 volt 100 ampere, drop box similar to standard CMP detail 980-31.1.4. Provide 15-20 watt self-ballasted compact fluorescent, lamps with plastic “cages” as needed. or 4 foot twin lamp (T8) fluorescent tamper-proof, gasketed and water-tight as required.

1.08 CONTRACT DRAWINGS AND SPECIFICATIONS

A. It is to be understood that drawings accompanying these specifications are intended to show general arrangement and extent of work to be done, but exact location and arrangement of all components shall be determined as work progresses. Anything shown on the drawings and not specifically mentioned in specifications or vice versa shall be considered as required in both.

B. Locations of equipment, and materials, etc., as given on drawings are approximate unless dimensioned. It shall be understood they are subject to such modifications as may be found necessary or desirable at time of installation in order to meet any structural conditions. Such changes shall be made by the contractor without extra charges.

C. Because of small scale drawings, all required offsets, etc., as may be required to clear work of other Contractors, may not be shown. Contractor, however, shall provide all necessary offsets, etc., as required to complete the installation of their work and not conflict with that of others.

D. It is the intention that wiring systems shall be complete and fully operational. The contractor shall identify system components during the bid process that clearly constitute conditions that would cause the system to be incomplete. Clarification: The remedy to these discrepancies shall be communicated by the engineer to all bidders or included as an addenda.

1.09 MATERIALS AND LABOR

A. Bidders for this work shall carefully examine the Plans and Specifications, as the Contractor shall be required to furnish all materials and labor necessary to deliver to the Owner a complete system installed in full accordance with Local State and Federal laws. The system shall be furnished as specified, tested, and turned over to the Owner in perfect operating condition.

B. All materials shall be new and of best quality of their respective kinds. Workmanship in all respects shall be of highest grade and all construction shall be done according to best practices of the trade. Materials shall be warrantied directly by the manufacturer.

C. Contractor shall provide, when required for review of Engineer, labeled samples of any material or equipment specified herein or proposed to be used on this project.

D. Where words "furnish", "provide" or "install" are mentioned, either singly or in combination, these words are hereby interpreted to mean "furnish and install" or "provide and install," including all materials complete with all connections, supplemental devices, accessories and appurtenances, unless specifically otherwise noted. These words are likewise hereby

interpreted as being prefixed to all materials, equipment, and apparatus hereinafter mentioned, either in abbreviated or schedule information.

1.10 PROTECTION OF WORK AND MATERIALS

A. Contractors shall be responsible for the care and protection of all materials delivered and labor performed until the completion of the work.

B. Cap all uncompleted lines, raceways, and ducts until ready for final connections, or future work as indicated.

C. All portions of the work liable to damage by weather or by those engaged on the project, must be securely protected by temporary, but substantial covering which must be maintained in position until Engineer authorizes removal.

1.11 REPLACEMENTS

A. In the event of damage to any equipment or materials, immediately make all repairs and replacements necessary to the approval of the Engineer at no additional cost to the Owner.

1.12 SAFETY REGULATIONS

A. All work to be performed and/or installed shall conform to all requirements of the Occupational Safety and Health Act (OSHA) of 1970 and all Amendments thereto.

1.13 QUALITY ASSURANCE/CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply fully with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform work using persons qualified to produce workmanship of specified quality.

F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and physical distortion or disfigurement.

1.14 UNDERWRITER'S APPROVALS

A. All electrical materials and equipment shall bear label of Underwriter's Laboratories, shall be listed by them in their list of electrical fittings and shall be approved by them for purpose for which they are to be used, unless materials and equipment are of a type for which Underwriter's Laboratories does not list or provide label service.

1.15 RECORD DRAWINGS

A. During construction, the Contractor shall keep an accurate record of all deviations to the installation of the work as indicated on the drawings. Upon completion of the work, the Contractor shall furnish a copy of this record to the Engineer, on a black line of the original which will be available from the Engineer. Submit record drawings before requesting final payment.

1.16 MANUFACTURER'S REPRESENTATIVE

A. At appropriate times, or as directed by the Engineer, provide the services of a competent factory trained Engineer or Technician of the particular manufacturer of equipment or item involved, to inspect, adjust, and place in proper operating condition any and all such items of manufacture. No additional compensation shall be allowed Contractors for such service.

1.17 MANUFACTURERS' INSTRUCTIONS, AND OPERATION AND MAINTENANCE DATA

A. Provide for each item of equipment or apparatus furnished, a complete set of printed instructions obtained from the manufacturer covering proper operation, care, lubrication, cleaning, servicing, adjustment, etc., together with any special safety instructions.

B. Manufacturers' data shall further include performance data (time current curves, where applicable), complete parts lists, recommended spare parts lists, and wiring diagrams.

C. Data shall be arranged in complete sets, properly indexed and marked.

D. Data shall include complete set of shop drawings.

E. Material shall first be submitted in preliminary fashion for review by Engineer. After approval, Contractor shall submit two (2) copies in bound volumes to the Engineer for distribution.

F. Provide contacts for service agencies for all major system components.

1.18 GUARANTEES

A. An item becomes "defective" when it ceases to conform to this Contract Document. Guarantees beginning on the date of issuance of the Owner's final payment, or certificate of substantial completion, with Owner taking occupancy or beneficial use thereafter.

B. Upon completion of the work and before applying for final payment, furnish a written guarantee, stating that the work complies with the provisions of codes listed herein and the local enforcing authorities, and that it will be free from defects of material and workmanship for the required guarantee period. Guarantee shall further state that the Contractor will, at his own expense, repair and/or replace any of his material and work which may become defective during the time of guarantee, together with other work damaged as a consequence of such defects. All manufacturers written warranties shall apply to materials. Warranties other than that of the manufacturer are not acceptable.

C. The guarantee period shall be one (1) year except when longer periods are indicated for specific equipment.

D. All materials in Division 26 where a written warranty is published shall require the warranty to be offered by the product manufacturer.

1.19 EXISTING UTILITIES AND EQUIPMENT

A. Extreme care shall be taken to protect existing utilities and equipment above and below grade and in all other locations. Information contained on drawings is not guaranteed as to location, invert, etc. but represent the best information available as to the location of underground and concealed utilities and equipment. The Contractor shall be responsible for the replacement of all damaged or broken utilities or equipment due to their work or operations.

1.20 ENERGIZING EQUIPMENT

A. Obtain Owner's written approval before energizing any equipment.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01 CONNECTION TO EQUIPMENT

A The Contractor shall be responsible for proper wiring and raceway connections to equipment, make sure of alignment, both initially and under operating conditions, and provide proper supports, brackets, means of expansion, etc., to make sure that no excessive stresses are applied to equipment. Raceways shall be run to the equipment and alignment checked before final bolting and fastening.

B At the request of the Engineer, dismantle equipment connections to demonstrate proper installation and make such corrections necessary without additional compensation for disassembly, re-connection, or the required corrective work.

C Equipment shall be installed in such a manner as to permit disconnecting for service and repairs without the necessity of rigging.

3.02 CLOSING IN UNINSPECTED WORK

A General: Do not cover up or enclose work until it has been properly and completely inspected and approved. Engineer may waive this requirement by written permission.

B Noncompliance: Should any of the work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required, and after it has been completely inspected and approved, make all repairs and replacements with such materials as are necessary to the approval of the Engineer and at no additional cost to the Owner.

3.03 CLEANING OF SYSTEMS

A All wiring systems shall be thoroughly cleaned prior to initial operation and in accordance with manufacturer's instructions for equipment to be furnished and/or installed.

B Furnish all detergents, solvents, cleaning compounds, tools, etc., required in connection with cleaning operations.

C Thoroughly clean all exposed portions of all equipment, remove all labels, and wipe clean with a damp rag.

3.04 TESTING, BALANCING, AND ADJUSTING

A Electrical loads shall be balanced on all phase legs to a tolerance of plus or minus 10 percent. Include testing circuits for shorts to ground. Measure grounding system resistance. Correct all deficiencies. Provide all test equipment.

3.05 INSTRUCTIONS

A On completion of the job, Contractor shall provide competent technicians to thoroughly instruct the Owner's representative in the care and operation of the system. The total period of instruction shall not exceed 2 hours and be performed in a minimum of one interval. The time of instruction shall be arranged with the Owner. The Electrical subcontractor shall be present and participate in the Owner’s instruction.

3.06 FIRESTOPPING

A Firestopping shall be performed in accordance with Specification Section “Firestopping”. All penetrations of fire-rated assemblies including walls and floors by electrical system components (conduits, cables, etc.) shall be firestopped as specified. Coordinate size, location and type of sleeves as required by firestopping systems.

*** END OF SECTION ***

SECTION 260519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

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. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1. Section 271500 "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. General Cable Technologies Corporation.
2. Southwire Incorporated.
3. The Okonite Company.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2.

D. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for Metal Clad cable, Type MC or SO cable.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Gardner Bender.
3. Hubbell Power Systems, Inc.
4. Ideal Industries, Inc.
5. Ilsco; a branch of Bardes Corporation.
6. NSi Industries LLC.
7. O-Z/Gedney; a brand of the EGS Electrical Group.
8. 3M; Electrical Markets Division.
9. Tyco Electronics.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

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. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

C. All conductor sizes shown on drawings are for copper unless noted otherwise.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-2-THWN-2, single conductors in raceway.

B. Feeders: Type THHN-2-THWN-2, single conductors in raceway.

C. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-2-THWN-2, single conductors in raceway.

D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Metal Clad Cable, Type MC.

E. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.

F. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

B. Test and Inspection Reports: Prepare a written report to record the following:

1. Procedures used.

2. Results that comply with requirements.
3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 260519

SECTION 260526

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 this Section.

1.2 SUMMARY

A. Section Includes: Grounding systems and equipment.

B. Section includes grounding systems and equipment, plus the following special applications:

1. Underground distribution grounding.

1.3 ACTION SUBMITTALS

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

1.4 QUALITY ASSURANCE

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. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

2.2 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches (1200 mm) long.
2. Backfill Material: Electrode manufacturers recommended material.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches (600 mm) below grade.
2. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.

C. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down to specified height above floor; connect to horizontal bus.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

D. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.

E. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

3.4 LABELING

A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for instruction signs. The label or its text shall be green.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and less: 10 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260533

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 this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Boxes, enclosures, and cabinets.

1.3 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. GRC: Comply with ANSI C80.1 and UL 6.

C. FMC: Comply with UL 1; zinc-coated steel or aluminum.

D. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

E. Fittings for Conduit: Comply with NEMA FB 1 and UL 514B.

1. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions were installed, and including flexible external bonding jumper.

F. Joint Compound for GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

C. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

D. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

B. Metal Floor Boxes: Wiremold Model RFB2

C. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

D. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).

E. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 3R with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC.
3. Underground Conduit: RNC, Type EPC-40-PVC.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed: RNC, Type EPC-40-PVC.
2. Concealed in Ceilings and Interior Walls and Partitions: RNC, Type EPC-40-PVC.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FNMC, except use LFNMC in damp or wet locations.
4. Damp or Wet Locations: RNC, Type EPC-40-PVC.
5. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Arrange stub-ups so curved portions of bends are not visible above finished slab.

E. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

F. Support conduit within 12 inches (300 mm) of enclosures to which attached.

G. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 1 inch (25 mm) of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

H. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

J. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

K. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

L. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

M. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

N. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

O. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC conduit that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
    d. Attics: 135 deg F (75 deg C) temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

P. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.

Q. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

R. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

S. Locate boxes so that cover or plate will not span different building finishes.

T. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

U. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 INSTALLATION OF ELECTRICAL BOXES IN FIRE RATED WALLS

A. Outlet boxes on opposite sides of the wall shall be separated as follows:

1. By a horizontal distance of not less than 24 inches (610 mm);

2. By a horizontal distance of not less than the depth of the wall cavity where the wall cavity is filled with cellulose loose fill, rockwool or slag mineral wool insulation.

3. By protecting both outlet boxes by listed putty pads, 3M Catalog # MPP+ or equal.

B. Boxes exceeding 16 sq. in. (103 sq. cm) must be protected by listed putty pads, 3M Catalog # MPP+ or equal.

3.4 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Civil sections for pipe less than 6 inches (150 mm) in nominal diameter.
2. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Civil sections"
3. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.
b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

END OF SECTION 260533

SECTION 260924

LIGHTING CONTROL DEVICES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wall box mounted, wall/corner mounted, and ceiling mounted occupancy sensors including dual technology, ultrasonic, and passive infrared technologies. This includes self contained PIR sensors as well as low voltage sensors that work with Switchpacks.

B. Related Sections:
   1. Section 265100 – Interior Lighting.

1.2 REFERENCES

A. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE)
   1. C62.41-1991 – Recommended Practice for Surge Voltages in Low Voltage AC Power Circuits.

B. ASTM International (ASTM)
   1. D4674 -02a Standard Test Method for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Fluorescent Lighting and Window-Filtered Daylight.

C. National Electrical Manufacturers Association (NEMA)
   1. WD1 (R2005) - General Color Requirements for Wiring Devices.

D. Underwriters Laboratories, Inc. (UL):
   1. 94 – Flammability Rating
   2. 916 – Energy Management Equipment.
   3. 508 (2005) - Standard for Industrial Control Equipment.
   4. 244A – Appliance Controls

1.3 SYSTEM DESCRIPTION

A. Permanently installed
   1. Wall switch occupancy sensors
   2. Ceiling mounted occupancy sensors

1.4 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Specification Conformance Document: Indicate whether the submitted equipment:
   1. Meets specification exactly as stated.
   2. Meets specification via an alternate means and indicate the specific methodology used.

C. Shop Drawings; include:
   1. Load schedule indicating actual connected load, load type, and voltage per circuit, circuits and their respective control zones, circuits that are on emergency, and capacity, phase, and corresponding circuit numbers.
   2. Schematic of system.
   3. Lighting plan clearly marking product type, location and orientation of each sensor.

D. Product Data: Catalog specification sheets with performance specifications demonstrating compliance with specified requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer: Minimum 20 years' experience in manufacture of occupancy sensor lighting controls.

B. Manufacturer's Quality System: Registered to ISO 9001:2000 Quality Standards, including in-house engineering for product design activities.

C. Occupancy Sensing Lighting Controls:

1. Listed by UL specifically for the required loads. Provide evidence of compliance upon request.

D. Installer Qualifications: Installer shall be one who is experienced in performing the work of this section, and who has specialized in installation of work similar to that required for this project.

E. Source Limitations: To assure compatibility, obtain occupancy sensors from a single source with complete responsibility over all lighting controls, including accessory products. The use of subcontracted component assemblers is not acceptable.

1.6 PROJECT CONDITIONS

A. Do not install equipment until following conditions can be maintained in spaces to receive equipment:

1. Ambient temperature: 0° to 40° C (32° to 104° F).
2. Relative humidity: Maximum 90 percent, non-condensing.
3. Occupancy Sensors must be protected from dust during installation.

1.7 WARRANTY

A. Provide manufacturer's 5-year parts warranty.

1.8 MAINTENANCE

A. Make ordering of new equipment for expansions, replacements, and spare parts available to end user.

B. Make new replacement parts available for minimum of ten years from date of manufacture.

C. Provide factory direct technical support.

PART 2- PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Eaton Lighting Systems (formerly Cooper Controls)

B. Substitutions: Allowed under provisions of Division 1.

2.2 SENSOR PERFORMANCE REQUIREMENTS

A. Sensing mechanism:

1. Infrared: Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
2. Dual technology:
   a. Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
   b. Utilize an operating frequency of 32 kHz or 40 kHz that shall be crystal controlled to operate within plus or minus 0.005% tolerance.
   c. Incorporate Doppler shift ultrasonic and passive infrared motion detection technologies. Products that react to noise or ambient sound shall not be

considered.

B. Power failure memory:
   1. Controls incorporate non-volatile memory. Should power be interrupted and subsequently restored, settings and parameters saved in protected memory shall not be lost.

C. Designed and tested to withstand discharges without impairment of performance when subjected to discharges of 15,000 volts per IEC 801-2.

D. Products tested in identical manner, complaint to NEMA WD 7 -2011 Occupancy Motion Sensors Standards.

E. Sensor shall have time delays from 10 to 30 min.

F. When specified, sensors shall automatically adjust time delay and sensitivity settings.

G. All sensors shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation.

H. All sensors shall have readily accessible, user adjustable settings for time delay and sensitivity. Settings shall be located on the sensor (not the control unit) and shall be recessed to limit tampering.

I. Where specified, sensor shall have an internal additional isolated relay with Normally Open, Normally Closed, and Common outputs for use with HVAC control, Data Logging and other control options. Sensors utilizing separate components or specially modified units to achieve this function are not acceptable.

2.3 LINE VOLTAGE CEILING MOUNTED OCCUPANCY SENSORS

A. Product: OAC-DT-2000-MV, OAC-DT-2000-DMV

B. Provide all necessary mounting hardware and instructions.

C. Capable of detection of occupancy at desktop level up to 300 square feet, and gross motion up to 1000 square feet

D. Shall accommodate loads from 0-800 watts at 120 volts; 0 to 1200 watts at 277 volts and shall have 180 degree coverage capability.

E. Shall be able to have their visible plastic parts replaced, for color changes in the field, without removing the body of the control from the wall and without requiring special tools.

F. Shall utilize Zero Crossing Circuitry which increases relay life, protects from the effects of inrush current, and increases sensor’s longevity.

G. Shall have no leakage current to load, in manual or in Auto/Off Mode for safety purposes and shall have voltage drop protection.

H. Where specified, dual relay sensors shall offer daylighting foot-candle adjustment control for either or both relays.

2.4 OCCUPANCY WALL SWITCHES

A. Product: OSW-P-0451-MV-*, ONW-P-1001-MV-*, ONW-P-1001-347-*, ONW-P-1001-DMV-*, ONW-P-1001-D347-*, ONW-P-1001-SP-*, ONW-P-1001-RR7-*

B. Capable of detection of occupancy at desktop level up to 300 square feet, and gross motion up to 1000 square feet

C. Shall accommodate loads from 0-800 watts at 120 volts; 0 to 1200 watts at 277 volts and shall have 180 degree coverage capability.

D. Shall be able to have their visible plastic parts replaced, for color changes in the field, without removing the body of the control from the wall and without requiring special tools.

E. Shall utilize Zero Crossing Circuitry which increases relay life, protects from the effects of inrush current, and increases sensor’s longevity.

F. Shall have no leakage current to load, in manual or in Auto/Off Mode for safety purposes and shall have voltage drop protection.

G. Where specified, wall switch sensors shall provide a field selectable option to convert sensor operation from Automatic On to Manual On.

H. Where specified, dual relay sensors shall offer daylighting footcandle adjustment control for either or both relays.

2.5 SOURCE QUALITY CONTROL

A. Perform full-function testing on 100% of all system components and panel assemblies at the factory.

PART 3- EXECUTION

3.1 INSTALLATION

A. Install equipment in accordance with manufacturer's installation instructions.

B. Provide complete installation of system in accordance with Contract Documents.

C. Provide equipment at locations and in quantities indicated on Drawings. Provide any additional equipment required to provide control intent.

3.2 TESTING

A. Upon completion of all wiring and after all fixtures are installed and lamped, a representative shall check the installation prior to energizing the system. Each installed occupancy sensor shall be tested in the Test Mode to see that lights turn OFF and on based on occupancy.

B. At the time testing, the owner's representative shall be thoroughly instructed in the proper operation of the system.

END OF SECTION

SECTION 262416

PANELBOARDS

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. Lighting and Appliance panelboards.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
6. Include wiring diagrams for power, signal, and control wiring.
7. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.4 MAINTENANCE MATERIAL SUBMITTALS

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

1. Keys: Two spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: Two spares for each panelboard.

1.5 QUALITY ASSURANCE

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. Comply with NEMA PB 1.

C. Comply with NFPA 70.

1.6 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: Flush- and surface-mounted cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.

3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
5. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
6. Finishes:

    a. Panels and Trim: Steel factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    b. Back Boxes: Same finish as panels and trim.

7. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover.

B. Incoming Mains Location: Top and bottom.

C. Line, Neutral, and Ground Buses:

1. Material: Tin-plated aluminum.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

D. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Tin-plated aluminum.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.

F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

G. Panelboard Short-Circuit Current Rating: Fully rated or rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, and listed and labeled for series-connected short-circuit rating by an NRTL.

2.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

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

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: As scheduled.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

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

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
7. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
8. Molded-Case Circuit-Breaker (MCCB) Features and Accessories as shown on panel schedules:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

e. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

2.4 PANELBOARD SUPPRESSORS

A. Surge Protection Device: IEEE C62.41-compliant, integrally mounted, solid-state, parallel-connected, non-modular type, with sine-wave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the panelboard short-circuit rating, and with the following features and accessories:

1. Accessories:

a. LED indicator lights for power and protection status.
b. Audible alarm, with silencing switch, to indicate when protection has failed.
c. One set of dry contacts rated at 5 A and 250-V ac, for remote monitoring of protection status.

B. Surge Protection Device: IEEE C62.41-compliant, integrally mounted, plug-in, solid-state, parallel-connected, modular (with field-replaceable modules) type, with sine-wave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the panelboard short-circuit rating, and with the following features and accessories:

1. Accessories:
   a. Redundant suppression circuits.
   b. Redundant replaceable modules.
   c. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
   d. LED indicator lights for power and protection status.
   e. Audible alarm, with silencing switch, to indicate when protection has failed.
   f. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of system operation. Contacts shall reverse position on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
   g. Four-digit, transient-event counter set to totalize transient surges.

2. Peak Single-Impulse Surge Current Rating: 120 kA per mode/240 kA per phase.
3. Minimum single-impulse current ratings, using 8-by-20-mic.sec. waveform described in IEEE C62.41.2.

   a. Line to Neutral: 70,000 A.
   b. Line to Ground: 70,000 A.
   c. Neutral to Ground: 50,000 A.

4. Protection modes and UL 1449 SVR for 240/120-V, single-phase, three-wire circuits shall be as follows:

   a. Line to Neutral: 400 V.
   b. Line to Ground: 400 V.
   c. Neutral to Ground: 400 V.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Mount panels in non-residential spaces with top of trim 90 inches above finished floor unless otherwise indicated.

C. Mount panels in residential spaces so no circuit breaker handle is more than 48” above finished floor.

D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

E. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

F. Install filler plates in unused spaces.

G. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

H. Comply with NECA 1.

I. Install Arc fault circuit interrupter type circuit breakers in residential circuits per NEC 210.12

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as indicated.

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.

3.6 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416

SECTION 262713

ELECTRICITY METERING

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 equipment for electricity metering by utility company.

1.3 ACTION SUBMITTALS

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

1.4 QUALITY ASSURANCE

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.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Receive, store, and handle modular meter center according to NECA 400.

1.6 COORDINATION

A. Electrical Service Connections: Coordinate with utility companies and components they furnish as follows:

1. Comply with requirements of utilities providing electrical power services.
2. Coordinate installation and connection of utilities and services, including provision for electricity-metering components.

PART 2 - PRODUCTS

2.1 EQUIPMENT FOR ELECTRICITY METERING BY UTILITY COMPANY

A. Meters will be furnished by utility company.

B. Modular Meter Center: Factory-coordinated assembly of a main service disconnect device, wireways, tenant meter socket modules, and tenant feeder circuit breakers arranged in adjacent

vertical sections. Assembly shall be complete with interconnecting buses and other features as specified below.

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

    a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
    b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
    c. Siemens Energy & Automation, Inc.
    d. Square D; a brand of Schneider Electric.

2. Comply with requirements of utility company for meter center.
3. Housing: NEMA 250, Type 3R enclosure.
4. Minimum Short-Circuit Rating: 42,000 A symmetrical at rated voltage.
5. Main Disconnect Device: Circuit breaker, series-combination rated for use with downstream feeder and branch circuit breakers.
6. Tenant Feeder Circuit Breakers: Series-combination-rated molded-case units, rated to protect circuit breakers in downstream tenant and house load centers that have 10,000A interrupting capacity.

    a. Identification: Complying with requirements in Section 260553 "Identification for Electrical Systems" with legend identifying tenant's address.
    b. Physical Protection: Tamper resistant, with hasp for padlock.

7. Meter Socket: Rating coordinated with indicated tenant feeder circuit rating.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with equipment installation requirements in NECA 1.

B. Install meters furnished by utility company. Install raceways and equipment according to utility company's written requirements. Provide empty conduits for metering leads and extend grounding connections as required by utility company.

3.2 IDENTIFICATION

A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Series Combination Warning Label: Self-adhesive type, with text as required by NFPA 70.
2. Equipment Identification Labels: Adhesive film labels with clear protective overlay.

END OF SECTION 262713

SECTION 262726

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 this Section.

1.2 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Weather-resistant receptacles.
3. Snap switches.
4. Cord and plug sets.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

B. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

C. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

A. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

B. General Use: Pass & Seymour BR20-I or equal.

C. Tamper Resistant: Pass & Seymour TR63-I or equal.

D. Electric Range: Pass & Seymour 3854/3854-40 or equal.

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A: Pass & Seymour BR20A1-I or equal.

C. Tamper Resistant GFCI: Pass & Seymour 2095TRI or equal.

2.5 CORD AND PLUG SETS

A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.

3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.6 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A

C. SPST switches, Pass & Seymour CS20AC1-I or equal.

D. 3-Way Switches, Pass & Seymour CS20AC3-I or equal.

E. 4-Way Switches, Pass & Seymour CS20AC4-I or equal.

F. Boiler Cut-off switches, Pass & Seymour PS20AC2-RED or equal.

G. Telephone Outlet:

1. Description: Single RJ-45 jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e. Comply with UL 1863.

2.7 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.
1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.8 FINISHES

A. Device Color:

1. Ivory or required by NFPA 70 or device listing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Test straight-blade for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz. (115 g).

B. Wiring device will be considered defective if it does not pass tests and inspections.

END OF SECTION 262726

SECTION 265100

INTERIOR LIGHTING

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 lighting fixtures, LEDs and drivers.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color-rendering index.

C. LER: Luminaire efficacy rating.

D. Lumen: Measured output of lamp and luminaire, or both.

E. Luminaire: Complete lighting fixture.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions.
2. Emergency lighting units including battery and charger.
3. Energy-efficiency data.
4. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
5. Lamp data including dimensions, color temperature and power consumption
6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & 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.

a. Testing Agency Certified Data: For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by manufacturer.
b. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Installation instructions.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.6 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. Lamps: 10 of each type and rating installed. Furnish at least one of each type.
2. Plastic Diffusers and Lenses: One of each type and rating installed. Furnish at least one of each type.
3. Globes and Guards: 1 of each type and rating installed. Furnish at least one of each type.

1.7 QUALITY ASSURANCE

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. Comply with NFPA 70.

1.8 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, product(s) indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Metal Parts: Free of burrs and sharp corners and edges.

C. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

E. Diffusers and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

   a. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
   b. UV stabilized.

2. Glass: Annealed crystal glass unless otherwise indicated.

2.3 LEDs

1. The light source of the luminaires shall consist of LED arrays or bars. If required, the LED arrays or bars shall be removable.
2. The LEDs shall be either white or RGB, according to the light fixture schedule and Drawings. For luminaires specified with white light, it is not acceptable to provide RGB LEDs mixed to produce white light.
3. Refer to the light fixture schedule and Drawings for the specified correlated color temperature (CCT) of each luminaire.
4. Individual LEDs shall be binned by manufacturer to comply with ANSI C78.377.
5. The LEDs shall be manufactured by Cree, Philips, Toshiba, Osram, Samsung, or Nichia, unless otherwise noted.

2.4 DRIVERS

1. The driver or power supply for the luminaire shall be modular and replaceable.
2. The rated life of the driver shall match the rated life of the LEDs and luminaire.
3. In general, the drive current rating of the driver shall be minimized, while still maintaining the required lumen output, to improve luminaire efficiency and life.
4. The driver shall meet the emission standards of IEC EN-61000-6-3 at a minimum. For healthcare or other applications with EMI sensitive equipment, provide drivers that meet more stringent standards as required.

2.5 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

a. Battery: Sealed, maintenance-free, nickel-cadmium type.
b. Charger: Fully automatic, solid-state type with sealed transfer relay.
c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.6 EMERGENCY LIGHTING UNITS

A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.

1. Battery: Sealed, maintenance-free, lead-acid type.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures:

1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
2. Install lamps in each luminaire.

B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.

C. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.

3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

3.4 STARTUP SERVICE

A. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Owner. Burn-in fluorescent and compact fluorescent lamps intended to be dimmed, for at least 100 hours at full voltage.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.

1. Adjust aimable luminaires in the presence of Architect.

END OF SECTION 265100

SECTION 265600

EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior LED luminaires.
2. Poles and accessories.

1.2 DEFINITIONS

A. CCT: Correlated color temperature.

B. LER: Luminaire efficacy rating.

C. Luminaire: Complete lighting fixture, including driver housing if provided.

D. Pole: Luminaire support structure, including tower used for large area illumination.

1.3 ACTION SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:

1. Physical description of luminaire, including materials and dimensions.
2. Details of installation and construction.
3. Luminaire materials.
4. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.
   a. Manufacturer Certified Data: Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
5. Photoelectric relays.
6. Lamps, including life, output, CCT, CRI, lumens, and energy-efficiency data.
7. Materials, dimensions, and finishes of poles.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and poles to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with IEEE C2, "National Electrical Safety Code."

D. Comply with NFPA 70.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store poles on decay-resistant-treated skids at least 12 inches (300 mm) above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

B. Retain factory-applied pole wrappings on metal poles until right before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.7 WARRANTY

1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
2. Warranty Period for Luminaires Poles: Repair or replace Luminaires and lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, product(s) indicated on Drawings.

2.2 EXTERIOR LED LUMINAIRES

A. LED luminaire housings shall be die cast or extruded aluminum.

B. Luminaires shall be UL listed for wet locations per UL 1598.

C. Luminaires shall have IES distribution and NEMA field angle classifications as indicated in luminaire schedule on project plans per IES HB-10.

D. Luminaires shall be fully assembled and electrically tested prior to shipment from factory.

E. The finish color shall be as indicated in the luminaire schedule or detail on the project plans.

F. Luminaires shall have a nameplate bearing the manufacturer's name, address, model number, date of manufacture, and serial number securely affixed in a conspicuous place.

G. LED Light Sources

1. Correlated Color Temperature (CCT) shall be in accordance with NEMA ANSLG C78.377

H. Luminaire Power Supply Units (Drivers)

1. Minimum efficiency shall be 85 percent.
2. Shall be rated to operate between ambient temperatures of minus 22 degrees F and 122 degrees F
3. Shall be designed to operate on the voltage system to which they are connected, typically ranging from 120 V to 480 V nominal.
4. Power Factor (PF) shall be greater than or equal to 0.90.
5. Total Harmonic Distortion (THD) current shall be less than or equal to 20 percent.
6. Shall be mounted integral to luminaire. Remote mounting of power supply is not allowed.
7. Power supplies in luminaires mounted under a covered structure, such as a canopy, or where otherwise appropriate shall be UL listed with a sound rating of A.
8. Shall be dimmable, and compatible with a standard dimming control circuit of 0 - 10V or other approved dimming system.
9. Shall be equipped with over-temperature protection circuit that turns light source off until normal operating temperature is achieved.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

A. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

3.2 POLE INSTALLATION

A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:

1. Fire Hydrants and Storm Drainage Piping: 60 inches (1520 mm).
2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet (3 m).
3. Trees: 15 feet (5 m) from tree trunk.

C. Foundation-Mounted Poles: Mount poles as recommended by pole manufacturer.

1. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.

D. Raise and set poles using web fabric slings (not chain or cable).

3.3 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.4 GROUNDING

A. Ground metal poles and support structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole unless otherwise indicated.
2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

3.5 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.

1. Verify operation of photoelectric controls.

END OF SECTION 265600

SECTION 271500

COMMUNICATIONS HORIZONTAL CABLING

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. UTP cabling.
2. Coaxial cable.
3. Cable connecting hardware, patch panels, and cross-connects.
4. Telecommunications outlet/connectors.
5. Cabling system identification products.
6. Cable management system.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

C. EMI: Electromagnetic interference.

D. IDC: Insulation displacement connector.

E. LAN: Local area network.

F. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.

G. RCDD: Registered Communications Distribution Designer.

H. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate layout and installation of telecommunications cabling with Owner's telecommunications and LAN equipment and service suppliers.

B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For coaxial cable, include the following installation data for each type used:

a. Nominal OD.
b. Minimum bending radius.
c. Maximum pulling tension.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For splices and connectors to include in maintenance manuals.

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. Patch-Panel Units: One of each type.
2. Connecting Blocks: One of each type.
3. Device Plates: One of each type.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.
3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each pair of UTP cable for open and short circuits.

PART 2 - PRODUCTS

2.1 HORIZONTAL CABLING DESCRIPTION

A. The maximum allowable horizontal cable length is 295 feet (90 m). This maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) to the workstation equipment or in the horizontal cross-connect.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1 when tested according to test procedures of this standard.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Grounding: Comply with J-STD-607-A.

2.3 UTP CABLE

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

1. ADC.
2. Belden Inc.
3. CommScope, Inc.
4. Genesis Cable Products; Honeywell International, Inc.
5. Mohawk; a division of Belden Networking, Inc.
6. 3M Communication Markets Division.
7. Tyco Electronics Corporation; AMP Products.

B. Description: 100-ohm, four-pair UTP, formed into 25-pair, binder groups covered with a blue thermoplastic jacket.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, Category 6.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

a. Communications, General Purpose: Type CM or CMG.
b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
c. Communications, Riser Rated: Type CMR, complying with UL 1666.
d. Communications, Limited Purpose: Type CMX.
e. Multipurpose: Type MP or MPG.
f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
g. Multipurpose, Riser Rated: Type MPR, complying with UL 1666.

C. Jacket Colors:

a. Yellow for video
b. Blue for data

2.4 UTP CABLE HARDWARE

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

1. ADC.
2. American Technology Systems Industries, Inc.
3. Belden Inc.
4. Dynacom Inc.
5. Hubbell Premise Wiring.

6. Leviton Commercial Networks Division.
7. Molex Premise Networks; a division of Molex, Inc.
8. Panduit Corp.
9. Siemon Co. (The).
10. Tyco Electronics Corporation; AMP Products.

B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

C. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.

1. Number of Terminals per Field: One for each conductor in assigned cables.

E. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.

F. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.

G. Patch Cords: Factory-made, four-pair cables in 36-inch (900 mm) lengths; terminated with eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.

2.5 COAXIAL CABLE

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

1. Alpha Wire Company.
2. Belden Inc.
3. Coleman Cable, Inc.
4. CommScope, Inc.
5. Draka Cableteq USA.

B. Cable Characteristics: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz.

C. RG-6/U: NFPA 70, Type CATV or CM.

1. No. 16 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
2. Double shielded with 100 percent aluminum-foil shield and 60 percent aluminum braid.
3. Jacketed with black PVC or PE.
4. Suitable for indoor installations.

2.6 COAXIAL CABLE HARDWARE

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

1. Emerson Network Power Connectivity Solutions.
2. Leviton Commercial Networks Division.
3. Siemon Co. (The).

B. Coaxial-Cable Connectors: F Type.

2.7 TELECOMMUNICATIONS OUTLET/CONNECTORS

A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1.

1. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
2. For use with snap-in jacks accommodating any combination of UTP and coaxial work area cords.
3. Legend: Snap-in, clear-label covers and machine-printed paper inserts.

2.8 GROUNDING

A. Comply with J-STD-607-A.

2.9 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

B. Comply with requirements in Section 260553 "Identification for Electrical Systems."

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Install cables in pathways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal pathways and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.

B. Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures:

1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
2. Install lacing bars and distribution spools.

3. Install conductors parallel with or at right angles to sides and back of enclosure.

3.2 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. MUTOA shall not be used as a cross-connect point.
5. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
6. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
7. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
8. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
9. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
10. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
11. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.
12. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 60 inches (1524 mm) apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Group connecting hardware for cables into separate logical fields.

F. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-B for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.

2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (610 mm).

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.3 FIRESTOPPING

A. Comply with TIA-569-B, Annex A, "Firestopping."

B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.4 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Administration Class: Coordinate with owners IT department.
2. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.

B. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

C. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, terminal

hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by Owner.

D. Cable and Wire Identification:

1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

    a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
    b. Label each unit and field within distribution racks and frames.

4. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

E. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.

1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:

1. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

3. UTP Performance Tests:

    a. Test for each outlet and MUTOA. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:

        1) Wire map.
        2) Length (physical vs. electrical, and length requirements).
        3) Insertion loss.
        4) Near-end crosstalk (NEXT) loss.
        5) Power sum near-end crosstalk (PSNEXT) loss.
        6) Equal-level far-end crosstalk (ELFEXT).
        7) Power sum equal-level far-end crosstalk (PSELFEXT).
        8) Return loss.

9) Propagation delay.
10) Delay skew.

C. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

D. End-to-end cabling will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and keeping records of cabling assignments and revisions when extending wiring to establish new workstation outlets.

END OF SECTION 271500

SECTION 283111 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Heat detectors.
5. Notification appliances.
6. Remote annunciator.
7. Addressable interface device.
8. Digital alarm communicator transmitter.
9. Emergency Responder Radio Coverage Testing

1.2 SYSTEM DESCRIPTION

A. Noncoded, addressable system, with multiplexed signal transmission, dedicated to fire-alarm service only.

1.3 ACTION SUBMITTALS

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

B. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.

1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
2. Include voltage drop calculations for notification appliance circuits.
3. Include battery-size calculations.
4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
5. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.

C. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:

a. Trained and certified by manufacturer in fire-alarm system design.

b. NICET-certified fire-alarm technician, Level III minimum.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:

    a. Frequency of testing of installed components.
    b. Frequency of inspection of installed components.
    c. Requirements and recommendations related to results of maintenance.
    d. Manufacturer's user training manuals.

5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.6 EMERGENCY RESPONDER RADIO COVERAGE TESTING

A. Employ the services of Radio Communications Management, Inc. (207) 797-7503 for the following:

1. Perform signal strength measurements for City of Portland Fire Department.
2. Compile data and provide a report for submission to City of Portland Fire Department.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level II technician.

C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.8 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning with Substantial Completion, provide software support for two years.

C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. AMSECO - a Potter brand; Potter Electric Signal Company.
2. Bosch Security Systems.
3. Commercial Products Group/CPG Life Safety Signals.
4. Faraday; Siemens Building Technologies, Inc.
5. Federal Signal Corporation.
6. Fire Control Instruments, Inc.; a Honeywell company.
7. Fire Lite Alarms; a Honeywell company.
8. GAMEWELL; a Honeywell company.
9. GE Infrastructure; a unit of General Electric Company.
10. Gentex Corporation.
11. Harrington Signal, Inc.
12. NOTIFIER; a Honeywell company.
13. Siemens Building Technologies, Inc.; Fire Safety Division.
14. Silent Knight; a Honeywell company.
15. SimplexGrinnell LP; a Tyco International company.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.
5. Automatic sprinkler system water flow.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm-notification appliances.
2. Identify alarm at the fire-alarm control unit and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
5. Record events in the system memory.
6. Actuate Fire/Smoke Dampers associated with duct smoke detectors.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at fire-alarm control unit.
4. Ground or a single break in fire-alarm control unit internal circuits.
5. Abnormal ac voltage at fire-alarm control unit.
6. Break in standby battery circuitry.
7. Failure of battery charging.
8. Abnormal position of any switch at fire-alarm control unit or annunciator.

E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators.

2.3 FIRE-ALARM CONTROL UNIT

A. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.

a. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
b. Include a real-time clock for time annotation of events on the event recorder and printer.

2. Addressable control circuits for operation of mechanical equipment.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 3 line(s) of 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

C. Circuits:

1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class A.

a. Initiating Device Circuits: Style D.
b. Notification Appliance Circuits: Style Z.
c. Signaling Line Circuits: Style 6.
d. Install no more than 50 addressable devices on each signaling line circuit.

D. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

E. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, and supervisory signals shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

F. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries: Sealed lead calcium.

G. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.4 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key- or wrench-operated switch.

2.5 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be four-wire type.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.6 HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) or a rate of rise that exceeds 15 deg F (8 deg C) per minute unless otherwise indicated.

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.7 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.

B. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet (3 m) from the horn, using the coded signal prescribed in UL 464 test protocol.

C. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.

1. Rated Light Output:

a. 15/30/75/110 cd, selectable in the field.

2. Mounting: Wall mounted unless otherwise indicated.
3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
4. Flashing shall be in a temporal pattern, synchronized with other units.
5. Strobe Leads: Factory connected to screw terminals.
6. Mounting Faceplate: Factory finished, red.

2.8 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Flush cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.9 ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.

2.10 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture one telephone line and dial a preset number for a remote central station. When contact is made with central station, signals shall be transmitted. If service on line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply or loss of power.
5. Low battery.
6. Abnormal test signal.
7. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.

B. Install wall-mounted equipment, with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

C. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.

D. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

E. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

F. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

G. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.2 CONNECTIONS

A. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet (1 m) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Supervisory connections at valve supervisory switches.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.4 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.

    a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
    b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
5. Test visible appliances for the public operating mode according to manufacturer's written instructions.

6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

B. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

C. Fire-alarm system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

F. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

END OF SECTION 283111