

Project Manual

Carpenter Square

South 17th St. & Carpenter St.
Philadelphia, PA 19146

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For:

Carpenter Square, LP

Architect:

Johnson Stromberg Architecture
1745 South Street, 2nd Floor
Philadelphia, PA 19122

DOCUMENT 00 01 02

PROJECT TEAM

OWNER/CLIENT

Carpenter Square L.P.
350 Sentry Parkway
Building 630, Suite 300
Blue Bell, PA

David Mercuris
t. (610) 260-9600
e. dmercuris@goldenberggroup.com

Mark Scott
t. (609)468-2662
e. mrscottdev@gmail.com

CONSTRUCTION MANAGER

MR Scott Development LLC
1530 Christian Street
Philadelphia, PA 19146

Mark Scott
t. (609)468-2662
e. mrscottdev@gmail.com

ARCHITECTS

Johnston Stromberg Architecture, Inc.
1745 South Street, 2nd Floor
Philadelphia, PA. 19146

Christopher Stromberg, LEED AP
t. (215) 545-1177
e. christopher@johnstonstromberg.com

Brian Johnston, AIA, LEED AP
t. (215) 545-1177
e. brian@johnstonstromberg.com

STRUCTURAL ENGINEER

Larsen & Landis, Inc.
1400 N. American Street, Suite 205
Philadelphia, PA 19122

Eric Larsen, PE
t. (215) 232-7207
e. elarsen@LarsenLandis.com

MEP / FP ENGINEER

E&M Engineering Inc.
2773 Philmont Avenue
Huntington Valley, PA 19006

Caryn Helhowski, PE
t. (215) 947-4562
e. caryn@eandmeng.com

Jon Helhowski, PE
t. (215) 947-4562
e. caryn@eandmeng.com

LANDSCAPE ARCHITECT

Elise Geyelin, RLA
2025 Carpenter Street
Philadelphia, PA 19146

Elise Geyelin, RLA
t. (610) 306-6541
e. egeyelin@gmail.com

CIVIL ENGINEER

KS Engineers, P.C.
35 S. 3rd Street
Philadelphia, PA 19106

David Hassinger, Sr.
t. (215) 925-0430
e. dhassinger@kseng.com

Sean Skierski, P.E.
t. (215) 925-0430
e. sskierski@kseng.com

ENERGY CONSULTANT / ENGINEER

MaGrann Associates
701 East Gate Drive
Mount Laurel, NJ 08054

Jon Jensen
t. (856) 722-9799
e. jonjensen@magrann.com

LEED CONSULTANT

Solibs, LLC
1536 Montrose Street
Philadelphia, PA 19146
Emily Stromberg, LEED AP
t. (215)531.2060
e. Emily@solibs.com

TECHNICAL SUPPORT / SPECIFICATIONS

Conspectus, Inc.
2231 Route 50 / P.O. Box 248
Tuckahoe, NJ 08250

David Stutzman, AIA, CSI, CCS, SCIP, LEED AP
e. dstutzman@conspectusinc.com

Jay Bethel, CSI, CDT, SCIP
e. jbethel@conspectusinc.com
t. (609) 628-2390

END OF DOCUMENT

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END OF SECTION

SECTION 01 10 00

SUMMARY

PART 1 GENERAL

NOTE: The Summary description and Contract description do not portray the project accurately as written. As details of the phasing and inclusion of contracts is determined, the summary articles will be revised.

1.1 SUMMARY

- A. Section includes:
 - 1. Contract description.
 - 2. Work by Owner.
 - 3. Owner supplied products.
 - 4. Future work.

1.2 CONTRACT DESCRIPTION

- A. Work of the Project includes the construction of a new neighborhood development which will include eleven 4-story, 3 bedroom townhouses, two thousand square feet of commercial space at grade with six one and two bedroom condominiums on three floors above the commercial space. Townhouses will include two car parking in a partially enclosed carport. Townhouse parking will be served by a gated drive lane. The commercial space will be developed as core and shell space for future tenant fit out. The design includes a park area outside of the commercial space.
- B. Perform Work of Contract under a stipulated sum contract with the Owner in accordance with the Conditions of Contract.
- C. The type of Contract and number of contracts is yet to be determined, and the description of contracts will be revised when determined.

1.3 WORK BY OWNER

- A. The Owner will award contracts for supply and installation of various materials and systems, which Work may or may not coincide with the Project.
- B. Work under these contracts will include items in a list provided by Owner and Architect when determined.
- C. Items noted NIC (Not in Contract), will be furnished and installed by Owner at Owner's discretion.

1.4 FUTURE WORK

- A. Project is designed for future fit out of commercial space.

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 SUMMARY

- A. Section includes:
 - 1. Schedule of values.
 - 2. Applications for payment.
 - 3. Change procedures.
 - 4. Alternates.

1.2 SUBMITTALS

- A. Submit one PDF electronic file or three paper copies of each required submittal to Architect with a copy to the Owner.

1.3 SCHEDULE OF VALUES

- A. Submit completed schedule of values.
 - 1. Use AIA Form G703 - Application and Certificate for Payment Continuation Sheet, or other form acceptable to Architect containing same information.
 - 2. Contractor's standard form or electronic media printout will be considered.
- B. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- C. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the major specification Section.
- D. Include in each line item, the amount of Allowances specified in this section.
- E. Include Contractor's overhead and profit and separate line items for:
 - 1. Site mobilization,
- F. Revise schedule to list approved Change Orders, with each Application For Payment.

1.4 APPLICATIONS FOR PAYMENT

- A. Submit completed applications for payment.
 - 1. Use AIA Form G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheet, or other form acceptable to Architect containing same information.
- B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
- C. Submit an updated construction schedule with each Application for Payment.

- D. Payment Period: Submit at intervals stipulated in the Agreement.
- E. Submit waivers as identified in the Agreement.
- F. Substantiating Data: When Architect requires substantiating information, submit data justifying dollar amounts in question. Include the following with the application:
 - 1. Current construction photographs specified in Section 01 33 00.
 - 2. Partial release of liens from major subcontractors and vendors.
 - 3. Affidavits attesting to off-site stored products.
- G. Submit executive summary of progress since previous Application for Payment.
 - 1. Include summary bar graph construction schedule, reproductions of construction photographs, and other pertinent information for distribution to Board of Trustees.
 - 2. Coordinate content of report with Owner.

1.5 ALTERNATES

- A. Alternates quoted on Bid Forms 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 as required.
- C. Schedule of Alternates: Currently there are no Alternates being 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 SUMMARY

- A. Section includes:
 - 1. Coordination and project conditions.
 - 2. Field engineering.
 - 3. Preconstruction meeting.
 - 4. Site mobilization meeting.
 - 5. Progress meetings.
 - 6. Preinstallation meetings.
 - 7. Request for interpretation procedures.

1.2 SUBMITTALS

- A. Submit one PDF electronic file or three paper copies of each required submittal to Architect with a copy to the Owner.
- B. Submit with transmittal letter as specified for Submittals in Section 01 33 00.

1.3 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Coordinate work of this contract with work of separate contracts to ensure efficient use of space and efficient completion of all Owner's contracts.
- C. Coordinate required utility services and service connections with utility companies.
 - 1. Contact utility companies to arrange for installation of required services and service connections.
 - 2. Submit copy of correspondence with utility companies to Architect; include instructions received from utilities regarding installation requirements.
 - 3. Coordinate schedule with utility companies for work provided by utility.
- D. 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, such equipment.
- E. Coordinate space requirements, supports, and installation of mechanical and electrical Work which are 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.

- F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- G. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion.
- H. 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.

1.4 COORDINATION DOCUMENTS

- A. Prepare coordination drawings to organize installation of Kitchen, Mechanical, Plumbing, Fire Protection, and Electrical equipment and systems for efficient use of available space, for proper sequence of installation, and to identify potential conflicts.
- B. Show all systems for each area on single drawing. Indicate systems showing actual size including size transitions, proposed location, and elevation.
- C. Indicate clearances where systems cross structural framing.
- D. Identify electrical power characteristics and control wiring required for each item of equipment.
- E. Revise drawings as required to eliminate conflicts preventing completion of any element of the Work.
- F. Require each subcontractor with work indicated on coordination drawings to sign drawings indicating acceptance of assigned locations for work of each subcontractor.
- G. Maintain documents for the duration of the Work, recording changes due to site instructions, modifications or adjustments.
- H. After Architect review of original and revised documents, reproduce and distribute copies to concerned parties.

1.5 FIELD ENGINEERING

- A. Employ a Land Surveyor registered in the State of the Project and acceptable to Owner.
- B. Locate and protect survey control and reference points. Promptly notify Architect of any discrepancies discovered.
- C. Control datum for survey is shown on Drawings.
- D. Verify set-backs and easements; confirm drawing dimensions and elevations.
- E. Provide field engineering services. Establish elevations, lines, levels, and locations of the Work utilizing recognized engineering survey practices.

Architect: Will a final ALTA survey be required by the Owner or for filing with the local municipality?

- F. Prepare final Record Document site survey recording actual site conditions in accordance with Minimum Standard Detail Requirements and Classifications ALTA/ASCM Land Title Surveys published by American Land Title Association and American Congress on Surveying and Mapping.
- G. Maintain a complete and accurate log of control and survey work as it progresses.
- H. On completion of foundation walls and major site improvements, prepare a 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 the loss or destruction of any 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.

1.6 PRECONSTRUCTION MEETING

- A. Owner will schedule a meeting after Notice of Award.
- B. Attendance Required: Owner, Architect, and Contractor.
- C. Agenda:
 - 1. Execution of 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 the parties in Contract.
 - 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, and those affected by decisions made.

1.7 SITE MOBILIZATION MEETING

- A. Owner will schedule a meeting at the Project site prior to Contractor occupancy.
 - 1. At Owner's discretion, mobilization meeting may be combined with preconstruction meeting.
- B. Attendance Required: Owner, Architect, Special Consultants as required, Contractor, Contractor's Superintendent, and major Subcontractors.

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

- D. Record minutes and distribute copies within two days after meeting to participants, and those affected by decisions made.

1.8 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at bi-weekly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.
- C. Attendance Required: Job superintendent, major subcontractors and suppliers, as appropriate to agenda topics for each meeting.
 - 1. Owner will attend progress meetings at Owner's discretion.
 - 2. Architect will attend progress meetings as required by Owner-Architect agreement.
- D. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of Work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems which impede planned progress.
 - 5. Review questions about Contract Documents. Refer to RFI procedures in this section.
 - 6. Review of submittals schedule and status of submittals.
 - 7. Review of off-site fabrication and delivery schedules.
 - 8. Maintenance of progress schedule.
 - 9. Corrective measures to regain projected schedules.
 - 10. Planned progress during succeeding work period.
 - 11. Coordination of projected progress.
 - 12. Maintenance of quality and work standards.
 - 13. Effect of proposed changes on progress schedule and coordination.
 - 14. Other business relating to Work.
- E. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, and those affected by decisions made.

1.9 PREINSTALLATION MEETING

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
 - 1. Schedule meetings for times when Architect will normally be at the Project site, such as for regularly scheduled progress meetings.
- B. Require attendance of parties directly affecting, or affected by, Work of the specific section.
- C. Notify Architect five days in advance of meeting date.
- 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, and those affected by decisions made.

1.10 REQUEST FOR INTERPRETATION PROCEDURES

- A. Publish agenda prior to progress meetings, listing questions to be addressed, so Architect can be prepared to answer the questions.
- B. Present questions at regular project progress meeting.
- C. Architect will provide answers to questions at project progress meeting, wherever possible. Record answers in meeting minutes.
- D. When Architect cannot answer question at project progress meeting, prepare RFI on form attached to this section. Submit request to Architect with copy to Owner.
- E. Identify Drawing or Specification requiring clarification and describe condition requiring clarification.
 - 1. Drawings: Include drawing number, detail or section number, column line coordinates and other information to clearly identify area of drawing in question.
 - 2. Specification: Include section number, page number, and article, paragraph, and subparagraph number as appropriate.
- F. Architect will review RFI and respond in writing. When required, Architect may issue sketches and revised specifications to supplement response.

- G. Distribute Architect's response to those affected by response.
- H. Promptly enter information from response in Project Record Documents.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION



REQUEST FOR INTERPRETATION

Project: _____	R.F.I. Number: _____
_____	From: _____
To: _____	Date: _____
_____	A/E Project Number: _____
Re: _____	Contract For: _____

Specification Section: _____	Paragraph: _____	Drawing Reference: _____	Detail: _____
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Request:

Signed by: _____	Date: _____
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Response:

Attachments

Response From: _____	To: _____	Date Rec'd: _____	Date Ret'd: _____
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Signed by: _____	Date: _____
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Copies: Owner Consultants _____ _____ _____ _____ File

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Submittal procedures.
 - 2. Submittal processing.
 - 3. Construction progress schedules.
 - 4. Proposed products list.
 - 5. Product data.
 - 6. Shop drawings.
 - 7. Samples.
 - 8. Design data.
 - 9. Test reports.
 - 10. Certificates.
 - 11. Manufacturer's instructions.
 - 12. Manufacturer's field reports.

1.2 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Architect accepted form.
- B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- C. Identify Project, Contractor, subcontractor and supplier; pertinent drawing and detail number, and specification section number, as appropriate.
- 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 the requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite the Project. Coordinate submission of related items for delivery at the same time.
- F. Submit one PDF electronic file or three paper copies of each required submittal to Architect with a copy to the Owner.
 - 1. One PDF electronic file or one paper copy will be returned to Contractor.
 - 2. For physical samples, make submittal showing sample identification and image in addition to physical samples.
- G. Make submittals to parties as scheduled in this Section.
- H. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.

- I. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of the completed Work.
- J. Provide space for Contractor and Architect review stamps.
- K. When revised for resubmission, identify all changes made since previous submission.
- L. Distribute copies of reviewed submittals to affected parties. Instruct parties to promptly report any inability to comply with requirements.

1.3 SUBMITTAL PROCESSING

- A. Allow two weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Architect will promptly notify the Contractor when a submittal being processed must be delayed for coordination.
- B. When an intermediate submittal is necessary, process the same as the initial submittal.
- C. Allow two weeks for processing each re-submittal.
- D. No extension of Contract Time will be permitted because of failure to transmit submittals to Architect sufficiently in advance of the Work to permit processing.

1.4 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial schedules within 15 days after date of Owner-Contractor Agreement. After review, resubmit required revised data within ten days.
- B. Distribute copies of reviewed schedules to Project site file, subcontractors, suppliers, and other affected parties.
- C. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.
- D. Submit a horizontal bar chart with separate line for each major portion of Work or operation, identifying first work day of each week.
 - 1. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities.
- E. 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. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect including the effect of changes on schedules of separate contractors.

1.5 PROPOSED PRODUCTS LIST

- A. Within 15 days after date of Owner-Contractor Agreement, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. When proposed products are one of the products specified by manufacturer, and model number, additional submittals for that product are not required except as follows:
 - 1. Shop drawings are required for products specially fabricated to size or configuration to comply with project conditions.
 - 2. Samples are required for products where color, texture, finish, pattern and other selections must be made.
 - 3. Manufacturer's Installation Instructions are required for products where specified.
- C. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.6 PRODUCT DATA

- A. Product Data: Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- B. Submit product data in quantities as scheduled in this Section. Two copies will be retained by Architect.
- 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. Material Safety Data Sheets (MSDS) are not permitted as submittal in lieu of required product information.
 - 1. When requested by Owner, submit MSDS directly to Owner.
- F. After review provide and distribute copies in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01 70 00.

1.7 SHOP DRAWINGS

- A. Shop Drawings: Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.
- B. 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.
- C. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. Submit shop drawings in the form and quantities as scheduled in this Section. One copy will be returned.
- E. After review provide and distribute copies in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01 70 00.

1.8 SAMPLES

- A. Samples: Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.
- B. Samples For Selection as Specified in Product Sections:
 1. Submit to Architect for aesthetic, color, or finish selection.
 2. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for Architect selection. Include custom colors and other Product characteristics where specified.
 3. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents purposes described in Section 01 70 00.
- C. Submit samples to illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work where aesthetic selections are required so related samples are submitted at same time.
- D. Include identification on each sample, with full Project information.
- E. Submit the number of samples specified in individual specification sections; one of which will be retained by Architect.
- F. Reviewed samples which may be used in the Work are indicated in individual specification sections.

1.9 DESIGN DATA

- A. Submit for the Architect's knowledge as contract administrator or for the Owner in quantities as scheduled in this Section.
- B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

1.10 TEST REPORTS

- A. Submit for the Architect's knowledge as contract administrator or for the Owner in quantities as scheduled in this Section.
- B. Submit test reports for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

1.11 CERTIFICATES

- A. When specified in individual specification sections, submit certification by the manufacturer, installation/application subcontractor, or the Contractor to Architect, in quantities as scheduled in this Section.
- 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.

1.12 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 as scheduled in this Section.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.13 MANUFACTURER'S FIELD REPORTS

- A. Submit reports for the Architect's benefit as contract administrator or for the Owner in quantities as scheduled in this Section.
- B. Submit report within 5 days of observation to Architect for information.
- C. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Quality control and control of installation.
 - 2. Tolerances
 - 3. Manufacturers' field services.
 - 4. Examination.
 - 5. 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 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 that field measurements are as indicated on shop drawings or as instructed by the 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 before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 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 as applicable, instruct owner's personnel in operation and maintenance, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- C. Submit report of field services within 5 days of observation. 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 that substrate surfaces of work in place are acceptable for subsequent Work.
- B. Verify that substrates of work in place are capable of structural support and attachment of new Work.
- C. Verify tolerances of work in place for plumb, level, plane, and line are acceptable for installation of new Work.
- D. Examine and verify specific substrate and environmental requirements of individual specification sections are met before installing and applying new Work of each specification section.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Notify Architect in writing when unsatisfactory work in place will prevent application and installation of subsequent construction in accordance with Contract Documents.
- G. Correct unsatisfactory work in place before continuing with subsequent work.
- H. Beginning new Work constitutes acceptance of work in place.

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 any new material or substance in contact or bond.

END OF SECTION

SECTION 01 43 35

EXTERIOR WALL MOCKUPS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Exterior wall mockup:
 - a. The mock up serves as a basis for the quality and workmanship of the exterior wall construction and built to represent the Contractor's understanding of the detail level of quality outlined in the Contract Documents.
 - b. Refer to Drawings for mockup extent and location.

1.2 SUBMITTALS

- A. Section 013300 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawing: Submit drawing indicating layout and location of mockup.
- C. Submit shop drawings, product data, certificates and other items required by individual specification sections for Products incorporated into mockup.
- D. Provide description of products incorporated into mockup that are not included in Contract Documents.

1.3 SEQUENCE

- A. Complete submittal process and obtain approvals for mockup products prior to installation of materials.
- B. Coordinate submittals for products requiring color selection so Architect has all color samples at same time.

1.4 MOCKUP INSPECTION

- A. Architect and Owner will inspect mockup during construction and upon completion.
- B. Promptly make changes requested by Architect or Owner.
- C. Accepted mockups are representative of the quality required for the Work.
- D. Revisions resulting from mockup construction will be documented by the Architect as Changes to the Contract Documents.

PART 2 PRODUCTS

2.1 MOCKUP

- A. Products: As specified in other sections of Project Manual.

2.2 MOCKUP REQUIREMENTS

- A. Assemble and erect specified items at the site as required by individual specifications sections for review.
- B. Accepted mock-ups are representative of the quality required for the Work.
- C. Provide the following for exterior wall mockup:
 - 1. Sheet waterproofing.
 - 2. Stud wall framing.
 - 3. Exterior sheathing system.
 - 4. Minimum one window and frame.
 - 5. Vapor retarders.
 - 6. Drainage plane membrane system.
 - 7. Associated flashings.
 - 8. Joint sealers.
 - 9. Fireproofing.
 - 10. Firestopping.
 - 11. Face brick.
 - 12. Cast Stone Masonry.
 - 13. Fiber cement panels and fiber cement siding.
 - 14. Metal wall panels.
 - 15. Metal fabrications and trims.
 - 16. Stucco.
 - 17. Modified bituminous membrane roofing.
 - 18. Paints and coatings.
 - 19. Rainscreen System.
- D. Where mock-up is specified in individual Sections to be removed, clear area when directed by Architect.

2.3 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, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- C. Submit report of field services within 5 days of observation.

PART 3 EXECUTION

3.1 LOCATION

- A. Construction mockups will be located on site in locations designated by Owner.

3.2 MOCKUP

- A. Construct mockups of exterior walls sections. Coordinate extent of required mockup with Owner.
- B. Materials and accessories to be included in mockup to be provided by Contractor.
- C. Incorporate all materials that will be exposed to view in final construction. Concealed utilities and services are required as part of mockup to establish clearances required and to verify wall requirements to conceal services.

3.3 MAINTENANCE AND REMOVAL

- A. Maintain mockup until directed by Architect.
- B. Remove mockup in accordance with Section 017000 when directed by Architect.

END OF SECTION

SECTION 014335

EXTERIOR WALL MOCKUP

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Exterior wall mockup:
 - a. The mock up serves as a basis for the quality and workmanship of the exterior wall construction and built to represent the Contractor's understanding of the detail level of quality outlined in the Contract Documents.
 - b. Refer to Drawings for mockup extent and location.
 - c. Approved mockups may remain as part of the Work unless designated for removal in individual specification sections.

1.2 SUBMITTALS

- A. Section 013300 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawing: Submit drawing indicating layout and location of mockup.
- C. Submit shop drawings, product data, certificates and other items required by individual specification sections for Products incorporated into mockup.
- D. Provide description of products incorporated into mockup that are not included in Contract Documents.

1.3 SEQUENCE

- A. Complete submittal process and obtain approvals for mockup products prior to installation of materials.
- B. Coordinate submittals for products requiring color selection so Architect has all color samples at same time.

1.4 MOCKUP INSPECTION

- A. Architect and Owner will inspect mockup during construction and upon completion.
- B. Promptly make changes requested by Architect or Owner.
- C. Accepted mockups are representative of the quality required for the Work.
- D. Revisions resulting from mockup construction will be documented by the Architect as Changes to the Contract Documents.

PART 2 PRODUCTS

2.1 MOCKUP

- A. Products: As specified in other sections of Project Manual.

2.2 MOCKUP REQUIREMENTS

- A. Assemble and erect specified items at the site as required by individual specifications sections for review.
- B. Accepted mock-ups are representative of the quality required for the Work.
- C. Provide the following for exterior wall mockup:
 - 1. CMU structural backup wall.
 - 2. Sheet waterproofing.
 - 3. Stud wall framing.
 - 4. Exterior sheathing system.
 - 5. Minimum one window and door and door frame.
 - 6. Storefront.
 - 7. Vapor retarders.
 - 8. Drainage plane membrane system.
 - 9. Associated flashings.
 - 10. Joint sealers.
 - 11. Fireproofing.
 - 12. Firestopping.
 - 13. Face brick.
 - 14. Cast Stone Masonry.
 - 15. Fiber cement panels and fiber cement siding.
 - 16. Metal wall panels.
 - 17. Metal fabrications and trims.
 - 18. Stucco.
 - 19. Modified bituminous membrane roofing.
 - 20. Paints and coatings.
- D. Where mock-up is specified in individual Sections to be removed, clear area when directed by Architect.

2.3 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, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- C. Submit report of field services within 5 days of observation.

PART 3 EXECUTION

3.1 LOCATION

- A. Construction mockups will be located on site in locations designated by Owner.

3.2 MOCKUP

- A. Construct mockup of exterior wall. Coordinate extent of required mockup with Owner.
- B. Materials and accessories to be included in mockup to be provided by Contractor.
- C. Incorporate all materials that will be exposed to view in final construction. Concealed utilities and services are required as part of mockup to establish clearances required and to verify wall requirements to conceal services.

3.3 MAINTENANCE AND REMOVAL

- A. Maintain mockup until directed by Architect.
- B. Remove mockup in accordance with Section 017000 when directed by Architect.

END OF SECTION

SECTION 01 45 23

TESTING AND INSPECTING SERVICES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Selection and payment.
 - 2. Laboratory responsibilities.
 - 3. Laboratory reports.
 - 4. Limits on testing laboratory authority.
 - 5. Contractor responsibilities.

1.2 SELECTION AND PAYMENT

- A. Owner will employ and pay for services of an independent testing laboratory to perform specified inspecting and testing, at Owner's discretion as scheduled in this section.
- B. Employ and pay for services of an independent testing agency or laboratory acceptable to the Owner to perform specified testing as scheduled in this section.
 - 1. Employment of testing laboratory does not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

1.3 QUALITY ASSURANCE

- A. Comply with requirements of ASTM C802, ASTM C1021, ASTM C1077, ASTM C1093, ASTM D3740, ASTM D4561, ASTM E329, ASTM E543, and ASTM E699.
- B. Laboratory: Authorized to operate in State in which Project is located.
- C. Laboratory Staff: Maintain a full time registered engineer on staff to review services.
- D. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to either National Institute of Standards and Technology or accepted values of natural physical constants.

1.4 CONTRACTOR SUBMITTALS

- A. Prior to start of Work, submit testing laboratory name, address, and telephone number, and names of full time registered Engineer and responsible officer.
- B. Submit copy of report of laboratory facilities inspection made by Materials Reference Laboratory of National Institute of Standards and Technology during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

1.5 LABORATORY RESPONSIBILITIES

- A. The independent firm will perform tests, inspections and other services specified in individual specification sections.
 - 1. Perform additional inspections and tests required by Owner or Architect.
- B. Testing, inspections and source quality control may occur on or off the project site. Perform off-site testing as required by the Architect or the Owner.
- C. Test samples of mixes submitted by Contractor.
- D. Provide qualified personnel at site. Cooperate with Owner and Contractor in performance of services.
- E. Perform specified inspection, sampling, and testing of Products in accordance with specified standards.
- F. Ascertain compliance of materials and mixes with requirements of Contract Documents.
- G. Promptly notify Owner, Architect and Contractor of observed irregularities or non-conformance of Work or Products.
- H. Attend preconstruction conferences and progress meetings as requested.

1.6 LABORATORY REPORTS

- A. After each inspection and test, promptly submit copies of laboratory report to the following:
 - 1. Architect, two copies.
 - 2. Owner, one copy.
 - 3. Contractor, two copies.
 - 4. Local authority having jurisdiction, one copy.
- B. Include:
 - 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 the Project.
 - 7. Type of inspection or test.
 - 8. Date of test.
 - 9. Results of tests.
 - 10. Conformance with Contract Documents.
- C. When requested by Owner or Architect, provide interpretation of test results.

1.7 LIMITS ON TESTING LABORATORY AUTHORITY

- A. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.

- B. Laboratory may not approve or accept any portion of the Work.
- C. Laboratory may not assume any duties of Contractor.
- D. Laboratory has no authority to stop the Work.

1.8 CONTRACTOR RESPONSIBILITIES

- A. Deliver to laboratory at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs.
- B. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
- C. Provide incidental labor and facilities to provide access to Work to be tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, storage and curing of test samples.
- D. Notify laboratory 24 hours prior to expected time for operations requiring inspection and testing services. Coordinate schedule with laboratory to ensure testing and inspection personnel are available at the site when required by Work in progress.
- E. Arrange with laboratory and pay for additional samples and tests required by Contractor beyond specified requirements.
- F. When initial tests indicate Work is defective, provide and pay for additional inspections and tests required to confirm corrected Work conforms to Contract Documents.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 TESTING AND INSPECTION SCHEDULE

- A. Owner's Testing Laboratory will perform the following tests and inspections as specified in other Sections.
 - 1. Soils: Compaction density, moisture content.
 - 2. Concrete: Mix design, compressive strength, slump, air entrainment, reinforcement placement.
 - 3. Masonry: Mortar strength, masonry unit strength, masonry prism strength, reinforcement placement.
 - 4. Structural Steel: Field connections, shop connections.
 - 5. Fireproofing thickness, density, bond strength.
- B. Contractor shall provide and pay for other specified and code required tests and inspections.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Temporary Utilities.
 - 2. Construction Facilities.
 - 3. Temporary Controls.
 - 4. 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. Exercise measures to conserve energy.
- C. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.
- D. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.3 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain lighting for construction operations to achieve a minimum 10 footcandle illuminance.
- B. Provide and maintain 5 footcandle illuminance to exterior staging and storage areas and entire site after dark for security purposes.
- C. Provide and maintain 2 footcandle illuminance to interior work areas after dark for security purposes.
- D. Provide local lighting as required to meet construction needs.
- E. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required to meet construction needs.
- F. Maintain lighting and provide routine repairs.
- G. Permanent building lighting may be utilized during construction.

1.4 TEMPORARY HEATING AND COOLING

- A. Provide and pay for heating and cooling devices. Heat and cool as needed to maintain specified conditions for construction operations.
- B. Exercise measures to conserve energy.
- C. Prior to operation of permanent equipment for temporary heating or cooling purposes, verify that 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.
- D. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in product sections.
- E. When specified in other sections, maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress.
- F. When specified in other sections, operate heating and cooling system to maintain interior temperature and relative humidity design conditions required for completed construction.

1.5 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. Provide temporary fan units as required to maintain clean air for construction operations.

1.6 COMMUNICATIONS SERVICE

- A. Provide, maintain and pay for the following services to Contractor's field office at time of project mobilization.
 - 1. Telephone service.
 - 2. Facsimile service with dedicated telephone line.
 - 3. DSL or other broadband internet service with email capability.

1.7 TEMPORARY WATER SERVICE

- A. Provide, maintain and pay for suitable quality water service required for construction operations.
- B. Exercise measures to conserve water.
- C. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation and heat trace as required to prevent freezing.

1.8 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures at time of mobilization.

- B. Use of permanent facilities during construction is not permitted.

1.9 FIELD OFFICES AND SHEDS

- A. Office: Weather tight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture drawing rack, and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 10 persons.
- C. When permanent facilities are enclosed with operable utilities, relocate offices and storage into building, with written agreement of Owner, and remove temporary buildings.
- D. 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.
- E. Preparation: Fill and grade sites for temporary structures to provide drainage away from buildings.
- F. Installation:
 - 1. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.
 - 2. Parking: Two hard surfaced parking spaces for use by the Owner and Architect, connected to office by hard surfaced walk.
 - 3. Employee Residential Occupancy: Not allowed on Owner's property.
- G. Maintenance And Cleaning:
 - 1. Maintain approach walks free of mud, water, and snow.

1.10 VEHICULAR ACCESS

- A. Use existing public rights-of-way and designated on-site roadways to access construction areas.
- B. Provide unimpeded access for emergency vehicles.
 - 1. Maintain 20 foot width driveways with turning space between and around combustible materials.
- C. Provide and maintain access to fire hydrants free of obstructions.

Architect: What are Contractor requirements for parking?

1.11 PARKING

- A. Provide temporary gravel surface parking areas to accommodate construction personnel as possible on site.
- B. Locate as approved by Architect.
- C. When site space is not adequate, provide additional off-site parking.

- D. Use of designated existing on-site streets and driveways for construction traffic is permitted. Tracked vehicles not allowed on paved areas.
- E. Do not allow heavy vehicles or construction equipment in parking areas.
- F. Permanent Pavements and Parking Facilities:
 - 1. Prior to Substantial Completion the base for permanent roads and parking areas may be used for construction traffic.
 - 2. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.
- G. Maintenance:
 - 1. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.
 - 2. Maintain 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.

1.12 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a 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 the space.
- C. Keep streets and sidewalks clear of construction materials and waste in accordance with City codes and ordinances.
- D. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- E. Collect and remove waste materials, debris, and rubbish from site minimum weekly and legally dispose off-site.
- F. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

Architect: Project presumably have sign ID requirements. Please provide.

1.13 PROJECT IDENTIFICATION

- A. Project Identification Sign:
 - 1. One painted sign of construction, design, and content shown on Drawings, location designated.
- B. Project Informational Signs:
 - 1. Painted informational signs of same colors and lettering as Project Identification sign, or standard products; size lettering to provide legibility at 100 foot distance.
 - 2. Provide at each field office, storage shed, and directional signs to direct traffic into and within site. Relocate as Work progress requires.

- 3. No other signs are allowed without Owner permission except those required by law.
- C. Design sign and structure to withstand 60 miles/hr wind velocity.
- D. Sign Painter: Experienced as a professional sign painter for minimum three years.
- E. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

Architect: Please provide sign information (requirements, materials, etc.)

- F. Sign Materials:
- G. Installation:
 - 1. Install project identification sign within 15 days after date fixed by Notice to Proceed.
 - 2. Erect at designated location.
 - 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. No other signs are allowed without Owner permission except those required by law.
- I. Maintenance: Maintain signs and supports clean, repair deterioration and damage.

1.14 TRAFFIC REGULATION

- A. Maintain pedestrian traffic on sidewalks. Provide barriers as specified in this section.
- B. Obtain required permits for street, and sidewalk closures when required to accommodate construction operations.
- C. Signs, Signals, And Devices: As required by local jurisdictions.
- D. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.
- E. Haul Routes:
 - 1. Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.

1.15 FIRE PREVENTION FACILITIES

- A. Prohibit smoking within buildings under construction. Designate area on site where smoking is permitted. Provide approved ashtrays in designated smoking areas.
- 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 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.
 - 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.

1.16 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Protect existing facilities and finishes outside Project area subject to construction traffic and construction operations necessary to complete the Work. Repair damage to existing facilities and finishes.
- C. Provide barricades and covered walkways required by governing authorities for public rights-of-way.
- D. Sidewalk Bridging:
 - 1. Provide prefabricated metal framed sidewalk bridging with timber roofs, water tight, barrier at both street and building side; and have enclosed all weather fluorescent lighting.
 - 2. Maintain sidewalk bridge from the start-up of construction until all exterior and roof work is complete or when removal is permitted by the authorities having jurisdiction.
- E. Provide protection for plants designated to remain. Replace damaged plants.
- F. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.17 ENCLOSURES AND FENCING

- A. Fencing: Commercial grade chain link fence.
 - 1. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.
- B. 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.

1.18 SECURITY

- A. Security Program:
 - 1. Protect Work from theft, vandalism, and unauthorized entry.

2. Initiate security program acceptable to Owner at project mobilization.
 3. Maintain program throughout construction period until Owner occupancy.
- B. Entry Control:
1. Restrict entrance of persons and vehicles into Project site.
 2. Allow entrance only to authorized persons with proper identification.
 3. Maintain log of workers and visitors, make available to Owner on request.

Architect: Will this level of worker ID be required?

- C. Personnel Identification:
1. Provide identification badge to each person authorized to enter premises.
 2. Badge To Include: Personal photograph, name and employer.
 3. Maintain a list of accredited persons, submit copy to Owner on request.
 4. Require return of badges at expiration of their employment on the Work.
- D. Restrictions:
1. Do not allow cameras on site or photographs taken except by written approval of Owner.
 2. Do no work on Sundays. or days indicated in Owner-Contractor Agreement.

1.19 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.

1.20 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.

1.21 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 amount of bare soil exposed at one time.
- C. Provide temporary measures such as berms, dikes, and drains, 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.

1.22 NOISE CONTROL

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

1.23 PEST CONTROL

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

1.24 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.

1.25 RODENT CONTROL

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

1.26 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary facilities and controls, except those required for the field offices and sheds prior to Substantial Completion.
- B. Remove remaining temporary facilities and controls prior to Final Application for Payment inspection.
- C. Remove temporary signs, framing, supports, and foundations.
- D. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- E. Clean and repair damage caused by installation or use of temporary work.
- F. Restore existing facilities used during construction to original condition.
- G. Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - Not Used.

PART 3 EXECUTION - Not Used.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Products.
 - 2. Product delivery requirements.
 - 3. Product storage and handling requirements.
 - 4. Product options.
 - 5. Product substitution procedures.

1.2 PRODUCTS

- A. Provide products of qualified manufacturers suitable for intended use. Provide products of each type by a single manufacturer unless specified otherwise.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- C. Provide interchangeable components of the same manufacturer for components being replaced.

1.3 PRODUCT DELIVERY REQUIREMENTS

- A. Package product for protection during shipment, handling, and storage. Protect sensitive equipment and finishes against impact, abrasion, and other damage.
- B. Transport and handle products in accordance with manufacturer's instructions.
- C. Arrange deliveries of products in accordance with Project schedule. Allow time for inspection prior to installation.
- D. Coordinate deliveries to avoid conflict with Work and conditions at site; limitations on storage space; availability of personnel and handling equipment; and Owner's use of premises.
- E. Deliver products in undamaged, dry condition, in original unopened containers or packaging with identifying labels intact and legible.
- F. Clearly mark partial deliveries of component parts of equipment to identify equipment and contents to permit easy accumulation of parts and to facilitate assembly.
- G. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

- H. 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 bonded off-site storage and protection when site does not permit on-site storage or protection.
- 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 a 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 a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with the following article.

1.6 PRODUCT SUBSTITUTION PROCEDURES

- A. Architect will consider requests for Substitutions only within 30 days after date established in Notice to Proceed.
- B. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.

- C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- D. A request constitutes a representation that the Contractor:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 - 2. Will provide the same warranty for the Substitution as for the 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.
- E. Substitutions will not be considered:
 - 1. When they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request.
 - 2. When acceptance will require revision to the Contract Documents.
 - 3. Without a net reduction in Contract Sum or a reduction in Contract time.
 - 4. When request is from a source other than Contractor.
- F. Substitution Submittal Procedure:
 - 1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
 - 2. Complete Substitution Request form attached to this section for each substitution request.
 - 3. Indicate net reduction in Contract Sum or reduction in Contract time, if proposed substitution is accepted.
 - 4. Submit side-by-side comparison of features of specified Product and proposed substitution.
 - 5. Burden of proof that proposed substitution is equivalent to specified Product is on proposer.
 - 6. Submit Shop Drawings, Product Data, and certified test results attesting to the proposed product equivalence.
 - 7. Architect will notify Contractor and Owner of estimated costs and time to evaluate proposed substitution.
 - 8. Contractor will notify Architect to proceed with review or to return proposed substitution request without action. By requesting Architect to complete the review, Contractor agrees to reimburse Architect for actual costs incurred to complete the review.
 - 9. The Architect will notify Contractor in writing of decision to accept or reject request.
 - 10. Architect will consider only one request for substitution for each product. If request is not accepted, provide specified product.

PART 2 PRODUCTS - Not Used.

PART 3 EXECUTION - Not Used.

END OF SECTION



SUBSTITUTION REQUEST (After the Bidding Phase)

Project: _____ Substitution Request Number: _____

 From: _____
 To: _____ Date: _____

 A/E Project Number: _____
 Re: _____ Contract For: _____

Specification Title: _____ Description: _____
 Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____
 Manufacturer: _____ Address: _____ Phone: _____
 Trade Name: _____ Model No.: _____
 Installer: _____ Address: _____ Phone: _____
 History: New product 2-5 years old 5-10 yrs old More than 10 years old
 Differences between proposed substitution and specified product: _____

Point-by-point comparative data attached - REQUIRED BY A/E

Reason for not providing specified item: _____

Similar Installation:

Project: _____ Architect: _____
 Address: _____ Owner: _____
 _____ Date Installed: _____

Proposed substitution affects other parts of Work: No Yes; explain _____

Savings to Owner for accepting substitution: _____ (\$ _____).
 Proposed substitution changes Contract Time: No Yes [Add] [Deduct] _____ days.

Supporting Data Attached: Drawings Product Data Samples Tests Reports _____

SUBSTITUTION REQUEST (Continued)

The Undersigned certifies:

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

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

Attachments: _____

A/E's REVIEW AND ACTION

- Substitution approved - Make submittals in accordance with Specification Section 01330.
- Substitution approved as noted - Make submittals in accordance with Specification Section 01330.
- Substitution rejected - Use specified materials.
- Substitution Request received too late - Use specified materials.

Signed by:

Date:

Additional Comments: Contractor Subcontractor Supplier Manufacturer A/E _____

SECTION 01 70 00

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Closeout procedures.
 - 2. Final cleaning.
 - 3. Protecting installed construction.
 - 4. Project record documents.
 - 5. Spare parts and maintenance products.
 - 6. Product warranties and product bonds.
 - 7. 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's review.
- B. Provide submittals to Architect that are required by governing or other authorities.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- D. Owner will occupy the Project at Substantial Completion.

1.3 FINAL CLEANING

- A. Clean building and site areas affected by construction operations.
- 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 a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- D. Clean permanent and replace disposable filters of operating equipment used during progress of work.
- 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 the site.

1.4 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. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- F. Prohibit traffic from landscaped areas.

1.5 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.
 - 7. Requests for interpretation.
- 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. Allow inspection by Architect or Owner upon request to verify documents are current and accurately reflect the Work.
- 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 and 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 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. Requests for Interpretation (RFI): Record Architect's responses on Record Drawings and in Specifications as appropriate to suit response.
- H. Submit documents to Architect with claim for final Application for Payment.

1.6 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Provide spare parts, maintenance, and extra products in quantities specified in individual specification sections.
- B. Deliver to Project site and place in location as directed; obtain receipt prior to final payment.

1.7 PRODUCT WARRANTIES AND PRODUCT BONDS

- A. Obtain warranties and bonds executed in triplicate by responsible subcontractors, suppliers, and manufacturers.
- B. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers.
- C. Verify that documents are in proper form, contain full information, and are notarized.
- D. Co-execute submittals when required.
- E. Provide Table of Contents and assemble in three D side ring binder with durable cover.
- F. Submit warranties and bonds prior to final Application for Payment.

PART 2 PRODUCTS - Not Used.

PART 3 EXECUTION - Not Used.

END OF SECTION

SECTION 01 73 29
CUTTING AND PATCHING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Requirements and limitations for cutting and patching of Work.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Submit written request in advance of cutting or alteration which affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate contractor.
 - 6. Continuous operation of utilities, building services, fire suppression, fire alarm, or security system.
- C. Include in request:
 - 1. Identification of Project.
 - 2. Location and description of affected Work.
 - 3. Necessity for cutting or alteration.
 - 4. Description of proposed Work, and Products to be used.
 - 5. Alternatives to cutting and patching.
 - 6. Effect on work of Owner or separate contractor.
 - 7. Written permission of affected separate contractor.
 - 8. Date and time work will be executed.

1.3 WARRANTY

- A. Perform cutting and patching in a manner to preserve conditions suitable for executing specified warranties and maintaining previously issued warranties for the Work.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Primary Products: Those required for original installation.
- B. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.
- B. After uncovering existing Work, assess conditions affecting performance of work.
- C. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

- A. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
- B. Provide protection from elements for areas which may be exposed by uncovering work.
- C. Maintain excavations free of water.

3.3 CUTTING

- A. Execute work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- B. Identify hazardous substances or conditions exposed during the Work to the Architect for decision or remedy.
- C. Execute cutting and fitting to complete the Work.
- D. Uncover work to install improperly sequenced work.
- E. Remove and replace defective or non-conforming work.
- F. Remove samples of installed work for testing when requested.
- G. Provide openings in the Work for penetration of mechanical and electrical work.
- H. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight-exposed surfaces.
- I. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

3.4 PATCHING

- A. Execute patching to complement adjacent Work.
- B. Fit Products together to integrate with other Work.

- C. Employ original installer to perform patching for weather exposed and moisture resistant elements, and sight-exposed surfaces.
- D. Restore Work with new Products in accordance with requirements of Contract Documents.
- E. Fit Work to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- F. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids in accordance with Section 07 84 00.
- G. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Construction waste management plan.
 - 2. Construction waste recycling.
 - 3. Construction waste adaptive reuse.

1.2 CONSTRUCTION WASTE MANAGEMENT PLAN REQUIREMENTS

- A. Develop and implement construction waste management plan in accordance with ASTM E1609 and as approved by Owner for compliance with the following:
 - 1. USGBC LEED-H (LEED for Homes) and LEED-ND (LEED Neighborhood Development).
 - 2. Refer to Section 018113 "Sustainable Project Requirements".
- B. Intent:
 - 1. Divert construction, demolition, and land clearing debris from landfill disposal.
 - 2. Redirect recyclable material back to manufacturing process.
 - 3. Generate cost savings or increase minimal additional cost to Project for waste disposal.

1.3 DEFINITIONS

- A. Beneficial use: To sort, separate, process, treat or reconstitute solid waste and other discarded materials for the purpose of use in a new application where it is of benefit.
- B. Clean: Untreated and unpainted, not contaminated with oils, solvents, caulk or the like.
- C. Construction and demolition waste: Solid waste typically including building materials, packaging, trash debris and rubble resulting from construction related trash, remodeling repair and demolition operations. Hazardous materials are not included.
- D. Construction Waste Management Plan: A project related plan for the collection, transportation and disposal of waste generated at the construction site. The purpose of the plan is to ultimately reduce the amount of material becoming landfill.
- E. Contamination: Placement of material into a container or other receptacle that was not designated for that material.
- F. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycled, reuse or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

- G. Diversion from landfill: To remove, or have removed, from the site for recycling, reuse or salvage material that might be sent to a landfill. Diversion from landfill does not include burning, incinerating or thermally destroying waste.
- H. Hazardous: Exhibiting the characteristics of hazardous substances, i.e. ignitability, corrosiveness, toxicity or reactivity.
- I. Recyclable: The ability of a product to be recovered at the end of its life cycle and remanufactured into a new product.
- J. Recycle: To sort, separate, process, treat or reconstitute solid waste and other discarded materials for the purpose of redirecting such materials into the manufacture of useful products. Recycling does not include burning, incinerating or thermally destroying waste.
- K. Return: To give back reusable items or unused products to vendors.
- L. Reuse: To reuse excess or discarded construction material in some manner on the project site.
- M. Salvage: To remove a waste material from the project site for resale or reuse.
- N. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- O. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- P. Trash: Any product or material unable to be reused, returned, recycled or salvaged.
- Q. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste can include salvageable, returnable, recyclable, reusable and trash materials.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Construction Waste Management Plan: Submit construction waste management plan within 30 days of notice to proceed, or prior to any waste removal, describing methods and procedures for implementation and monitoring compliance including the following:
 - 1. Transportation company hauling construction waste to waste processing facilities.
 - 2. Recycling and adaptive reuse processing facilities and waste type each facility will accept.
 - 3. Construction waste materials anticipated for recycling and adaptive reuse.
 - 4. On site sorting and site storage methods.
 - 5. Proposed alternatives to landfills.
 - 6. Government Contacts: Maintain contact information for local agencies that regulate and manage waste and recyclables.
 - 7. Material handling procedures for each type of waste for recycling.
- C. Submit documentation with each application for payment substantiating construction waste management plan was maintained and goals are being achieved.

1. Trash: Quantity by weight deposited in landfills. Include associated fees, transportation costs, container rentals, and taxes for total cost of disposal.
2. Salvaged Material: Quantity by weight with destination for each type of material salvaged for resale, recycling, or adaptive reuse. Include associated fees, transportation costs, container rentals, and taxes for total cost of disposal. Also include reimbursements due to salvage resale.
3. Total Cost: Indicate total cost or savings for implementation of construction waste management plan.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Submit completed required USGBC LEED Letter Template indicating diverted waste quantity, total waste quantity and percentage of waste diverted from landfills.

1.6 CONSTRUCTION WASTE MANAGEMENT PLAN

- A. Construction Waste Landfill Diversion: Minimum 75 percent by weight of construction waste materials for duration of Project through resale, recycling, or adaptive reuse.
- B. Implement construction waste management plan at start of construction.
- C. Review construction waste management plan at pre-construction meeting and progress meetings specified in Section 01 30 00.
- D. Distribute approved construction waste management plan to subcontractors and others affected by Plan Requirements.
- E. Oversee plan implementation, instruct construction personnel for plan compliance, and document plan results, including reports.

1.7 SUBCONTRACTOR REQUIREMENTS

- A. Recycling requirements shall be incorporated into all subcontractor contracts. Subcontractor contracts should require compliance with the CWM Plan. Subcontractors must not contaminate recycling containers by placing incorrect materials in a container designated for a specific recyclable material. Subcontractors must not place recyclable materials in a container designated for trash. Non-compliance with the waste management plan will be penalized. A subcontractor who contaminates a container designated for recycling, or places a recyclable material in a trash container is responsible for removing the incorrect materials or will be billed for the cost of removal and/or disposal.
- B. Purchase Products to prevent waste by:
 1. Ensuring correct quantity of each material is delivered to site.
 2. Choosing products with minimal or no packaging.
 3. Requiring suppliers to use returnable pallets or containers.
 4. Requiring suppliers to take or buy-back rejected or unused items.

1.8 CONSTRUCTION WASTE RECYCLING

- A. Use source separation method or co-mingling method suitable to sorting and processing method of selected recycling center. Dispose non-recyclable trash separately into landfill.
- B. Source Separation Method: Recyclable materials separated from trash and sorted into separate bins or containers, identified by waste type, prior to transportation to recycling center.
- C. Co-Mingling Method: Recyclable materials separated from trash and placed in unsorted bins or container for sorting at recycling center.
- D. Materials suggested for recycling include:
 - 1. Packing materials including paper, cardboard, foam plastic, and sheeting.
 - 2. Recyclable plastics.
 - 3. Organic plant debris.
 - 4. Earth materials.
 - 5. Native stone and granular fill.
 - 6. Asphalt and concrete paving.
 - 7. Wood with and without embedded nails and staples.
 - 8. Glass, clear and colored types.
 - 9. Metals.
 - 10. Gypsum products.
 - 11. Acoustical ceiling tile.
 - 12. Carpet.
 - 13. Equipment oil.

1.9 CONSTRUCTION WASTE ADAPTIVE RE-USE

- A. Arrange with processing facility for salvage of construction material and processing for reuse. Do not reuse construction materials on site except as accepted by Owner.
- B. Materials suggested for adaptive reuse include:
 - 1. Concrete and crushed concrete.
 - 2. Masonry units.
 - 3. Lumber suitable for re-sawing or refinishing.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 CONSTRUCTION WASTE COLLECTION

- A. Collect construction waste materials in marked bins or containers and arrange for transportation to recycling centers or adaptive salvage and reuse processing facilities.

- B. Maintain recycling and adaptive reuse storage and collection area in orderly arrangement with materials separated to eliminate co-mingling of materials required to be delivered separately to waste processing facility.
- C. Store construction waste materials to prevent environmental pollution, fire hazards, hazards to persons and property, and contamination of stored materials.
- D. Cover construction waste materials subject to disintegration, evaporation, settling, or runoff to prevent polluting air, water, and soil.

3.2 CONSTRUCTION WASTE DISPOSAL

- A. Deliver construction waste to waste processing facilities. Obtain receipt for deliveries.
- B. Dispose construction waste not capable of being recycled or adaptively reused by delivery to landfill, incinerator, or other legal disposal facility. Obtain receipt for deliveries.

END OF SECTION

SECTION 01 75 00

STARTING AND ADJUSTING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Starting systems.
 - 2. Demonstration and instructions.

1.2 STARTING SYSTEMS

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and Owner seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. 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.
- G. Execute start-up in accordance with manufacturers' instructions.
- 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.

1.3 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of Products to Owner's personnel two weeks prior to date of final inspection.
- B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- C. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.
- D. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

PART 2 PRODUCTS - Not Used.

PART 3 EXECUTION - Not Used.

END OF SECTION

SECTION 01 78 53

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Format and content of manuals.
 - 2. Schedule of submittals.

1.2 QUALITY ASSURANCE

- A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.
- B. Prepare data in the form of an instructional manual.

1.3 PAPER FORMAT

- A. Binders: Commercial quality, 8-1/2 x 11 inch three-ring binders with hardback, cleanable, plastic covers; one inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- B. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; list title of Project; identify subject matter of contents.
- C. Internally subdivide the 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.

1.4 DIGITAL FORMAT

- A. Digital Form: DVD, labeled to identify project and DVD contents as OPERATION AND MAINTENANCE INSTRUCTIONS.
- B. Index DVD content with hyperlinks from table of contents and bookmarks for each specification section and each distinct product included within data.
- C. Include digital format of each document in searchable PDF format capable of accepting comments and text markups. Scanned images in PDF format are not acceptable.

1.5 CONTENTS, EACH VOLUME

- A. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, typed on white paper, in three parts.

- B. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
- C. 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:
 - 1. Significant design criteria.
 - 2. List of equipment.
 - 3. Parts list for each component.
 - 4. Local source of supplies and parts.
 - 5. Operating instructions.
 - 6. Maintenance instructions for equipment and systems.
 - 7. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
- D. Part 3: Project documents and certificates, including the following:
 - 1. Shop drawings and product data.
 - 2. Air and water balance reports.
 - 3. Certificates.
 - 4. Photocopies of warranties and bonds.
- E. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- F. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- G. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions submitted under provisions of Section 01 33 00.

1.6 MANUAL FOR MATERIALS AND FINISHES

- A. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, color and texture designations. Provide information for re-ordering custom manufactured products.
- B. 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.
- C. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional Requirements: As specified in individual product specification Sections.

1.7 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. 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 commercial model number of replaceable parts.
- B. Panelboard Circuit Directories: Provide electrical service characteristics, controls and communications.
- C. Include color coded wiring diagrams as installed.
- D. 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 any special operating instructions.
- E. 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.
- F. Provide servicing and lubrication schedule, and list of lubricants required.
- G. Include manufacturer's printed operation and maintenance instructions.
- H. Include sequence of operation by controls manufacturer.
- I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- J. Provide control diagrams by controls manufacturer as installed.
- K. Provide Contractor's coordination drawings, with color coded piping, wiring, and control diagrams as installed.
- L. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- M. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- N. Additional Requirements: As specified in individual product specification Sections.
- O. Provide a listing in Table of Contents for design data and test and balance reports, with tabbed fly sheet. Allow space in manual for insertion of data by Owner.

1.8 SUBMITTALS

- A. Manual for Materials and Finishes:
 - 1. Submit two copies of completed manuals, in final form 30 days prior to application for Substantial Completion.

- B. Manual for Equipment and Systems:
1. Submit two copies of completed manuals, in final form 30 days prior to application for Substantial Completion.
 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit manuals 15 days prior to equipment acceptance.
 3. Submit copies of additional data required for start-up, instruction and demonstration prior to application for final payment. Provide number of copies required for manuals.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 81 13

SUSTAINABLE PROJECT REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

- A. The Project will seek a LEED-ND (Neighborhood Development) certification through the U.S. Green Building Council (USGBC). As a part of that certification the project will accomplish the following:
 - 1. The multiple use building project (condominium areas and commercial shell) will pursue the EPA's Energy Star Version 2 as a minimum standard.
 - 2. The multiple use building project (all townhomes) will meet certification through the USGBC's LEED for Homes program.
- B. Section Includes: Sustainable product requirements meeting LEED H and Energy Star Programs, as well as LEED-ND Program prerequisites.
- C. Target Performance:
 - 1. A target performance tier of Gold is being sought for the LEED H portion of the Project. The number of points required for Gold level depends on the home's size adjustment factor in LEED H and LEED ND programs.
 - 2. A target performance of meeting Energy Star Version 2 minimum standards is being sought for the Energy Star portion of the project.
 - 3. A target performance tier of Certified is being sought for the entire project through LEED-ND.

1.2 LEED ND PREREQUISITES

- A. Smart Location and Linkage (SLL)
 - 1. SLL Prerequisite 1: Smart Location- To encourage development within and near existing communities and public transit infrastructure.
 - a. Locate the project on a site served by existing water and wastewater infrastructure.
 - b. Infill Sites: Locate the project on an infill site.
 - 2. SLL Prerequisite 2: Imperiled Species and Ecological Communities Conservation- To conserve imperiled species and ecological communities.
 - a. Consult with the state Natural Heritage Program and state fish and wildlife agencies to determine whether species listed as threatened or endangered under the federal Endangered Species Act have been or are likely to be found on the project site because of the presence of suitable habitat and nearby occurrences. The prerequisite is satisfied if the consultation and any necessary biological surveys determine that no such imperiled species or ecological community have been found or have a high likelihood of occurring.
 - 3. SLL Prerequisite 3: Wetland and Water Body Conservation- To preserve water quality, natural hydrology, habitat, and biodiversity through conservation of wetlands and water bodies.

- a. Limit development effects on wetlands, water bodies, and surrounding buffer land by locating the project on a site that includes no wetlands, no water bodies, no land within 50 feet of wetlands, and no land within 100 feet of water bodies.
 4. SLL Prerequisite 4: Agricultural Land Conservation- To preserve irreplaceable agricultural resources by protecting prime and unique soils on farmland and forestland from development
 - a. Locate the project on a site that is not within a state or locally designated agricultural preservation district, unless any changes made to the site conform to the requirements for development within the district.
 - b. Protected Soils Not impacted: Locate the project development footprint such that it does not disturb prime soils, unique soils, or soils of state significance as identified in a state Natural Resources Conservation Service soil survey.
 5. SLL Prerequisite 5: Floodplain Avoidance- To protect life and property, promote open space and habitat conservation, and enhance water quality and natural hydrological systems.
 - a. Sites without Floodplains: Locate on a site that does not contain any land within a 100-year high- or moderate-risk floodplain as defined and mapped by the Federal Emergency Management Agency (FEMA) or a state or local floodplain management agency, whichever is more recent.
- B. Neighborhood Pattern and Design (NPD) Prerequisites:
1. NPD Prerequisite 1: Walkable Streets- To promote transportation efficiency, including reduced vehicle miles traveled (VMT). To promote walking by providing safe, appealing, and comfortable street environments that support public health by reducing pedestrian injuries and encouraging daily physical activity.
 2. Design and build the project to achieve all of the following (refer to LEED-ND rating system for guidelines):
 - a. For 90% of new building frontage, a principal functional entry on the front façade faces a public space, such as a street, square, park, paseo, or plaza, but not a parking lot, and is connected to sidewalks or equivalent provisions for walking. The square, park, or plaza must be at least 50 feet wide at a point perpendicular to each entry.
 - b. At least 15% of existing and new street frontage within and bordering the project has a minimum building height-to-street-width ratio of 1:3 (i.e., a minimum of 1 foot of building height for every 3 feet of street width).
 - c. Continuous sidewalks or equivalent all-weather provisions for walking are provided along both sides of 90% of streets or frontage within the project, including the project side of streets bordering the project. New sidewalks, whether adjacent to streets or not, must be at least 8 feet wide on retail or mixed-use blocks and at least 4 feet wide on all other blocks. Alleys, driveways, and reconstructed existing sidewalks are excluded from these calculations.
 - d. No more than 20% of the street frontages within the project are faced directly by garage and service bay openings.
 3. NPD Prerequisite 2: Compact Development- To conserve land. To promote livability, walkability, and transportation efficiency, including reduced vehicle miles traveled (VMT). To leverage and support transit investments. To reduce public health risks by encouraging daily physical activity associated with walking and bicycling.
 - a. Projects in Transit Corridors: For projects with existing and/or planned transit service that meets or exceeds the 2-point threshold in SLL Credit 3, Locations with Reduced Automobile Dependence, Option 1, build at the following

densities, based on the walk distances to the transit service specified in SLL
Credit 3:

- 1) For residential components located within the walk distances: 12 or more dwelling units per acre of buildable land available for residential uses.
 - 2) For nonresidential components located within the walk distances: 0.80 floor-area ratio (FAR) or greater of buildable land available for nonresidential uses.
4. NPD Prerequisite 3: Connected and Open Community- To promote projects that have high levels of internal connectivity and are well connected to the community at large. To encourage development within existing communities that promote transportation efficiency through multimodal transportation. To improve public health by encouraging daily physical activity.
- a. Projects without Internal Streets: Locate the project such that the connectivity of the existing streets within 1/4 mile of the project boundary is at least 90 intersections per square mile. All streets and sidewalks that are counted toward the connectivity requirement must be available for general public use and not gated.
- C. Green Infrastructure and Building (GIB):
1. GIB Prerequisite 1: Certified Green Building- To encourage the design, construction, and retrofit of buildings that utilize green building practices.
 - a. Design, construct, or retrofit one whole building within the project to be certified through LEED for Homes, or through a green building rating system requiring review by independent, impartial, third-party certifying bodies that have either been accredited by an IAF accreditation body to, or could demonstrate compliance to, ISO 17021 or ISO/IEC Guide 65, and, when subsequently available, ISO/IEC 17065.
 2. GIB Prerequisite 2: Minimum Building Energy Efficiency- To encourage the design and construction of energy-efficient buildings that reduce air, water, and land pollution and adverse environmental effects from energy production and consumption.
 - a. The following requirement applies to 90% of the building floor area (rounded up to the next whole building) of all nonresidential buildings, mixed-use buildings, and multiunit residential buildings four stories or more constructed as part of the project or undergoing major renovations as part of the project. New buildings must demonstrate an average 10% improvement over ANSI/ASHRAE/IESNA Standard 90.1–2007 (with errata but without addenda). Buildings undergoing major renovations must demonstrate an average 5% improvement over ANSI/ASHRAE/IESNA Standard 90.1–2007. Projects must document building energy efficiency using the following:
 - 1) Produce a LEED-compliant energy model following the methodology outlined in the LEED rating system appropriate to each building’s scope, including demonstration by a whole building project computer simulation using the building performance rating method in Appendix G of ANSI/ASHRAE/IESNA Standard 90.1–2007. Appendix G requires that the energy analysis done for the building performance rating method include all energy costs associated with the building project.
 - b. For new single-family residential buildings and new multiunit residential buildings three stories or fewer, 90% of the buildings must meet ENERGY STAR or equivalent criteria. Projects may demonstrate compliance with

ENERGY STAR criteria through the Home Energy Rating System (HERS) index.

3. GIB Prerequisite 3: Minimum Building Water Efficiency- To reduce effects on natural water resources and reduce burdens on community water supply and wastewater systems.
 - a. For nonresidential buildings, mixed-use buildings, and multifamily residential buildings four stories or more: Indoor water usage in new buildings and buildings undergoing major renovations as part of the project must be an average 20% less than in baseline buildings. Refer to the LEED ND rating system for details about baseline usage requirements.
 - 1) Calculations are based on estimated occupant usage and include only the following fixtures and fixture fittings (as applicable to the project scope): water closets (toilets), urinals, lavatory faucets, showers, kitchen sink faucets, and pre-rinse spray valves. The water efficiency threshold is calculated as a weighted average of water usage for the buildings constructed as part of the project based on their conditioned square footage.
 - 2) The following fixtures, fittings, and appliances are outside the scope of the water use reduction calculation: a. Commercial steam cookers, b. Commercial dishwashers, c. Automatic commercial ice makers, d. Commercial (family-sized) clothes washers, e. Residential clothes washers, f. Standard and compact residential dishwashers.
 - b. For new single-family residential buildings and new multiunit residential buildings three stories or fewer, 90% of buildings must use a combination of fixtures that would earn 3 points under LEED for Homes 2008 WE Credit 3, Indoor Water Use.
4. GIB Prerequisite 4: Construction Activity Pollution Prevention- To reduce pollution from construction activities by controlling soil erosion, waterway sedimentation, and airbornedust generation.
 - a. Create and implement an erosion and sedimentation control plan for all new construction activities associated with the project. The plan must incorporate practices such as phasing, seeding, grading, mulching, filter socks, stabilized site entrances, preservation of existing vegetation, and other best management practices (BMPs) to control erosion and sedimentation in runoff from the entire project site during construction.
 - b. The plan must list the BMPs employed and describe how they accomplish the following objectives: a. Prevent loss of soil during construction by stormwater runoff and/or wind erosion, including but not limited to stockpiling of topsoil for reuse, b. Prevent sedimentation of any affected stormwater conveyance systems or receiving streams, c. Prevent polluting the air with dust and particulate matter.
 - c. The erosion and sedimentation control plan must describe how the project team will do the following: a. Preserve vegetation and mark clearing limits, b. Establish and delineate construction access, c. Control flow rates, d. Install sediment controls, e. Stabilize soils, f. Protect slopes, g. Protect drain inlets, h. Stabilize channels and outlets, i. Control pollutants, j. Control dewatering, k. Maintain the BMPs, l. Manage the erosion and sedimentation control plan.
 - d. The BMPs must be selected from the Washington State Department of Ecology's Stormwater Management Manual for Western Washington, Volume II, Construction Stormwater Pollution Prevention (2005 edition), or a locally

approved equivalent, whichever is more stringent, and must comply with all federal, state, and local erosion and sedimentation control regulations.

D. Innovation and Design Process (IDP)

1. Innovation and Exemplary Performance- To encourage exemplary performance above the requirements set by the LEED for Neighborhood Development Rating System and/or innovative performance in green building, smart growth, or new urbanist categories not specifically addressed by the LEED for Neighborhood Development Rating System. Three of the five possible strategies listed below are being targeted for the project:
 - a. Exemplary Performance : NPD Credit 14, Tree-Lined Streets – Provide street trees on 90% of new and existing streets on the project side of bordering streets; the trees must be between the vehicle travel way and the walkway at intervals averaging no greater than 40 feet (excluding driveways and utility vaults).
 - b. Exemplary Performance : NPD Credit 3, Mixed-Use Neighborhood Center- At least 30 diverse uses must be available within a ¼ mile walk distance of 50% of the dwelling units
 - c. Exemplary Performance : NPD Credit 1, Walkable Streets
 - 1) Achieve at least 7 points for walkable street features, according to the LEED-ND guidelines in Table 1.
 - 2) Meet a 95% threshold for n)Design Speeds for Safe Pedestrian Travel: residential streets within the project are designed for a target speed of no more than 20 mph.
 - 3) Meet a 90% threshold for o)Design Speeds for Safe Bicycle Travel: mixed-use streets within the project are designed for a project speed of no more than 25 mph.
 - d. Exemplary Performance : GIB Credit 4, Water Efficient Landscaping- Reduce water consumption for outdoor landscaping by 75% from a calculated midsummer baseline case, using LEED-ND guidelines.
2. LEED Accredited Professional- To support the integrated planning and design required for a LEED for Neighborhood Development project and to streamline the application and certification process.
 - a. At least one principal member of the project team must be a LEED Accredited Professional.

E. Regional Priority Credit (RPC)

1. To encourage strategies that address geographically specific environmental, social equity, and public health priorities. The following credits are being targeted for the project:
2. Regional Priority Credit: GIB Credit 2, Energy Efficiency- To encourage the design and construction of energy-efficient buildings that reduce air, water, and land pollution and adverse environmental effects from energy production and consumption.
 - a. For non residential, mixed use, or multiunit residential: new buildings must demonstrate an average 18% (1 point) or 26% (2 points) improvement over ANSI/ASHRAE/IESNA Standard 90.1–2007 (with errata but without addenda)
 - b. For new single-family residential buildings and new multiunit residential buildings three stories or fewer, 90% of the buildings must achieve a Home Energy Rating System (HERS) index score of at least 75.
3. Regional Priority Credit: NPD Credit 1, Walkable Streets- To promote transportation efficiency, including reduced vehicle miles traveled (VMT). To promote walking by providing safe, appealing, and comfortable street environments that support public health by reducing pedestrian injuries and encouraging daily physical activity.

- a. Achieve at least 10 out of the possible 16 options listed in the NPD Credit 1 section of the LEED ND rating system

1.3 SUSTAINABLE PROJECT REQUIREMENTS

- A. Perform Work of the Project to qualify for certification in both the USBG's LEED-for Homes and LEED for Neighborhood Development programs, and meet the minimum standards of the U.S. EPA's Energy Star Version 2 Program.
- B. Specific requirements of all programs are incorporated into the Contract Documents.
- C. Comply with the following general LEED H, LEED ND, and Energy Star program requirements. Refer to specific specification sections for product requirements.
 1. Notify Owner and Architect when conflicts arise between Work performance and sustainable requirements.

1.4 INNOVATIVE AND DESIGN PROCESS (ID)

- A. Refer to Energy Star Version 2 standard attachment.
 1. ENERGY STAR Version 2 performance standards include:
 - a. HERS score of 85 or lower in climate zones 1-5
 - b. Completed Thermal Bypass Inspection Checklist, including slab-edge insulation in climate zones 4+
 - c. Duct leakage of less than 6 CFM to outdoors per 100 SF, as documented by RESNET certified rater.
 - d. Include at least one Energy Star qualified product category: heating or cooling equipment; OR windows that meet regional eligibility requirements; OR water heating equipment; OR 5 or more labeled light fixtures, appliances, ceiling fans with light fixtures, and/or ventilation fans)
 - e. Indoor and outdoor coils must be matched, in accordance with AHRI standards
 - f. Adaptive recovery for any programmable thermostats installed in homes with a heat pump
 - g. Maximum oversizing limit for air conditioners and heat pumps is 15%. Note: a maximum of 20% of screw-in light bulb sockets in the home may use compact fluorescent lamps (CFLs) to achieve the HERS index required to qualify the home. CFLs used for this purpose must be ENERGY STAR qualified.
- B. Integrated Project Planning:
 1. Prior to construction, the Builder must:
 - a. As early as practical, conduct a preliminary LEED for Homes meeting, with the participation of the Provider and key members of the project team. As part of the meeting, create an action plan that confirms the following:
 - 1) The targeted LEED award level.
 - 2) The LEED for Homes credits that have been selected to meet the targeted award level.
 - 3) The party accountable for meeting the LEED for Homes requirements for each selected credit.
 2. Conduct meetings with the project team at least monthly to review project status, introduce new team members to project goals, discuss problems encountered, formulate solutions, review responsibilities and identify next steps.

- C. Quality Management for Durability:
 - 1. Prior to construction, the Builder must:
 - a. Review the Durability Evaluation to identify all moderate and high risk durability issues for the building enclosure.
 - b. Review strategies to respond to those durability issues.
 - c. Prior to construction, the builder must have a quality management program in place to ensure implementation of the durability strategies during construction.
 - d. Third Party Durability Inspection:
 - 1) The builder must complete a Durability Inspection Checklist, which the provider must use to verify implementation of the builder's durability strategies.
 - a) Refer to attachments for LEED Durability Checklist.
 - 2. Durability Management - Builder shall inspect and check off each measure in the durability inspection checklist.

- D. Innovative or Regional Design:
 - 1. Clothes Washers over living space: Install drain and drain pan.
 - 2. Sustainable Sites 6: Compact Development.
 - a. Build at 48 units/acre.
 - 3. Sustainable Sites 3 - Reduce Heat Island Effects with 100 % of hardscappe meets minimum Solar Reflectance Index (SRI) or 29.
 - 4. TBD.

1.5 LOCATION & LINKAGES (LL)

- A. LEED for Neighborhood Development - Complete all of the prerequisite requirements of the LEED for Neighborhood Development (LEED - ND) certification program.

1.6 SUSTAINABLE SITES (SS)

- A. Site Stewardship.
 - 1. Erosion Controls During Construction - During construction implement erosion control measures. Erosion control measures to include:
 - a. Stockpile and protect disturbed topsoil from erosion for reuse.
 - b. Control the path and velocity of runoff with silt fencing or comparable measures.
 - c. Protect on-site storm sewer inlets, streams, and lakes with straw bales, silt fencing, silt sacks, rock filters, or comparable measures.
 - d. Provide swales to divert surface water from hillsides.
 - e. If soils in a sloped area are disturbed during construction, use tiers, erosion blankets, compost blankets, filter socks and berms, or some comparable approach to keep soil stabilized.
 - 2. Minimize Disturbed Area of the Site as follows:
 - a. Implement tree/plant preservation plan with "no disturbance" zones.
 - b. Rehabilitate lot; undo soil compaction and remove invasive plants.

- B. Landscaping.
 - 1. No Invasive Plants - Introduce no invasive plants species into the landscape.
 - 2. Basic Landscape Design Requirements:
 - a. Any turf must be drought-tolerant.
 - b. Do not use turf in densely shaded areas.

- c. Do not use turf in areas with a slope of 25%.
 - d. Add mulch or soil amendments as appropriate.
 - e. Till all compacted soil to at least 6 inches depth.
 3. Limit Conventional Turf in the designed softscapes to 0%.
 4. Drought tolerant plants to comprise 90% of plant installations.
 5. Design the landscape and irrigation system to reduce overall irrigation demand by at least 20%. Irrigation demand calculations and estimates to be prepared by a landscape professional, biologist, or other qualified professional using the method outlined in the LEED for Homes rating system.
 6. Local Heat Island Effects - Design landscape features to reduce local heat island effects.
 - a. Locate trees or other plantings to provide shading for at least 50 percent of sidewalks, Patios, or driveways within 50 feet of the home. Shading calculated according to LEED-H guidelines.
 - b. Install light-colored, high albedo materials or vegetation for 100 percent of sidewalks, patios, and driveways within 50 feet of the home.
 - 1) Acceptable strategies include:
 - a) White concrete.
 - b) Gray concrete (Solar Reflectance Index {SRI} of minimum 29).
 - c) Open pavers of any material with minimum SRI of 29.
- C. Surface Water Management - Design the lot such that at least 70% of the built environment is permeable or designed to capture water runoff for infiltration on-site, not including area under roof, by the following methods:
1. Permeable Lot:
 - a. Minimum 5 % vegetative landscaping.
 - b. Minimum 35% of paving to be permeable.
 - c. Minimum 30% impermeable surfaces, directed to infiltration features.
 - d. 30% maximum other impermeable surfaces.
 2. Management of Runoff from Roof - Install permanent stormwater controls to manage runoff from the building.
- D. Non-Toxic Pest Control - Pest Control Alternatives:
1. Keep all wood at least 12 inches above soil.
 2. Seal all external cracks, joints, penetrations, edges, and entry points with caulking. Where openings cannot be caulked or sealed, install rodent and corrosion proof screens. Protect exposed foundation insulation with moisture resistant, pest-proof cover.
 3. Include no wood to concrete connections or separate any exterior wood to concrete connections with metal or plastic fasteners or dividers.
 4. Use solid concrete foundation walls or masonry wall with top course of solid block bond beam or concrete filled block due to "moderate to heavy" probability of termite infestation at the project site.
- E. Compact Development.
1. Build homes with an average housing density of 20 or more dwelling units per acre of buildable land.
 - a. 11 housing units on 0.23 acre lot is 47.8 density (units/acre).

1.7 WATER EFFICIENCY (WE)

- A. Indoor Water Use - Minimize indoor demand for water through water efficient fixtures and fittings.
 - 1. High efficiency fixtures and fittings:
 - a. Toilets meet the U.S. EPA WaterSense specification and are certified and labeled accordingly.
 - 2. Very high efficiency fixtures and fittings:
 - a. Average flow rate for lavatory faucets is ≤ 1.5 gpm.
 - b. Average flow rate for all showers is ≤ 1.75 gpm per stall.

1.8 ENERGY AND ATMOSPHERE (EA)

- A. Exceptional Energy Performance - Exceed the performance of Energy Star for Homes Version 2 per LEED for Homes rating system.
- B. Refer to Energy Star Performance Standard List attached to this Section.
- C. Hot Water Distribution System:
 - 1. The water heater must be centrally located to ensure that the longest water heater to fixture piping run is 50 feet in four-story homes, not including cold water demand loads, such as toilets, washing machines, etc). Branch lines run from a central header and are a maximum of 1/2 inch diameter.
 - 2. Use PEX piping and a central distribution manifold for domestic hot water distribution.
 - 3. Central manifold trunk no more than 6 feet in length.
 - 4. Pipe Insulation: All domestic hot water piping to have R-4 insulation minimum. Insulation shall be properly installed on all piping elbows to adequately insulate the 90 degree bend.
 - 5. Insulate central manifold trunk to minimum value of R-4.
- D. Residential Refrigerant Management.
 - 1. Provide proof of proper refrigerant charge of the air conditioning system, even if a precharged split system is used.
 - a. Install HVAC system with R-410a refrigerant.
- E. Energy Star Appliances: Appliances must be Energy Star rated.

1.9 MATERIALS AND RESOURCES (MR)

- A. Framing Order Waste Factor Limit - Limit the overall estimated waste factor to 10% or less, calculated per LEED for Homes Rating System.
 - 1. Implement any two of the following:
 - a. Size headers for actual loads.
 - b. Use ladder blocking or drywall clips.
 - c. Use 2-stud corners.
- B. Environmentally Preferable Products:
 - 1. FSC Certified Tropical Wood:
 - a. Provide wood suppliers with:

- 1) A notice of preference for FSC certified products. Finished products that are verified with any FSC designation (ie: FSC Pure, FSC Mixed Source, FSC Recycled, etc.) can be considered "FSC Certified".
 - 2) A request for the country of manufacture of each product supplied.
 - 3) Sample Notice to Wood Products Suppliers: "Notice to Vendors: [the company] prefers to purchase wood products that are certified according to the guidelines of the Forest Stewardship Council (FSC). [the company] also prefers not to use any tropical wood or wood products. If any tropical wood or wood products are supplied, they must be FSC certified. Please provide the country of manufacture of each product you expect to supply to us. Also, please provide a list of FSC-certified products you can supply."
- b. Use no tropical wood except for FSC-certified or reclaimed wood.
2. Environmentally Preferable Products:
- a. Exterior Wall framing: FSC certified wood
 - b. Exterior Wall siding: Certaineed fiber cement siding (25% min.post consumer recycled content); local production (extracted, processed, and manufactured within 500 mi of site)
 - c. Flooring:
 - 1) FSC hardwood/bamboo: minimum 90% of total floor area
 - 2) Floor framing: FSC certified wood
 - d. Foundation elements
 - 1) Aggregate- local production
 - 2) Cement- local production
 - e. Interior Wall framing: FSC certified
 - f. Interior wall and ceiling gypsum board: 10% post consumer recycled content or 95% post industrial recycled content
 - g. Interior wall and ceiling and millwork paints and coatings: All paints and coatings, including primers, must comply with Environmentally Preferable/low VOC content standards in the LEED for Homes rating system (Flats- 50 g/L; Nonflats- 150 g/L).
 - h. Landscape decking and/or patio material: 25% min. post consumerrecycled content, FSC certified, or reclaimed
 - i. Countertops- Caesarstone, 25% min.post consumer recycled content; composite materials contain no added urea-formaldehyde resins
 - j. Interior trim: FSC certified Poplar; location production.
 - k. Interior adhesives and sealants: comply with Low-Emissions standards in the LEED for Homes rating system.
 - l. Roof framing: FSC certified
 - m. Roof floor, wall, cavity insulation: 25% min.post consumer recycled content; low emission per LEED guidelines
 - n. Water supply piping: PEX
- C. Waste Management.
1. Construction Waste Management:
 - a. Investigate and document local options for diversion of all anticipated major constituents of the project waste stream, including cardboard packaging and household recyclables.

- b. Document the diversion rate for construction waste. Record the diversion rate for land clearing and/or demolition, if applicable, separately from the rate for the new construction.
- c. If using waste management facility for processing, the average monthly or annual diversion rate for the entire facility may be used, if annual waste facility data is available and verified.
- d. Reduce or divert waste generated from landfills and incinerators to a level below the industry norm. Use either of the following strategies:
 - 1) Increase waste diversion by diverting 25 % or more of total materials taken off the construction site from landfills and incinerators, not including land clearing and demolition waste.

1.10 INDOOR ENVIRONMENTAL QUALITY (EQ)

- A. Combustion Venting - Minimize the leakage of combustion gases into the occupied space of the home.
 1. No unvented combustion appliances are permitted.
 2. Carbon monoxide monitor installed on each floor.
 3. No fireplaces installed.
 4. Space and water heating equipment that involves combustion must be designed and installed with closed combustion, sealed supply air, and exhaust ducting, or with power-vented exhaust.
 5. Enhanced combustion venting achieved through the above measures.
- B. Outdoor Air Ventilation - Reduce occupant exposure to indoor pollutants by ventilating with outdoor air.
 1. Basic Outdoor Air Ventilation: Design and install a whole building ventilation system that complies with ASHRAE Standard 62.2-2007, Sections 4 and 7.
 - a. Continuous ventilation - meet the ventilation requirements in Table 30 of LEED for Homes Rating System. For a 4 bedroom, 2,800 sf home, minimum air flow requirements are 75 cfm for a continuous ventilation system.
 2. Enhanced Outdoor Air Ventilation:
 - a. Install a system that provides heat transfer between the incoming outdoor air stream and the exhaust air stream, such as a heat recovery ventilator or energy recovery ventilator. The heat recovery system must be listed by a certified testing lab.
 3. Third Party Performance Testing - Have a third party test the flow rate of air brought into the home, and verify that the requirements of ASHRAE Standard 62.2-2007 are met. In exhaust only ventilation systems install exhaust ducts according to Table 7.1 of ASHRAE Standard 62.2-2007 and either test the flow rate out of the home or conduct air flow tests to ensure back-pressure of ≤ 0.20 inches w.c.
- C. Local Exhaust - Reduce moisture and exposure to indoor pollutants in kitchens and bathrooms.
 1. Basic Local Exhaust - Meet all of the following requirements:
 - a. Design and install local exhaust systems in all bathrooms, including half baths, and the kitchen to meet the requirements of Section 5 of ASHRAE Standard 62.2-2007.
 - 1) Minimum Air Flow:
 - a) Kitchen: 100 cfm.

- b) Bathrooms: 50 cfm.
 - b. Design and install fans and ducts to meet the requirements of Section 5 of ASHRAE Standard 62.2-2007.
 - c. Exhaust air to the outdoors.
 - d. Use EnergyStar labeled bathroom exhaust fans.
 - 2. Enhanced Local Exhaust - Use one of the following strategies in every bathroom to control the use of the local exhaust fan, excluding half baths.
 - a. Use local exhaust fan with automatic timer to operate the fan for a timed interval after occupant leaves the room, at least 20 minutes.
 - b. Use local exhaust fans that are continuously operating.
 - 3. Provide third party performance testing of air flow rate of air brought into the home and verify that the requirements of ASHRAE Standard 62.2-2007 are met.
- D. Distribution of Space Heating and Cooling - Provide appropriate distribution of space heating and cooling in the home to improved thermal comfort and energy performance.
 - 1. Room-by-Room Load Calculations: Perform design calculations using ACCA Manuals J and D, the ASHRAE Handbook of Fundamentals, or an equivalent computation procedure and install ducts accordingly.
 - 2. Return Air Flow - Forced Air Systems.
 - a. Limit pressure differential between closed rooms and adjacent spaces with return is no greater than 2.5 Pa., not including baths, kitchens, closets, pantries, and laundry rooms.
- E. Air Filtering - Reduce particulate matter from the air supply system.
 - 1. Good Filters: Install air filters with a minimum efficiency reporting value (MERV) of 8 or greater and ensure that air handlers can maintain adequate pressure and air flow. Air filter housings must be airtight to prevent bypass or leakage. Air filter requirements do not apply to ERV or HRV systems, only to forced air AHU systems.
- F. Contaminant Control - Reduce occupants' and construction workers' exposure to indoor airborne contaminants through source control and removal.
 - 1. Indoor Contaminant Control During Construction: Upon installation, seal all permanent ducts and vents to minimize contamination during construction. Remove all seals after all phases of construction are completed.
 - 2. Indoor Contaminant Control: Design and install permanent walk-off mats at each entry that are at least 4 feet in length and allow accessibility for cleaning.
 - 3. Preoccupancy Flush: Flush the home with fresh air according to LEED for Homes Rating System, prior to occupancy but after all phases of construction are complete.
- G. Garage Pollutant Protection - Reduce occupant exposure to indoor pollutants originating from an adjacent garage.
 - 1. No HVAC in garage- place all air handling equipment outside the fire-rated envelope of the garage.
 - 2. Detached garage or no garage.

1.11 AWARENESS AND EDUCATION (AE)

- A. Basic Operations Training - Provided home's occupants with:

1. An operations and maintenance manual or binder as outlined in LEED for Homes Rating System. Coordinate with project team to compile Operating & Maintenance Manual.
- B. Enhanced Training - Provide DVD with operations and maintenance information on the LEED for Homes measures.
- C. Public Awareness of LEED Home:
 1. Publish a website with at least two pages that provides detailed information about the features and benefits of LEED homes.
 2. Generate a newspaper article on the LEED for Homes project.
 3. Display LEED for Homes signage, measuring six square feet or more, on the exterior of the building.

1.12 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data for filter media and filter efficiency.

1.13 QUALITY ASSURANCE

- A. Perform Work in accordance with LEED-H Reference Guide to permit application and certification to achieve minimum Certified Rating under LEED-H Rating System. Targeted performance tier of Gold is being sought.
- B. Perform Work to meet or exceed minimum energy efficiency and performance in accordance with local energy code.

1.14 QUALIFICATIONS

- A. Monitor and manage compliance with this section under direct supervision of LEED Accredited Professional.

1.15 PRE-INSTALLATION MEETINGS

- A. Section 01300 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.
 1. Review submittal and documentation requirements for LEED H certificate.
 2. Review construction procedures and temporary facilities required for LEED H compliance.

1.16 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept absorptive materials on site in manufacturer's sealed, protective packaging. Inspect for damage.

- C. Store absorptive materials in enclosed, environmentally conditioned space to prevent moisture absorption.
- D. Do not store or install absorptive materials within building until building is enclosed and materials are protected from exposure to elements.
- E. Protect installed absorptive materials from damage with temporary exterior enclosure to prevent moisture absorption.

PART 2 PRODUCTS

2.1 PROHIBITED MATERIALS

- A. Do not use materials containing asbestos, polychlorinated biphenyls (PCB) or other hazardous materials.
- B. Do not use materials containing butyl for interior locations.

PART 3 EXECUTION - Not Used.

END OF SECTION

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.
- C. Refer to Section 01 43 35 for Mockup requirements affecting work of this section.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture.
- C. Shop Drawings: For steel reinforcement.
- D. Material test reports.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specification for Structural Concrete."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, deformed.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.
- C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I or II.
- B. Normal-Weight Aggregates: ASTM C 33.
- C. Water: ASTM C 94/C 94M and potable.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

2.4 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class C, or polyethylene sheet, ASTM D 4397, not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

2.5 CURING MATERIALS

- A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

- B. Water: Potable.
- C. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

2.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1752, cork or self-expanding cork.

2.7 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Proportion normal-weight concrete mixture as follows:
 - 1. Minimum Compressive Strength: As called out on drawings.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45 for concrete with minimum compressive strength of 4,000 psi or greater.
 - 3. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for concrete with permanent exterior exposure, unless noted otherwise.
 - 4. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.
 - 5. Maximum slag or flyash to cement ratio: 0.40.

2.8 FABRICATING REINFORCEMENT

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

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork according to ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR RETARDERS

- A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
- C. Cold-Weather Placement: Comply with ACI 306.1.
- D. Hot-Weather Placement: Comply with ACI 301.

3.7 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in 1 direction.
 1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings or mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
 1. Apply float finish to surfaces indicated, to receive trowel finish, and to be covered with fluid-applied or sheet waterproofing or built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 1. Apply a trowel finish to surfaces indicated that are exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 2. Finish and measure surface in accordance with criteria called out on drawings.
- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

3.9 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.10 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.11 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
 - 1. Testing Services: Tests shall be performed according to ACI 301.

END OF SECTION 03300

SECTION 04 05 03

MASONRY MORTARING AND GROUTING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Mortar for masonry.
 - 2. Grout for masonry.
- B. Refer to Section 01 43 35 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Samples: Submit two samples of mortar, illustrating mortar color and color range.
- C. Design Data: Submit design mix when the Property specification of ASTM C270 is to be used, required environmental conditions, and admixture limitations.
- D. Test Reports:
 - 1. Submit reports on mortar indicating conformance of mortar to property requirements of ASTM C270, and test and evaluation reports to ASTM C780 for aggregate ratio and water content, air content, consistency, and compressive strength.
 - 2. Submit reports on grout indicating conformance of grout to property requirements of ASTM C476 and test and evaluation reports to ASTM C1019.
- E. Manufacturer's Installation Instructions: Submit premix mortar manufacturer's installation instructions.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 530 Building Code Requirements for Masonry Structures and ACI 530.1 Specification for Masonry Structures.

1.4 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements Environmental conditions affecting products on site.

- B. Cold Weather Requirements: In accordance with ACI 530.1 when ambient temperature or temperature of masonry units is less than 40 degrees F.
- C. Hot Weather Requirements: In accordance with ACI 530.1 when ambient temperature is greater than 100 degrees F or ambient temperature is greater than 90 degrees F with wind velocity greater than 8 mph.

PART 2 PRODUCTS

2.1 PREMIX MORTAR

- A. Manufacturers:
 - 1. Glen-Gery; Color Mortar Blend
 - 2. Lafarge; Eaglebond
 - 3. Holcim (US), Inc.; Rainbow Mortamix Custom Color Cement/Lime
 - 4. Lafarge Corporation; Centurion Colorbond PL.
 - 5. Lehigh Portland Cement Co.; Lehigh Custom Color Portland/Lime
 - 6. Substitutions: Section 01 60 00 - Product Requirements.
- B. Premix Mortar: ASTM C387, Type S unless otherwise indicated, mortar components as specified, without calcium chloride.
 - 1. Mortar Color:
 - a. As selected.

2.2 MORTAR COMPONENTS

- A. Portland Cement: ASTM C150, Type I, color as selected
- B. Mortar Aggregate: ASTM C144, standard masonry type.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Grout Aggregate: ASTM C404.
 - 1. Coarse unless otherwise indicated.
- E. Water: Clean and potable.
- F. Mortar Color: Mineral oxide pigment; color as selected.
 - 1. Solomon Colors; SGS Mortar Colors.
 - 2. Davis Colors; True Tone Mortar.
 - 3. Lanxess Corp.; Bayferrox Iron Oxide Pigments.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- G. Water Repellent: Dry Block manufactured by Grace Construction Products.
- H. Calcium chloride is not permitted.

2.3 MIXES

- A. Mortar Mixes:
 - 1. Mortar: ASTM C270, Type S using:
 - a. Property specification.
- B. Pointing Mortar:
 - 1. Pointing Mortar: ASTM C270, Type N using the Proportion specification.
- C. Mortar Mixing:
 - 1. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.
 - 2. Achieve uniformly damp sand immediately before the mixing process.
 - 3. Add mortar color. Provide uniformity of mix and coloration.
 - 4. Re-temper only within two hours of mixing.
- D. Grout Mixes:
 - 1. Grout: 2,000 psi strength at 28 days; 8-11 inches slump; mixed in accordance with ASTM C476.
 - a. Coarse Grout: For grouting spaces with minimum 4 inch dimension in every direction.
 - b. Fine Grout: For grouting other spaces.
- E. Grout Mixing:
 - 1. Transit Mixed Grout: Mix grout in accordance with ASTM C94, modified to use ingredients complying with ASTM C476.
 - 2. Site Mixed Grout: Mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Request inspection of spaces to be grouted.

3.2 INSTALLATION

- A. Install mortar to requirements of Section 04 20 00 Unit Masonry and ACI 530.1.
- B. Install grout to requirements of Section 04 20 00 Unit Masonry and ACI 530.1.

3.3 FIELD QUALITY CONTROL

- A. Section 01 45 23 - Testing and Inspecting Services: Testing and Inspection Services.

- B. Mortar Testing: In accordance with ASTM C780 for aggregate ratio and water content, air content, consistency, and compressive strength.
- C. Grout Testing: In accordance with ASTM C1019 for compressive strength, and in accordance with ASTM C143 for slump.
- D. Test flexural bond strength of mortar and masonry units to ASTM C1357; test in conjunction with masonry unit sections specified.
- E. Test compressive strength of mortar and masonry to ASTM C1314; test in accordance with masonry unit sections specified.

END OF SECTION

SECTION 04 20 00

UNIT MASONRY

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Brick units.
 - 2. Concrete masonry units.
 - 3. Reinforcement, anchorage, and accessories.
 - 4. Precast lintels.
- B. Refer to Section 01 43 35 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data for the following:
 - 1. Brick
 - 2. Standard concrete masonry units
 - 3. Reinforcement and anchorage
 - 4. Wall ties
 - 5. Flashing
 - 6. Precast masonry units.
 - 7. Accessories
- C. Samples: Submit four samples of face brick units to illustrate color, texture and extremes of color range.
 - 1. Submit three samples of each brick laid up on 2 by 2 feet board with selected mortar, as bond sample.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 530 Building Code Requirements for Masonry Structures and ACI 530.1 Specification for Masonry Structures.
- B. Fire Rated Wall Floor Roof Construction: Rating as indicated on Drawings.
 - 1. Tested Rating: Determined in accordance with ASTM E119.
- 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 foam plastic insulation insert.
- 1.4 MOCKUPS
- A. Refer to Section 01429 for Mockup requirements affecting work of this section.
- 1.5 QUALIFICATIONS
- A. Installer: Company specializing in performing Work of this section with minimum three years documented experience.
- 1.6 PRE-INSTALLATION MEETING
- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
 - B. Convene minimum one week prior to commencing Work of this section.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- 1.8 ENVIRONMENTAL REQUIREMENTS
- A. Section 01 60 00 - Product Requirements. Environmental conditions affecting products on site.
 - B. Cold Weather Requirements: In accordance with ACI 530.1 when ambient temperature or temperature of masonry units is less than 40 degrees F.
 - C. Hot Weather Requirements: In accordance with ACI 530.1 when ambient temperature is greater than 100 degrees F or ambient temperature is greater than 90 degrees F with wind velocity greater than 8 mph.
- 1.9 COORDINATION
- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
 - B. Coordinate the masonry work with brick veneer and installation of window and door anchors.

PART 2 PRODUCTS

2.1 BRICK UNITS

- A. Manufacturers: Provide "Black diamond Velour A" brick as manufactured by The Belden Brick Co. or approved comparable products by one of the following:
 - 1. Glen-Gery.
 - 2.
 - 3. Diener Brick Model.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Face Brick: ASTM C216, Type FBS, Grade SW; color as selected.
- C. Brick Size and Shape: Nominal size as selected. Provide special units for 90 degree corners, and terminations where required.

2.2 PRECAST LINTELS

- A. Precast Concrete Lintels: Type, size and reinforcing as indicated on Drawings, 3,000 psi strength at 28 days unless otherwise indicated.

2.3 MORTAR AND GROUT

- A. Mortar and Grout: As specified in Section 04 05 03.

2.4 FLASHINGS

- A. Metal Flashings: 5 oz copper sheet bonded between two layers of fiberglass, produced by
 - 1. York Mfg. Inc., Copper Fabric Flashing.
 - 2. AFCO Products Inc.; AFCO Copper Fabric.
 - 3. Sandell Manufacturing Company; Copper Fabric.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Stainless Steel: ASTM A240/A240M, Type 304, soft temper; minimum 0.018 inch thick; smooth finish where indicated.
- C. Flexible Flashing: Composite sheet 40 mils thick; 38 mils thick self adhesive rubberized asphalt bonded to 2 mils thick high density polyethylene film.
 - 1. Manufacturers:
 - a. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
 - b. Grace Construction Products; Perm-A-Barrier.
 - c. W. R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.
 - d. Substitutions: Section 01 60 00 - Product Requirements.
 - 2. Surface Conditioner: As recommended by flashing manufacturer.
 - 3. Termination Mastic: As recommended by flashing manufacturer.
 - 4. Primer: Grace Construction Products; Low VOC Bituthene Primer.
 - 5. Form flexible flashing sealant caps and drip edges from stainless steel.
- D. Lap Sealant: Butyl type as specified in Section 07 90 00.

2.5 ACCESSORIES

- A. Brick Masonry Preformed Control Joints: Closed cell neoprene, thickness to match width of head joints, depth to suit wythe thickness, conforming to ASTM D1056.
 - 1. Dur-O-Wal, Inc.; DA2015.
 - 2. Hohmann & Barnard Inc.; #NS Closed Cell Neoprene Sponge.
 - 3. Wire-Bond.; 3000 Vertical, closed cell neoprene.
- B. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, cement fused joints.
- C. Building Paper: ASTM D226, No. 30 asphalt saturated felt.
- D. Nailing Strips: Softwood, preservative treated for moisture resistance, dovetail shape, sized to masonry joints.
- E. Weeps: Preformed plastic vents with sloping louvers.
- F. Cavity Drain Material: Open polyethylene mesh thickness required to fill cavity space, and shaped to ensure moisture drainage to cavity weeps.
 - 1. Advanced Building Products, Inc.; Mortar Break.
 - 2. CavClear/Archovations Inc.; CavClear Masonry Mat.
 - 3. Dur-O-Wal, Inc.; DA1008.
 - 4. Mortar Net USA, Ltd.; Mortar Net.
 - 5. Substitutions: Section 01 60 00 - Product Requirements.
- G. Cleaning Solution: Not harmful to masonry work or adjacent materials.
 - 1. Prosoco Inc.; Sure Klean 600 Detergent.
 - 2. Diedrich Technologies, Inc.; 202 New Masonry Detergent.
 - 3. Chargar Corporation; Florock 700 Masonry Detergent Cleaner.
- H. Steel Lintels: size as indicated inch size, hot-dip galvanized.

2.6 SOURCE QUALITY CONTROL

- A. Section 01 45 23 - Testing and Inspecting Services: Testing and Inspection Services.
- B. Test brick efflorescence in accordance with ASTM C67. Brick rated greater than “slightly effloresced” is not acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify that field conditions are acceptable and are ready to receive work.

- C. Verify items provided by other sections of work are properly sized and located.
- D. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.2 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied to other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent support.

3.3 INSTALLATION

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form bed and head joints of uniform thickness.
- C. Coursing of Brick Units:
 - 1. Bond: Running and Soldier where indicated.
 - 2. Coursing: Three units and three mortar joints to equal 8 inches.
 - 3. Mortar Joints: Concave.
- D. Placing And Bonding:
 - 1. Lay solid masonry units in full bed of mortar, with full head joints.
 - 2. Lay hollow masonry units with face shell bedding on head and bed joints.
 - 3. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.
 - 4. Remove excess mortar as work progresses.
 - 5. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
 - 6. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
 - 7. Cut mortar joints flush where cement parging is required, cavity insulation, vapor barrier adhesive is applied, or bitumen dampproofing is applied.
 - 8. Isolate masonry from vertical structural framing members with a movement joint.
 - 9. Isolate top of non-load bearing masonry from horizontal structural framing members and slabs or decks with compressible joint filler.
 - 10. Place precast concrete components as work progresses; mortar into place.
 - a. Do not install mortar in top and vertical face joints of precast wall cap.
 - b. Seal precast wall cap top and vertical face joints as specified in Section 07 90 00.
- E. Weeps and Vents: Provide weeps and vents in outer wythe at 24 inches oc horizontally above through-wall flashing, above shelf angles and lintels, at bottom of walls, and at top of wall section.
- F. Cavity Wall: Do not permit mortar to drop or accumulate into cavity air space or to plug weeps. Build inner wythe ahead of outer wythe to receive cavity insulation and air/vapor barrier adhesive.
 - 1. Install cavity drain material continuously at bottom of each cavity above through wall flashing.

- G. Joint Reinforcement And Anchorage - Masonry Veneer:
1. Install horizontal joint reinforcement 16 inches oc.
 2. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches both sides of opening.
 3. Place joint reinforcement continuous in first and second joint below top of walls.
 4. Lap joint reinforcement ends minimum 6 inches.
 5. Attach wall ties to masonry backup horizontal joint reinforcement to bond veneer at maximum 16 inches oc vertically and 16 inches oc horizontally.
 6. Place wall ties at maximum 8 inches oc vertically within 8 inches of jamb of wall openings.
 7. Place wall ties at maximum 8 inches on center horizontally within 8 inches of head and sill of wall openings.
 8. Reinforce joint corners and intersections with strap anchors 16 inches oc.
- H. Masonry Flashings:
1. Install sealant caps above ledge and shelf angles and under flashing and turn down on outside face to form a drip.
 2. Extend flashings horizontally through outer wythe at foundation walls, above ledge or shelf angles and lintels, under sills, at bottom of walls, and turn down on outside face to form a drip.
 3. Turn flashing up minimum 8 inches and bed into mortar joint of masonry, seal to concrete, or seal to sheathing over framed backing.
 4. Lap end joints minimum 6 inches and seal watertight.
 5. Turn flashing, fold, and seal at corners, bends, and interruptions. Form sealed end dams at flashing terminations.
 6. Extend flashing minimum 2 inches beyond face of wall for installation verification. Cut flashings flush with face of wall after verification.
 7. Seal joints below sealant caps in accordance with Section 07 90 00.
- I. Lintels:
1. Install loose steel lintels over openings.
 2. Install precast lintels over openings where indicated.
 3. Maintain minimum 8 inches bearing on both sides of opening.
- J. Grouted Components:
1. Reinforce grouted components as indicated on Drawings.
 2. Lap splices minimum 48 bar diameters unless otherwise required by code.
 3. Support and secure reinforcing bars from displacement.
 4. Place and consolidate grout fill without displacing reinforcing.
 5. At bearing locations, fill masonry cores with grout for a minimum 12 inches both sides of opening.
- K. Reinforced Masonry:
1. Lay masonry units with core vertically aligned and cavities between wythes clear of mortar and unobstructed.
 2. Place reinforcement bars as indicated.
 3. Support and secure reinforcement from displacement.
 4. Place and consolidate grout fill without displacing reinforcing.
 5. Place grout in accordance with ACI 530.1 Specification for Masonry Structures.

L. Control Joints:

1. Install control joints at the following maximum spacings, unless otherwise indicated on Drawings:
 - a. Exterior Walls: 20 feet on center and within 24 inches on one side of each interior and exterior corner.
 - b. Interior Walls: 30 feet on center.
 - c. At changes in wall height.
2. Do not continue horizontal joint reinforcement through control joints.
3. Install preformed control joint device in continuous lengths. Seal butt and corner joints.
4. Size control joint in accordance with Section 07 90 00 for sealant performance.

M. Built-In Work:

1. As work progresses, install built-in metal door and glazed frames, fabricated metal frames, window frames, wood nailing strips, anchor bolts, plates, and other items to be built-in the work and furnished by other sections.
2. Install built-in items plumb and level.
3. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout or mortar. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
4. Do not build in materials subject to deterioration.

N. Cutting And Fitting:

1. Cut and fit for chases, pipes, conduit, sleeves, grounds, and other items penetrating masonry construction. Coordinate with other sections of work to provide correct size, shape, and location.
2. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.4 FIELD QUALITY CONTROL

- A. Section 01 45 23 - Testing and Inspecting Services: Testing and Inspection Services.
- B. Brick Units: Test each type in accordance with ASTM C67, 5 random units for each 50,000 units installed.
- C. Concrete Masonry Units: Test each type in accordance with ASTM C140.

3.5 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Remove excess mortar and mortar smears as work progresses.
- C. Replace defective mortar. Match adjacent work.
- D. Clean soiled surfaces with cleaning solution.
- E. Use non-metallic tools in cleaning operations.

3.6 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect exposed external corners subject to damage.
- C. Protect base of walls from mud and mortar splatter.
- D. Protect masonry and other items built into masonry walls from mortar droppings and staining caused by mortar.
- E. Protect tops of masonry work with waterproof coverings secured in place without damaging masonry. Provide coverings where masonry is exposed to weather when work is not in progress.

END OF SECTION

SECTION 04 40 00
STONE ASSEMBLIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cut bluestone steps, facing, and landings.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate layout, pertinent dimensions, and jointing methods.
- C. Product Data: Provide data on stone units
- D. Samples: Submit two stone samples 6 x 6 inch in size, illustrating color range and texture, markings, and surface finish.

1.3 QUALIFICATIONS

- A. Stone Fabricator Qualifications: Company specializing in fabricating cut stone with minimum ten years documented experience.

1.4 DELIVERY, STORAGE, AND PROTECTION

- A. Protect stone from discoloration during storage on site.
- B. Provide ventilation to prevent condensation from forming on stone.

PART 2 PRODUCTS

2.1 SANDSTONE

- A. Distributor:
 - 1. Ottey & Hoopes, Inc.; Heldeberg North River Bluestone.
 - 2. Quarry Cut; Parkerford, PA.
 - 3. Substitutions: Section 01 60 00 - Product Requirements.
- B. Bluestone: ASTM C616, Classification I - Sandstone.
 - 1. Color: Match Architect's sample.
 - 2. Surface Texture: Cleft finish.

2.2 ANCHORS AND ACCESSORIES

- A. Sealant: As specified in Section 07 90 00, color as selected.
- B. Cleaning Solution: Type which will not harm stone, joint materials, or adjacent surfaces.

2.3 STONE FABRICATION

- A. Steps and Facing: Profile and length as indicated on Drawings.
- B. Landing Stone: Size as indicated on drawings, cut square, thickness as indicated.
- C. Base: Height as indicated on drawings, cut square.
- D. Fabricate units for uniform coloration between adjacent units and over the full area of the installation.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install stone steps, risers, and landings in accordance with Section 09 30 00 mortar bed method with latex portland cement setting materials and grout, unless otherwise indicated.

3.2 CLEANING

- A. Clean soiled surfaces with cleaning solution.
- B. Use non-metallic tools in cleaning operations.

3.3 PROTECTION OF FINISHED WORK

- A. Cover stone steps and flooring subject to construction traffic or operations to protect finished surface from damage.
- B. Remove protection at time of Substantial Completion.

END OF SECTION

SECTION 04 72 00
CAST STONE MASONRY

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cast stone units and trim as indicated on Drawings for installation as specified in Section 04 20 00.
 - 2. Cast stone sills, exposed lintels, and profiles as indicated on Drawings.
- B. Refer to Section 01 43 35 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 DESIGN REQUIREMENTS

- A. Design lintels to resist live and dead loads with 1/360 maximum deflection.
 - 1. Refer to Drawings for performance requirements.
 - 2. Live Loads: As indicated.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings:
 - 1. Indicate cast stone layout, profiles, cross-sections, reinforcement, exposed faces, joint arrangement.
- C. Product Data: Submit data for cast stone units, indicate color range for selection.
- D. Samples:
 - 1. Submit two of each cast stone item, minimum 12 inches long illustrating profiles, finish, texture and color range.
- E. Design Data: Submit design calculations for lintels.
- F. Test Reports: Indicate concrete mix design compressive strength and water absorption.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with Cast Stone Institute Technical Manual.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept cast stone on site in manufacturer's protective packaging. Inspect for damage.
- C. Store cast stone on site covered and elevated above grade. Protect cast stone from damage, soiling, and staining.
- D. Provide ventilation to prevent condensation from forming on cast stone.

1.6 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate cast stone work with masonry construction and installation of window and door anchors.

PART 2 PRODUCTS

2.1 CAST STONE

- A. Products:
 - 1. Provide Water Table Trim Units: Rock Cast 8 by 24 inches units, as supplied by Diener Brick Company.
 - 2. Provide cast stone units and trims as indicated on Drawings, as manufactured by Shouldice Designer Stone.
 - 3. Provide cast stone sills, exposed lintels, and profiles as indicated on Drawings.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: ASTM C1364, architectural cast stone units fabricated by dry casting methods, with fine grained texture, simulating natural cut stone.
 - 1. Profiles: As indicated on Drawings, or match Architect's samples.
 - 2. Sizes: As indicated on Drawings.
 - 3. Colors and Finish: Match Architect's samples.
- C. Refer to Drawings for performance and reinforcing requirements.

2.2 COMPONENTS

- A. Portland Cement: ASTM C150, Type I - Normal or Type III - High Early Strength; color as required to achieve specified cast stone color.
- B. Coarse Aggregates: ASTM C33, except grading requirements; granite, quartz or limestone.
- C. Fine Aggregates: ASTM C33, except grading requirements; manufactured or natural sand.
- D. Colors: ASTM C979; inorganic iron oxide pigments.

- E. Admixtures: ASTM C494.
- F. Fly Ash: ASTM C618.
- G. Water: Potable.
- H. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade, deformed billet bars finish.
 - 1. Epoxy Coating: ASTM A775/A775M.
 - 2. Galvanized Coating: ASTM A767/A767M.

2.3 MIXES

- A. Concrete Mix:
 - 1. Compressive Strength: ASTM C1194; minimum 6,500 psi at 28 days.
 - 2. Slump: No measurable slump.
 - 3. Absorption: ASTM C1195; maximum 6 percent for cold water and 10 percent for boiling water at 28 days.

2.4 FABRICATION

- A. Size and Profile: As indicated on Drawings.
- B. Form units to length required for joint layout indicated on shop drawings. Field cutting to length is not permitted.
- C. Use rigid molds, constructed to maintain cast stone units uniform in shape, size, and finish.
- D. Reinforce units in accordance with ASTM C1364 for safe handling and as required to resist structural loads.
 - 1. Use galvanized finished reinforcing when concrete cover over reinforcing is less than 1-1/2 inches thick.
- E. Form external corners to profile indicated on Drawings.
- F. Slope exposed top surfaces of horizontal sill, planter, watertable, and parapet cap surfaces for natural wash.
- G. Form drip slot in bottom surface of exterior units projecting more than 1/2 inch beyond face of wall or window frame. Size slot not less than 3/8 inch wide and 1/4 inch deep; full width of projection.
- H. Curing: Cure units to develop concrete quality, and to minimize appearance blemishes including non-uniformity, staining, or surface cracking.
- I. Acid etch exposed-to-view surfaces to remove cement film and achieve uniform appearance.

2.5 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

- B. Maintain plant records and quality control program during production of cast stone units. Make records available upon request.
- C. Test and analyze three random specimens for each 500 cubic feet of fabricated cast stone units:
 - 1. Compressive Strength: In accordance with ASTM C1194.
 - 2. Cold Water Absorption: In accordance with ASTM C1195.
- D. Visually inspect color differences between fabricated units and approved sample in accordance with ASTM D1729.

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 051200 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes structural steel and grout.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.
- C. Welding certificates.

1.3 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category Sbd.
- B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
- C. Comply with applicable provisions of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M, Grade 50.
- B. Channels and Angles: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M.
- D. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
- E. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - 1. Finish: Plain unless noted otherwise. Hot-dip zinc coating, ASTM A 153/A 153M, Class C, for use in steel permanently exposed to weather.
 - 2. Direct-Tension Indicators: ASTM F 959, Type 325 compressible-washer type.
 - a. Finish: Plain, unless noted otherwise.
- B. Headed or Unheaded (Hooked) Anchor Rods: ASTM F 1554, Grade 36.
 - 1. Finish: Plain, unless noted otherwise. Hot-dip zinc coating, ASTM A 153/A 153M, Class C if permanently exposed to weather.
- C. Threaded Rods: ASTM A 36/A 36M.
 - 1. Finish: Plain, unless noted otherwise. Hot-dip zinc coating, ASTM A 153/A 153M, Class C if permanently exposed to weather.

2.3 PRIMER

- A. Primer: SSPC-Paint 25, Type II, iron oxide, zinc oxide, raw linseed oil, and alkyd.
- B. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

2.4 GALVANIZING

- A. Galvanize all framing and connections permanently exposed to weather: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

2.5 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings."
- B. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

2.7 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened unless noted otherwise.
- B. Welded Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

2.8 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 - 2. Surfaces to be field welded.
 - 3. Surfaces to be high-strength bolted with slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials.
 - 5. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

PART 3 - EXECUTION

3.1 ERECTION

- A. Examination: Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings."

- C. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
 - 1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
 - 3. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- D. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.2 FIELD CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened, unless noted otherwise.
- B. Welded Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 - 1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner <verify> will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.
- D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION 05120

SECTION 05 50 00

METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes shop fabricated metal items.
 - 1. Lintels.
 - 2. Ledge and shelf angles.
 - 3. Elevator sill angles and hoist beams.
 - 4. Anchor bolts for sill plates.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.
- C. Product Data:
 - 1. Submit product description, dimensions, materials of construction and finishes for corner and wheel guards, bar grating, and stair nosings.

1.3 QUALIFICATIONS

- A. Welders: AWS qualified within previous 12 months.
- B. Design ladders, grating, and structural supports under direct supervision of a professional engineer experienced in design of this work and licensed in the Commonwealth of Pennsylvania.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept metal fabrications on site in labeled shipments. Inspect for damage.
- C. Protect metal fabrications from damage by exposure to weather.

1.5 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

- A. Structural W-Shapes: ASTM A992/A992M.
- B. Other Structural Shapes: ASTM A36/A36M.
- C. Steel Tubing: ASTM A500, Grade B. ASTM A501.
- D. Plates: ASTM A283/A283M.
- E. Pipe: ASTM A53, Grade B Schedule 40.
- F. Fasteners: Type 304.
- G. Bolts, Nuts, and Washers: ASTM A307, Grade A galvanized to ASTM A153/A153M for galvanized components.
- H. Welding Materials: AWS D1.1; type required for materials being welded.
- I. Shop Primer: SSPC 15, Type 1, red oxide unless otherwise indicated.
- J. Touch-Up Primer: To match shop primer.
 - 1. Flat and Non-Flat Paints: Maximum volatile organic compound content in accordance with GS-11.
 - 2. Anti-Corrosive Paints: Maximum volatile organic compound content in accordance with GC-03.

2.2 MATERIALS - ALUMINUM

- A. Extruded Aluminum: ASTM B221, B221M, Alloy 6063, Temper T5.
- B. Sheet Aluminum: ASTM B209, B209M.
- C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210, B210M, Alloy 6063, Temper T6.
- D. Aluminum-Alloy Bars: ASTM B211, B211M, Alloy 6063, Temper T6.
- E. Aluminum-Alloy Die Castings: ASTM B85.
- F. Bolts, Nuts, and Washers: Steel, galvanized to ASTM A153/A153M.
- G. Welding Materials: AWS D1.2; type required for materials being welded.

2.3 LINTELS

- A. Lintels: Steel angles, size and configuration as shown on the Drawings, length to allow 8 inches minimum bearing on both sides of opening.
 - 1. Exterior Locations: Galvanized.
 - 2. Interior Locations: Prime paint, one coat.

2.4 LEDGE AND SHELF ANGLES

- A. Ledge and Shelf Angles: Steel sections as detailed for support of stone veneer; galvanized finish.

2.5 ELEVATOR SILL ANGLES AND HOIST BEAMS

- A. Sill Angles: Steel sections as detailed for support of elevator sills. Shop prime, one coat.
- B. Hoist Beams: Steel wide flange sections, shape and size required to support applied loads with maximum deflection of 1/240 of the span. Shop prime, one coat.

2.6 01 60 00 - Product Requirements ANCHOR BOLTS

- A. Anchor Bolts: 3/4 inch bolt, standard J-hook, with nut and washer; unfinished.

2.7 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by intermittent welds and plastic filler.
- 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 Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.8 FACTORY APPLIED FINISHES - STEEL

- A. Prepare surfaces to be primed in accordance with SSPC SP 2 or SP 3.
- B. Do not prime surfaces in direct contact with concrete or where field welding is required.
- C. Prime paint items with one coat except where galvanizing is specified.
- D. Galvanizing: ASTM A123/A123M; hot dip galvanize after fabrication.

2.9 FACTORY APPLIED FINISHES - ALUMINUM

- A. Exterior Aluminum Surfaces: Mill finish.
- B. Finish coatings to conform to AAMA 603.8 AAMA 605.2 AAMA 606.1 AAMA 607.1 AAMA 608.1. Comply with AA DAF-45.

2.10 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify that field conditions are acceptable and are ready to receive Work.

3.2 PREPARATION

- A. Clean and strip primed steel items to bare metal and aluminum where site welding is required.
- B. Supply steel items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.

3.3 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components indicated on shop drawings.
- D. Perform field welding in accordance with AWS D1.1.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.

- F. After erection, touch up welds, abrasions, and damaged finishes with prime paint or galvanizing repair paint to match shop finishes.
- G. Finish paint steel components as specified in Section 09 90 00.

3.4 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.

END OF SECTION

SECTION 05 51 10

FABRICATED METAL STAIRS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Steel stair frame of structural sections, with open risers, wood treads.
 - 2. Integral balusters and handrails.
 - 3. Handrails for wall mounting.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 DESIGN REQUIREMENTS

- A. Design and fabricate stair assembly to support a uniform live load of 100 psf with deflection of stringer or landing framing not to exceed 1/240 of span. Test in accordance with ASTM E935.
 - 1. Design and fabricate stair treads and landings to support a 300 pounds concentrated load at any location.
- B. Design and fabricate handrail, and attachments to resist forces as required by applicable codes, ASCE 7 and IBC code. Apply loads non-simultaneously to produce maximum stresses.
 - 1. Top Rail Concentrated Load: 200 pounds applied at any point in any direction.
 - 2. Top Rail Uniform Load: 50 plf applied in any direction.
 - 3. Baluster Concentrated Load: 50 pounds applied to one square foot area.
- C. Railing assembly, wall rails, and attachments to resist lateral force of 75 lbs at any point without damage or permanent set. Test in accordance with ASTM E935.
- D. Fabricate stair assembly to NAAMM AMP 510 - Metal Stairs Manual, Class Industrial.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
 - 2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Samples: Submit two 6 inch long samples of abrasive nosing.
- D. Design Data: Submit design calculations signed and sealed by professional engineer.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with NAAMM AMP 510 - Metal Stairs Manual.
- B. Perform Work in accordance with ASTM E985 - Permanent Metal Railing Systems and Rails for Buildings.
- C. Maintain one copy of each document on site.

1.5 QUALIFICATIONS

- A. Prepare Shop Drawings under direct supervision of a professional engineer experienced in design of this work and licensed in the Commonwealth of Pennsylvania.
- B. Welders: AWS qualified within the previous 12 months.

1.6 PRE-INSTALLATION MEETING

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Steel Sections: ASTM A36/A36M.
- B. Handrail and Railing Tubing: ASTM A513, Type 5, minimum 50 ksi yield strength.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53, Grade B, Schedule 40.
- E. Sheet Steel: ASTM A653/A653M, galvanized with G60 coating class.
- F. Handrail Brackets: Malleable iron, concealed fastener type as indicated on Drawings.
- G. Splice Connectors: Steel welding collars.
- H. Treads: Wood, size, species, and finish as indicated on Drawings.
 - 1. Refer to Section 06 20 00 Finish Carpentry for requirements.
- I. Tread and Landing Concrete Reinforcement: Mesh type, unfinished.
- J. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain finish.

- K. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; consistent with design of stair structure.
- L. Welding Materials: AWS D1.1 or AWS D1.3; type required for materials being welded.
- M. Shop Primer SSPC 15, Type 1, red oxide.
- N. Touch-Up Primer: To match shop primer.
 - 1. Flat and Non-Flat Paints: Maximum volatile organic compound content in accordance with GS-11.

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 intermittent welds and plastic filler.
- 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 Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- G. Accurately form components required for anchorage of stairs and landings and railings to each other and to building structure.

2.3 FABRICATION - PAN STAIRS AND LANDINGS

- A. Fabricate stairs and landings ready to receive wood steps.
- B. Form stringers with 1/2 inch thick steel plate, as indicated.
- C. Sub-treads: Formed of 1/4 inch thick steel plate bent to profile indicated on Drawings.
- D. Form integral baluster and handrail from 1/2 by 2 inch diameter steel with 1/2 inch diameter steel rod pickets, welded construction. Space pickets to produce maximum 4 inch clear opening unless otherwise indicated. Weld handrails 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. Prime paint items with one coat two coats.
- D. Galvanizing: ASTM A123/A123M; hot dip galvanize after fabrication.
- E. Finish Coat: Fabricators standard powder coat finish for steel, color as selected by Architect.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify that 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 or embedded in masonry with setting templates.

3.3 INSTALLATION

- A. Install components plumb and level, accurately fitted, free from distortion or defects.
- B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.
- C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- D. Field weld components indicated on shop drawings. Perform field welding in accordance with AWS D1.1.
- E. Field bolt and weld to match shop bolting and welding. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- F. Mechanically fasten joints butted tight, flush, and hairline. Grind welds smooth and flush.
- G. Obtain approval prior to site cutting or creating adjustments not scheduled.
- H. Install wood treads as indicated on Drawings and in conformance with Shop Drawings.
- I. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.4 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.

3.5 PROTECTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Protection of installed construction.
- B. Protect stairs, balusters and handrail from damage from construction traffic and operations.

END OF SECTION

SECTION 05 52 00

METAL RAILINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Steel railings, balusters, and fittings.
 - 2. Handrails.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 DESIGN REQUIREMENTS

- A. Design handrail, guardrail, and attachments to resist forces as required by IBC. Apply loads non-simultaneously to produce maximum stresses.
 - 1. Guard Top Rail and Handrail Concentrated Load: 200 pounds applied at any point in any direction.
 - 2. Guard Top Rail Uniform Load: 50 plf applied in any direction.
 - 3. Intermediate Rails, Panels, and Baluster Concentrated Load: 50 pounds applied to 1 sf area.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
- C. Design Data: Submit structural design calculations signed and sealed by professional engineer responsible for their preparation.
- D. Samples:
 - 1. Submit two handrail samples, 12 inches long.
 - 2. Submit two samples of fittings, wall brackets, escutcheons, and end stops.

1.4 QUALITY ASSURANCE

- A. Prepare Shop Drawings under direct supervision of a professional engineer experienced in design of this work and licensed at the place where the Project is located.

1.5 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 HANDRAILS AND RAILINGS

- A. Manufacturers and Products: As selected

2.2 STEEL RAILING SYSTEM COMPONENTS

- A. Steel Materials:
 - 1. Rolled Sections: ASTM A36/A36M.
 - 2. Plates: ASTM A283/A283M.
 - 3. Bolts, Nuts, and Washers: ASTM A325 , hot-dip galvanized to ASTM A153/A153M for galvanized components.
 - 4. Welding Materials: AWS D1.1; type required for materials being welded.
- B. Rails: 1/2 by 2 inches steel plate; welded joints.
- C. Posts: 1/2 by 2 inches steel plate; welded joints.
- D. Balusters: 1/2 inch diameter steel bar, oriented as indicated.
- E. Fittings: Elbows, T-shapes, wall brackets, escutcheons; cast steel.
- F. Mounting: Adjustable brackets and flanges,. Prepare backing plate for mounting in wood stud framed wall construction.
- G. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.
- H. Splice Connectors: Steel concealed spigots.

2.3 ACCESSORIES

- A. Grout: As specified in Section 03 62 00.

2.4 FABRICATION

- A. Fit and shop assemble components in largest practical sizes for delivery to site.
- B. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
- C. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- E. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.

- F. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler or continuous welds.
- G. 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.
- H. Accurately form components [to suit ramps, stairs, and landings,] to each other and to building structure.
- I. Accommodate for expansion and contraction of members and building movement without damage to connections or members.

2.5 SHOP FINISHING - STEEL

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Do not paint surfaces in direct contact with concrete or where field welding is required.
- C. Shop Primer SSPC 15, Type 1, red oxide.
- D. Shop Painting: Manufacturer's standard powder coat finish, color as selected by Architect.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify that 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 or placed in partitions with setting templates, to appropriate sections.

3.3 INSTALLATION

- A. Install components plumb and level, accurately fitted, free from distortion or defects.
- B. Anchor railings to structure with anchors, plates, and angles.
- C. Set railing in sleeves where indicated. Grout annular space between sleeves and railing posts.

- D. Field weld anchors as indicated on shop drawings. Touch-up welds with primer. Grind welds smooth.
- E. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- F. Assemble with spigots and sleeves to accommodate tight joints and secure installation.
- G. After erection, touch up welds, abrasions, and damaged finishes with prime paint or galvanizing repair paint to match shop finishes.

3.4 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation From Plumb: 1/4 inch in 10 feet, non-cumulative.
- C. Maximum Offset From True Alignment: 1/4 inch.
- D. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 71 13

FABRICATED METAL SPIRAL STAIRS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes fabricated spiral stairs with steel central-supporting columns and radiating treads, custom top landing and landing support.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures: Requirements for submittals.
- B. Product Data: For each type of product.
- C. Shop Drawings: For fabricated spiral stairs. Include plans, elevations, sections, details, and attachments to other work.
- D. Design Data: Submit structural design calculations signed and sealed by professional engineer responsible for their preparation.
- E. Samples: For products involving selection of color, texture, or design.
- F. Welding certificates.

1.3 QUALITY ASSURANCE

- A. Prepare Shop Drawings under direct supervision of a professional engineer experienced in design of this work and licensed at the place where the Project is located.

1.4 QUALIFICATIONS

- A. Welders: AWS qualified within the previous 12 months.

1.5 PRE-INSTALLATION MEETING

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers:
 - 1. Iron Shop (The).
 - 2. Substitutions: Section 01 60 00 - Product Requirements

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance of Stairs: Fabricated spiral stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7:
 - 1. Uniform Load: 100 lbf/sq. ft.
 - 2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
 - 3. Uniform and concentrated loads need not be assumed to act concurrently.
 - 4. Railing Loads: Stairs shall withstand stresses resulting from railing loads in addition to loads specified above.

- B. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7:
 - 1. Handrails:
 - a. Uniform load of 50 lbf/ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Top Rails of Guards:
 - a. Uniform load of 50 lbf/ft. applied horizontally and concurrently, with 100 lbf/ft. applied vertically downward.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 3. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
 - b. Uniform load of 25 lbf/sq. ft. applied horizontally.
 - c. Infill load and other loads need not be assumed to act concurrently.

2.3 SPIRAL STAIRS

- A. Center Column: Steel pipe welded to baseplate for anchorage to floor structure. Brace column at upper floors by means of landings attached to column and floor structure unless otherwise indicated. Provide cap for column if top is exposed.

- B. Treads: Formed steel plate, welded to hubs or center column, and as follows:
 - 1. Diamond patten pan treads without legs.

- C. Railings: Uniformly bent to spiral shape, and continuing at top to form guardrail around floor opening.

2.4 MATERIALS

- A. Brackets, Flanges, and Anchors: Same metal and finish as supported item unless otherwise indicated.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or Grade D.
- D. Steel Pipe Columns: ASTM A 53/A 53M, Schedule 40. Provide Schedule 80 for columns larger than NPS 4 and where required to support loads.
- E. Steel Tubing: Either cold-formed steel tubing complying with ASTM A 500/A 500M or mandrel-drawn mechanical tubing complying with ASTM A 513, Type 5.
- F. Aluminum:
 - 1. Extrusions: ASTM B-221, alloy 6063, Temper 5.
 - 2. Sheet and Plate: ASTM B-209, alloy 3003, temper H16.

2.5 MISCELLANEOUS MATERIALS

- A. Fasteners: For connecting stair components and for anchoring stairs to other construction, select fasteners of the type, grade, and class required to produce connections capable of withstanding design loadings.
 - 1. For steel and cast iron, use plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
- B. Shop Primer for Steel: Primer formulated for use over zinc-coated metal and compatible with finish paint systems indicated.

2.6 FABRICATION

- A. Fabricate connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- B. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Finish exposed surfaces smooth and blended and, except for fillet welds, so welded surface matches contours of adjoining surfaces.
- C. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

2.7 STEEL AND IRON FINISHES

- A. Manufacturer's standard black primer, for field finishing.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify that field conditions are acceptable and are ready to receive work.

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 or embedded in masonry with setting templates.

3.3 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where needed for securing fabricated spiral stairs to in-place construction; include threaded fasteners for concrete and masonry inserts, through bolts, lag bolts, wood screws, and other connectors as required.
- B. Install fabricated spiral stairs accurately in location, alignment, and elevation; level and plumb; and according to manufacturer's written instructions.
- C. Install fabricated spiral stairs by welding to steel structure or to weld plates cast into concrete unless otherwise indicated.
- D. Field Welding:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

3.4 CLEANING AND PROTECTION

- A. For galvanized surfaces, clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780/A 780M.
 - 1. Paint repaired areas with same material used for shop painting.
- B. Protect finished tread surfaces during construction by covering with 1/2-inch- thick plywood secured with plastic strapping or another nonmarring fastening method.

END OF SECTION

SECTION 06 05 73
WOOD TREATMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Preservative treatment, ACQ type.
 - 2. Fire retardant treatment.
- B. Refer to Section 014335 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data for wood treatment materials and applications.

1.3 QUALITY ASSURANCE

- A. Source Quality: Obtain each type of treated wood from a single manufacturer.
- B. Surface Burning Characteristics: ASTM E84.
 - 1. Flame Spread Index: 25, maximum.
 - 2. Smoke Developed Index: 450, maximum.
- C. Moisture Content After Treatment:
 - 1. Lumber: Maximum 19 percent.
 - 2. Structural Panels: Maximum 15 percent.
- D. Apply label from agency approved by authority having jurisdiction to identify each fire retardant treated material. Include the following identification:
 - 1. Inspection agency.
 - 2. Standard to which the material was treated.
 - 3. Treating facility.
 - 4. Treatment material and retention.
 - 5. End use for which the product is suitable.
 - 6. Kiln dried after treatment.

PART 2 PRODUCTS

2.1 PRESERVATIVE WOOD TREATMENT - ACQ

- A. Manufacturers:
 - 1. Chemical Specialties Inc.; Preserve.
 - 2. Hoover Treated Wood Products Inc.; Dura-Guard.
 - 3. Osmose; NatureWood.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Wood Preservative (Pressure Treatment): AWPA U1, Commodity Specification A-Sawn Products or F-Wood Composites using water-borne ammoniacal copper quat (ACQ) preservative.
- C. Kiln dry wood after treatment to maximum moisture content specified in other sections.

2.2 FIRE RETARDANT WOOD TREATMENT

- A. Manufacturers:
 - 1. Interior Type:
 - a. Arch Wood Protection; Dricon fire retardant treated wood.
 - b. Hoover Treated Wood Products Inc.; Pyro-Guard fire retardant treated wood.
 - c. Chemical Specialties Inc.; D-Blaze fire retardant treated wood.
 - d. Osmose; FirePRO fire retardant treated wood.
 - e. Substitutions: Section 01 60 00 - Product Requirements.
 - 2. Exterior Type:
 - a. Chemco Inc; FRX Exterior Fire-Retardant-Treated Wood.
 - b. Hoover Treated Wood Products Inc.; Exterior Fire-X fire retardant treated wood.
 - c. Substitutions: Section 01 60 00 - Product Requirements.
- B. Fire Retardant Treatment: Urea formaldehyde free pressure treatment, AWPA C20 for lumber and AWPA C27 for plywood, chemically treated and pressure impregnated.
 - 1. Interior Applications:
 - a. Roof Sheathing, Roof Trusses, Roof Framing: Interior Type A High temperature.
 - b. Other Interior Locations: Interior Type A.
 - 2. Exterior Applications: Exterior type for the following components:
- C. Shop pressure treat wood materials required for concealed interior locations and where indicated on Drawings, in accordance with manufacturer's instructions.
- D. Kiln dry wood after treatment to maximum moisture content specified in other sections.

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 061000 – STRUCTURAL WOOD FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Wood framing.
2. Wood supports.
3. Wood blocking.
4. Wood nailers.
5. Wood sheathing.
6. Wood subflooring.

B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

C. Refer to Section 01 43 35 for Mockup requirements affecting work of this section.

1.2 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product indicated.

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

B. Research/Evaluation Reports: For the following:

1. Treated wood.
2. Engineered wood products.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Expansion anchors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive stained or natural finish, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Provide dressed lumber, S4S, unless otherwise indicated.
4. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

- B. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable Design Stresses: Meet or exceed those indicated per manufacturer's published values determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

- C. Wood Structural Panels:

1. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA C2 (lumber) and AWPA C9 (plywood), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

- B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.

- C. Mark each treated item with treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

- D. Application: Treat items indicated on Drawings, and the following:

1. Wood nailers, curbs, blocking, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2. Wood sills, sleepers, blocking, nailers, and similar concealed members in contact with masonry or concrete.
3. Wood floor plates that are installed over concrete slabs directly in contact with earth.

2.4 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, provide materials that comply with performance requirements in AWPAC20 (lumber) and AWPAC27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D 5664, for lumber and ASTM D 5516, for plywood.
 2. Use treatment that does not promote corrosion of metal fasteners.
 3. Use Exterior type for exterior locations and where indicated.
 4. Use Interior Type A High Temperature (HT), unless otherwise indicated.

2.5 DIMENSION LUMBER

- A. General: Of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.
- B. Framing: Construction or No. 2 grade and any of the following species:
1. Douglas fir-larch, Douglas fir-larch (north), or Douglas fir-south; NLGA, WCLIB, or WWPA.
 2. Hem-fir or Hem-fir (north); NLGA, WCLIB, or WWPA.
 3. Southern pine; SPIB.
 4. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.

2.6 ENGINEERED WOOD PRODUCTS

- A. Laminated-Veneer Lumber: Composite of wood veneers with grain primarily parallel to member lengths, manufactured with exterior-type adhesive complying with ASTM D 2559. Allowable design values determined according to ASTM D 5456.
1. Manufacturers:
 - a. Boise Cascade Corporation.
 - b. Georgia-Pacific Corporation.
 - c. Louisiana-Pacific Corporation.
 - d. Trus Joist MacMillan.
 2. Extreme Fiber Stress in Bending, As noted on drawings.

3. Modulus of Elasticity, Edgewise: As noted on drawings.
- B. Wood I-Joists: Prefabricated units complying with APA PRI-400; depths and performance ratings not less than those indicated.
1. Manufacturers:
 - a. Boise Cascade Corporation.
 - b. Georgia-Pacific Corporation.
 - c. Louisiana-Pacific Corporation.
 - d. Trus Joist MacMillan.
 2. Structural Capacities: Establish and monitor structural capacities according to ASTM D 5055.
 3. Trademark: Factory mark I-joists with APA trademark indicating nominal joist depth, joist class, span ratings, mill identification, and I-joist compliance with APA standard.
- C. Rim Boards: Performance-rated product complying with APA PRR-401.
1. Material: All-veneer panels, composite panels, or structural composite lumber.
 2. Thickness and Grade: 1.25 -inch rim board.
 3. Trademark: Factory mark with APA trademark indicating thickness, grade, and compliance with APA standard.

2.7 SHEATHING

- A. Plywood Wall Sheathing: Exterior, Structural I sheathing.
- B. Plywood Roof Sheathing: Exterior, Structural I sheathing.

2.8 SUBFLOORING AND UNDERLAYMENT

- A. Plywood Subflooring: Exterior, Structural I single-floor panels or sheathing.

2.9 MISCELLANEOUS MATERIALS

- A. Fasteners:
 1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
 2. Power-Driven Fasteners: CABO NER-272.
 3. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and flat washers.
- B. Metal Framing Anchors: Made from hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

1. Manufacturers:
 - a. Alpine Engineered Products, Inc.
 - b. Cleveland Steel Specialty Co.
 - c. Simpson Strong-Tie Company, Inc.
 - d. United Steel Products Company, Inc.
 2. Research/Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.
 3. Allowable Design Loads: Meet or exceed those indicated per manufacturer's published values determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- C. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.
- C. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 1. CABO NER-272 for power-driven fasteners.
 2. Published requirements of metal framing anchor manufacturer.
 3. Table ?????, "Fastening Schedule," in the International Building Code.
- D. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
- E. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.
- F. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

- G. Comply with applicable recommendations contained in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.

- H. Fastening Methods:
 - 1. Subflooring: Glue and nail to wood framing.
 - 2. Sheathing: Nail to wood framing.

END OF SECTION 06100

SECTION 06 10 53

MISCELLANEOUS ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Roof curbs, cants, and perimeter nailers.
 - 2. Blocking in wall and roof openings.
 - 3. Wood furring and grounds.
 - 4. Concealed wood blocking for support of toilet and bath accessories, wall cabinets, wood trim, and other components as required.
 - 5. Telephone and electrical panel back boards.
 - 6. Preservative treatment and fire treatment of wood.
- B. Refer to Section 06 10 00 "Rough Carpentry" for requirements affecting the Work of this section.
- C. Refer to Section 014335 for Mockup requirements affecting work of this section.
- D. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit technical data on wood preservative and fire retardant treatment materials and provide application instructions where required.

1.3 QUALITY ASSURANCE

- A. Perform Work in accordance with the following agencies:
 - 1. Lumber Grading Agency: Certified by ALSC.
 - 2. Plywood Grading Agency: Certified by APA/EWA.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Lumber Grading Rules: AP&PA.
- B. Miscellaneous Framing: Stress Group D, southern yellow pine, 19 percent maximum moisture content after treatment, pressure preservative treat.

- C. Plywood: APA/EWA Rated Sheathing or structural I as required, Grade C-D where permitted; Exposure Durability 1.

2.2 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Fasteners: Hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
 - 2. Anchors: Toggle bolt, expansion shield and lag bolt for anchorage to solid masonry or concrete. Bolt or ballistic fastener for anchorages to steel.

2.3 FACTORY WOOD TREATMENT

- A. Refer to Section 06 05 73 Wood Treatment.

PART 3 EXECUTION

3.1 FRAMING

- 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. Space framing and furring 16 inches oc.
- E. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.
- F. Coordinate curb installation with installation of decking and support of deck openings, roofing vapor retardant, parapet construction, and roof installation.

3.2 SHEATHING

- A. Secure sheathing to framing members with ends over firm bearing and staggered.
- B. Install telephone and electrical panel back boards with plywood sheathing material where required. Size the back board by 12 inches beyond size of electrical and telephone panel.

3.3 SITE APPLIED WOOD TREATMENT

- A. Apply preservative treatment.
- B. Brush apply two coats of preservative treatment on wood in contact with cementitious materials or roofing and related metal flashings. Treat site-sawn cuts.
- C. Allow preservative to dry prior to erecting members.

END OF SECTION

SECTION 06 16 00
SHEATHING (ZIP SYSTEM)

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Combination wall sheathing and air and water-resistive barrier.
 - 2. Self-adhering flexible flashing.
- B. Refer to Section 06 10 00 "Rough Carpentry" for requirements affecting the Work of this section.
- C. Refer to Section 014335 for Mockup requirements affecting work of this section.
- D. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. For panels with integral panel foam insulation and water resistive barrier, include data on air-/moisture-infiltration protection based on testing according to referenced standards.

1.3 QUALITY ASSURANCE

- A. Code Compliance: Comply with requirements of the following:
 - 1. International Code Council (ICC), ICC-ESR1474 (ZIP System Wall Sheathing).
 - 2. International Code Council (ICC), ICC-ESR2227 (ZIP System Tape).

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Outdoor Storage: Comply with manufacturer's recommendations
 - 1. Set panel bundles on supports to keep off ground.
 - 2. Cover panels loosely with waterproof protective material.
 - 3. Anchor covers on top of stack, but keep away from sides and bottom to assure adequate air circulation.
 - 4. When high moisture conditions exist, cut banding on panel stack to prevent edge damage.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sheathing system that fail due to manufacturing defects within specified warranty period.

1. System Warranty Period: 15 years from date of Substantial Completion.
2. Panel Warranty Period: 30 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
1. Fire-Resistance Ratings: As indicated on drawings

2.2 COMBINATION WALL SHEATHING, WATER-RESISTIVE BARRIER, AND AIR BARRIER

- A. Oriented-Strand-Board Wall Sheathing: With integral foam panel insulation and air and water-resistive barrier, Exposure 1 sheathing.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Huber Engineered Woods LLC; ZIP System R Sheathing.
 2. Panel Thickness: 1-1/2 inches unless otherwise indicated.
 3. TECO rated OSB: Not less than 7/16 inch.
 4. Provide fastening guide on top panel surface with pre-spaced fastening symbols for 16-inches and 24-inches on centers spacings.
 5. Performance Standard: DOC PS2 and ICC-ES ESR-1474.Factory laminated integral air and water-resistive barrier facer.
 7. Perm Rating of Integral Water-Resistive Barrier: 12-16 perms.
 8. Exposure Time: Designed to resist weather exposure for 120 days.

2.3 FASTENERS

- A. General: Provide fasteners of size and type that comply with requirements specified in this article by the authority having jurisdiction, International Building Code, International Residential Code, Wood Frame Construction manual, and National Design Specification..

2.4 MISCELLANEOUS MATERIALS

- A. Self-Adhering Tape: Pressure-sensitive, self-adhering, cold-applied, proprietary seam tape consisting of polyolefin film with acrylic adhesive.
1. Basis-of-Design Product: Subject to compliance with requirements provide Huber Engineered Woods; ZIP System Tape or a comparable product.
 2. Thickness: 0.012 inch Code Compliance: Comply with requirements of authorities having jurisdiction and ICC Evaluation Service, Inc. AC148 (2006).Furring Strips: Provide furring strips as recommended by Zip System manufacturer.
- C. Provide EPDM gasket between furring and Zip System components, as recommended by Zip System manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Chapter 23 in ICC's "International Building Code."
 - 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Only mechanically attached and drainable EIFS and exterior insulation should be used with ZIP System wall sheathing.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall and Roof Sheathing:
 - a. Nail to wood framing.
 - b. Space panels 1/8 inch apart at edges and ends.
 - c. Install fasteners 3/8 inch (9.5 mm) to 1/2 inch (12.7 mm) from panel edges.
 - d. Space fasteners in compliance with requirements of authority having jurisdiction.

3.3 SHEATHING JOINT TREATMENT

- A. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Apply proprietary seam tape to joints between sheathing panels.
 - 2. Utilize self-adhering tape gun or hard rubber roller provided by manufacturer to ensure tape is completely adhered to substrates.

3.4 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturers written instructions.
 - 1. After flashing has been applied, roll surfaces with a hard rubber to ensure that flashing is completely adhered to substrates.

END OF SECTION 06160

SECTION 06 16 29

ACOUSTICAL UNDERLAYMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Impact Sound Insulation.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 PERFORMANCE REQUIREMENTS

- A. Provide recycled rubber impact sound insulation which has been manufactured and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal Procedures.
- B. Product Data: Submit product data, including manufacturer's published literature, for specified products.
- C. Shop Drawings: Manufacturer's specifications, catalog cuts and other items needed to demonstrate compliance with the specified requirements. Also the manufacturer's recommended installation procedures, which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.
- D. Samples: Submit a verification sample.
- E. Quality Assurance Submittals: Submit the following:
 - 1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
 - 2. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics, criteria and physical requirements.
 - 3. Manufacturer's Instructions: Manufacturer's installation instructions
- F. Closeout Submittals: Submit the following:
 - 1. Warranty: Warranty documents specified herein.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
 - a. Certificate: When requested, submit certificate indicating qualification.

2. Manufacturer's Qualifications: Manufacturer capable of approving application method.

1.5 MOCK-UPS

- A. Section 01 40 00 - Quality Requirements: Mockups.
- B. Install at project site a job mock-up using acceptable products and manufacturer-approved installation methods. Comply with workmanship standard.
 1. Mock-Up Size: As determined by acoustical consultant.
 2. Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
 3. Incorporation: Mock-up may be incorporated into final construction upon Owner's approval.

1.6 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Preinstallation Meeting.
- B. Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's instructions and manufacturer's warranty requirements.

1.7 DELIVERY, STORAGE & HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- 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.
- D. Storage and Protection: Store materials at temperature and humidity conditions recommended by manufacturer and protect from exposure to harmful weather conditions.

1.8 PROJECT CONDITIONS

- A. Section 01 70 00 - Execution and Closeout Requirements: Product Warranties.
- B. Temperature Requirements: Maintain air temperature in spaces where products will be installed for time period before, during and after installation as recommended by manufacturer.
- C. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.9 WARRANTY

- A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

1. Manufacturer's Warranty: Warrant products to be free from manufacturing defects on both material and workmanship for life of the original floor, under normal non-abusive conditions.

1.10 EXTRA MATERIALS

- A. 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 01 Closeout Submittals (Maintenance Materials) Section.
 1. Quantity: Furnish quantity of recycled rubber Impact Sound Insulation units as requested on purchase order.
 2. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra materials.

PART 2 PRODUCTS

2.1 ACOUSTICAL UNDERLAYMENT

- A. Manufacturer:
 1. Maxxon Corporation; Acousti-Mat II.
 2. Substitutions: No substitutions permitted.
- B. Acoustical Underlayment:
 1. Thickness: 1/4 inch.
 2. Density: Minimum 4.0 pcf.
 3. Flammability/Smoke Density: NFPA Class A.
 4. Product Testing:
 - a. Field Impact Insulation Class (ASTM E1007): Floor-ceiling assembly must meet requirement as stated by building code.

2.2 SOURCE QUALITY

- A. Source Quality: Obtain Impact Sound Insulation materials from a single manufacturer.

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 substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

3.3 PREPARATION

- A. Surface Preparation: Surface shall be prepared in accordance with ANSI standards.

3.4 ERECTION/INSTALLATION/APPLICATION/CONSTRUCTION

- A. Recycled Rubber Impact Sound Insulation: Comply with manufacturer's instructions.
- B. Installation should not begin until all other trades are finished in the area.
- C. Areas to receive the Impact Sound Insulation should be weather tight and maintained at a minimum uniform temperature of 65°F for 48 hours before, during and after the installation.

3.5 FIELD QUALITY REQUIREMENTS

- A. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations in accordance with manufacturer's instructions.
- B. Field Tests should be performed by an independent acoustical laboratory accredited by the U.S. Department of Commerce, National Institute of Standards and Technology under the National Voluntary Laboratory Accreditation Program for the specified test procedure.
- C. The cost for all field acoustical testing, corrective work associated with the installation of the Impact Sound Insulation and flooring to meet the minimum requirements, shall be borne by the flooring contractor(s).

3.6 CLEANING

- A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. 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.

3.7 PROTECTION

- A. Protection: Protect installed product and finish surfaces from damage during construction.

END OF SECTION

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes
 - 1. Interior finish carpentry items.
 - a. Wood door frames.
 - b. Wood standing and running trim.
 - c. Wood casings.
 - d. Wood stairs.
 - e. High pressure laminate counter tops in laundry areas.
 - 2. Exterior finish carpentry items:
 - a. PVC trim - standing and running types.
 - b. Decking.
 - c. Privacy wall sheathing.
 - d. Rainscreen System.
 - e. Interior steel stair finish treads and risers.
 - 3. Hardware and attachment accessories.
- B. Refer to Section 014335 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings:
 - 1. Indicate materials, component profiles, fastening methods, jointing details, and accessories.
- C. Product Data:
 - 1. Submit data on PVC trim materials.
 - 2. Submit data on attachment hardware, finish hardware, and adhesives.
- D. Samples:
 - 1. Submit two samples of finish plywood, 8 x 10 inch in size illustrating wood grain and specified finish.
 - 2. Submit two samples each of all exterior trims, 12 inch long.
 - 3. Submit two samples of each wood trim section 10 inch long.
 - 4. Submit two samples of laminates, prefinished paneling, synthetic surfacing, hardware items, and shop finishes.
 - 5. Submit two samples in manufacturer's standard size, of each color of available decking for color selection.

- E. Certification: Submit copy of fabricator's authorization to use AWI Grade Stamps.

1.3 QUALITY ASSURANCE

- A. Perform work in accordance with AWI Quality Standards, Custom Grade.

1.4 QUALIFICATIONS

- A. Fabricator: Company specializing in fabricating Products specified in this section with minimum three years documented experience.
- B. Forest Stewardship Council accredited certification agencies.
 - 1. Rainforest Alliance SmartWood Program.
 - 2. Scientific Certification Systems.

1.5 PRE-INSTALLATION MEETING

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing Work of this section.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Protect work from moisture damage.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.8 SEQUENCING

- A. Section 01 10 00 - Summary: Requirements for sequencing.
- B. Sequence work to ensure utility connections are achieved in orderly and expeditious manner.

1.9 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate work with plumbing rough-in, electrical rough-in, installation of associated and adjacent components.

PART 2 PRODUCTS

2.1 COMPONENTS

- A. Lumber: Graded in accordance with AWI Quality Standards; maximum moisture content of 8 percent.
 - 1. Transparent Finished Lumber: AWI Grade II, species as indicated in finish schedule, plain sliced.
 - 2. Opaque Finished Lumber: AWI Grade III, any close grained hardwood; unless specified otherwise in finish schedule.
- B. Fiberboard: Super-Cut POP manufactured by The Milton W. Bosley Company.
 - 1. Applications: May be used in place of lumber for opaque finished wood trim.
- C. Softwood Lumber: PS 20; Graded in accordance with AWI Grade III; clear white pine species, maximum moisture content of 6 percent; suitable for opaque finish.
- D. Hardwood Lumber: Graded in accordance with AWI Grade II; red oak species, maximum moisture content of 8 percent; suitable for transparent finish.
- E. Hardwood Plywood: Graded in accordance with AWI Custom; particleboard core, type of glue recommended for application; rift cut red oak face species unless otherwise indicated, Grade A, suitable for transparent finish.
- F. High Pressure Decorative Laminate: NEMA LD 3, GP50 for horizontal surfaces, GP28 for vertical surfaces, CL20 for cabinet liner surfaces, BK20 for undecorated backing sheets, PF42 for post forming, FR50 for fire-retardant surfaces; through color, pattern, and gloss surface texture as selected.
- G. Sheet Metal Components: Stainless steel, Type 304 with #4 satin finish.
- H. Synthetic Surfacing: Synthetic marble of proprietary resins, with integral color and design, stain resistant to domestic chemicals and cleaners. Specified in Section 06 61 16 Solid Surface Fabrications.

2.2 WOOD STAIRS

- A. Prefabricated wood stair sets in configurations, sizes, and locations as indicated.
 - 1. Oak treads.
 - 2. Oak risers.
 - 3. Finish: Stained with transparent finish. Refer to Section 09 90 00 Painting and Coating.
- B. Metal Stair Treads: Red oak, sized as indicated on Drawings.

2.3 .PVC TRIM

- A. Manufacturers:
 - 1. AZEK Building Products, Inc.; AZEK Trimboards as Basis of Design.
 - 2. Brahma Building Products LLC.; BrahmaBoard Trim products.

3. Fypon.
 4. KLEER Lumber.
 5. Kommerling USA; KOMA Trimboards.
 6. Substitutions: Section 01 60 00 - Product Requirements.
- B. PVC Trim: Expanded PVC trim, white color; size as indicated on Drawings.
- C. Fasteners: Stainless steel finishing nails.
- D. Finish: Field painted. Refer to Section 09 90 00 Painting and Coating.

2.4 DECKING

- A. Manufacturers: Provide Trex Brasilia as Basis of Design or approved comparable products.
1. Colors and Texture: As selected.
- B. Plastic lumber formed from HDPE and wood sawdust consisting of 100 percent recycled material. Size: Nominal **5/4 x 6 inches** unless otherwise indicated on Drawings.
- C. Fasteners: Hot-dipped galvanized or stainless steel type recommended by decking manufacturer for application.

2.5 PRIVACY WALL SHEATHING

- A. Privacy Wall Sheathing: Provide Trex Brasilia as Basis of Design or approved comparable products. Plastic lumber formed from HDPE and wood sawdust consisting of 100 percent recycled material
1. Thickness: 5/4 inches.
 2. Width: 5-1/2 inches.
 3. Colors and Texture: As selected.
 4. Fasteners as recommended by manufacturer for application.

2.6 RAINSCREEN SYSTEM

- A. Provide rainscreen system as indicated on Drawings.
- B. Exterior Sheathing: Provide Trex Brasilia as Basis of Design or approved comparable products. Plastic lumber formed from HDPE and wood sawdust consisting of 100 percent recycled material
1. Thickness: 5/4 inches.
 2. Width: 5-1/2 inches.
 3. Colors and Texture: As selected.
- C. Weather Barrier Membrane: Self adhesive air and vapor barrier.
1. Manufacturers:
 - a. Henry Blueskin.
 - b. Delta Fassade S.
 2. Thickness: 40 mils.
 3. Elongation: 200 percent minimum per ASTM D412 Die C.
 4. Permeance: 0.03 perms.

- 5. Primer: As recommended by manufacturer.
- D. Substrate Sheathing: OSB plywood, thickness as indicated. Refer to Section 061000 Rough Carpentry.
- E. Furring Strips: 3/4 inch thick by minimum 3-1/2 inch wide pressure treated wood furring strips
- F. Fasteners and Accessories: All stainless steel fasteners, flashings, sealants, and other materials as indicated on Drawings.

2.7 HIGH PRESSURE LAMINATE COUNTER TOPS

- A. Install high pressure laminate counter tops in laundry areas. Refer to Section 064000 Architectural Woodwork.

2.8 ACCESSORIES

- A. Adhesive for High Pressure Decorative Laminates: Type recommended by laminate manufacturer to suit application.
 - 1. Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
 - 2. Aerosol Adhesives: Maximum volatile organic compound content in accordance with GS-36.
- B. Fasteners: Of size and type to suit application; galvanized finish.
- C. Concealed Joint Fasteners: Threaded steel.
- D. Lumber for Shimming, Blocking, and Support: Softwood lumber of hemfir species.
- E. Veneer Edge Band: Standard wood veneer edge band matching face veneer.
 - 1. Flat and Non-Flat Paints: Maximum volatile organic compound content in accordance with GS-11.
- F. Wood Filler: Tinted to match surface finish color.

2.9 WOOD TREATMENT

- A. Preservative Treatment: As specified in Section 06 05 73.
- B. Fire Retardant Treatment: As specified in Section 06 05 73.

2.10 FABRICATION

- A. Fabricate to AWI Custom standards.
- B. Door Frames:
 - 1. Fabricate swing door frames from solid lumber with applied stops and dadoed joints for field assembly.

2. Factory machine jambs for hinge and strike preparation. Coordinate hardware preparation with Section 08 14 16 and Section 08 71 00 for hardware type and location.
 3. Fabricate sliding and bi-fold door frames from solid lumber as cased opening.
- C. Stairs:
1. Shop fabricate stair assemblies including carriage, stringers, treads, and risers.
 2. Closed Stringers: Rout stair treads and risers into stringers and wedge tight.
 3. Risers: Rabbeted to receive tread.
 4. Closed end treads and risers do not require tongue and groove machining.
- D. Shop assemble work for delivery to site, permitting passage through building openings.
- E. Fit exposed sheet material edges with matching hardwood or matching veneer edging. Use one piece for full length only.
- F. Cap exposed high pressure decorative laminate finish edges with material of same finish and pattern unless otherwise indicated.
- G. Shop prepare and identify components for grain matching during site erection.
- H. When necessary to cut and fit on site, fabricate materials with ample allowance for cutting. Furnish trim for scribing and site cutting.
- I. Apply high pressure decorative laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises.
- J. Apply laminate backing sheet to reverse face of high pressure decorative laminate finished surfaces.

2.11 SHOP FINISHING

- A. Sand work smooth and set exposed nails and screws.
- B. Apply wood filler in exposed nail and screw indentations.
- C. On items to receive transparent finishes, use wood filler matching surrounding surfaces and of types recommended for applied finishes.
- D. Stain, seal, and varnish exposed to view surfaces.
- E. Seal internal surfaces and semi-concealed surfaces.
- F. Seal surfaces in contact with cementitious materials.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify adequacy of backing and support framing.
- C. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.2 PREPARATION

- A. Prime paint surfaces of items or assemblies in contact with cementitious materials in accordance with Section 09 90 00, before installation.

3.3 INSTALLATION

- A. Install work in accordance with AWI Custom quality standard.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do use additional overlay trim to conceal larger gaps.
- D. Install components with nails, screws, and bolts with blind fasteners at manufacturer's recommended spacing.
- E. Miter running joints and external corners. Cope internal corners.
- F. Install prefinished paneling with full bed contact adhesive applied to substrate.
- G. Preparation For Site Finishing:
 - 1. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
 - a. PVC Exterior Trim: Do not fill fastener indentations.
- H. Site Finishing: Refer to Section 09 90 00 Painting And Coating.

3.4 DECKING

- A. Install decking in accordance with manufacturer's instructions.
- B. Pre-drill holes for fasteners or use specialty fasteners as recommended by manufacturer.
- C. Install decking in single piece for full length wherever possible.
- D. Align decking with uniform open joints, no greater than width of 6d nail.

- E. Stagger end joints minimum 16 inches between adjacent deck boards.

3.5 PRIVACY WALL SHEATHING

- A. Install sheathing planks as indicated on Drawings.
- B. Use fasteners approved by manufacturer.

3.6 RAINSCREEN SYSTEM

- A. Install substrate sheathing as indicated on Drawings.
- B. Prepare substrate sheathing for installation of weather barrier. Install primer as recommended by weather barrier manufacturer.
- C. Install pressure treated furring strips, spaced at 16 inches o.c. unless otherwise indicated on Drawings.
- D. Install rainscreen sheathing planks as indicated on Drawings.

3.7 WOOD STAIR TREADS

- A. Install wood stair treads on steel subtreads of steel stair assemblies. Install per Shop Drawings and in conformance with Drawings.

3.8 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation from Indicated Position: 1/16 inch.
- C. Maximum Offset from Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 40 00

ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Plastic laminate counter tops.
 - 2. Preparation for installing utilities.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.
- C. Product Data: Submit data for hardware accessories.
- D. Samples:
 - 1. Submit two SAMPLES, 8 x 10 inch size samples, illustrating counter top finish and color.

1.3 QUALITY ASSURANCE

- A. Perform work in accordance with AWI Custom quality.

1.4 QUALIFICATIONS

- A. Fabricator: Company specializing in performing Work of this section with minimum three years documented experience.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. During and after installation of Work of this section, maintain same temperature and humidity conditions in building spaces as will occur after occupancy.

1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 PANEL MATERIALS

- A. Plywood: Graded in accordance with AWI Custom; veneer core, 7 ply, type of glue recommended for application; Grade B veneer or better.

2.2 SURFACING MATERIALS

- A. Laminate Manufacturers:
 - 1. Wilsonart.
 - 2. Formica.
 - 3. Nevamar.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Plastic Laminate: NEMA LD 3; color, pattern, and surface texture as selected.
 - 1. Exposed Surfaces: HGS, horizontal grade.
 - 2. Semi-Exposed Surfaces: VGS vertical grade.
 - 3. Concealed Surfaces: CLS for undecorated backing sheets.
- C. Sheet Metal Components: Stainless steel, Type 316 with #4 satin finish.

2.3 ACCESSORIES

- A. Adhesive for High Pressure Decorative Laminates: Type recommended by laminate manufacturer to suit application.
- B. Plastic Edge Trim: Extruded flat shaped; smooth finish; self locking serrated tongue of width to match component thickness, color to match countertop.
- C. Fasteners: Size and type to suit application.
- D. Concealed Joint Fasteners: Threaded steel.
- E. Grommets: Plastic material for cut-outs.
- F. Sealants: As specified in Section 07 90 00.

2.4 FABRICATION

- A. Shop assemble countertops for delivery to site in units easily handled and to permit passage through building openings.
- B. Cap exposed high pressure decorative laminate finish edges with same material with same finish and pattern.
- C. When necessary to cut and fit on site, fabricate materials with ample allowance for cutting. Furnish trim for scribing and site cutting.

- D. Apply high pressure decorative laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.
- E. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
- F. Mechanically fasten back splash to countertops with steel brackets at 16 inches on center.
- G. Fabricate counter tops with cutouts for plumbing fixtures, inserts, appliances, outlet boxes, fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal cut edges.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify adequacy of backing and support framing.
- C. Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

- A. Set and secure countertops in place; rigid, plumb, and level.
- B. Use concealed joint fasteners to align and secure adjoining counter tops.
- C. Carefully scribe countertops abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- D. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 06 61 16

SOLID SURFACING FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Quartz surface counter tops.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 DESIGN REQUIREMENTS

- A. Design items with sufficient strength for handling and placement stresses.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate dimensions, thicknesses, required clearances, tolerances, materials, colors, finishes, fabrication details, adjacent construction, design load parameters, methods of support and anchorages.
- C. Product Data: Provide data on specified component products.
- D. Samples: Submit two samples, 12 x 12 inch in size illustrating color, texture, and finish for each type of counter top selected.
- E. Manufacturer's Installation Instructions: Indicate preparation of opening required, rough-in sizes; tolerances for item placement, and temporary bracing of components.

1.4 OPERATION AND MAINTENANCE DATA

- A. Section 01 78 53 - Operation and Maintenance Data: Material manual submittals.
- B. Maintenance Data: Indicate list of approved cleaning materials and procedures required; list of substances that are harmful to the component materials.
- C. Include instructions for stain removal, and surface and gloss restoration.

1.5 QUALITY ASSURANCE

- A. Surface Burning Characteristics: ASTM E84.
 - 1. Flame Spread Index: 25, maximum.
 - 2. Smoke Developed Index: 450, maximum.

1.6 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Furnish 10 year manufacturer's warranty including coverage for failure from manufacturing, fabrication and installation failure

PART 2 PRODUCTS

2.1 MATERIALS

- A. Manufacturers:
 - 1. Caesarstone.
 - 2. Du Pont, Zodiaq.
 - 3. Substitutions: Section 01 60 00 - Product Requirements.
- B. Resin: Manufacturer's standard type, with integral coloring and aggregates, stain resistant to domestic chemicals and cleaners in accordance with the following:

Property	Result	Test Method
Compressive Strength (Dry)	27,304	ASTM D790
Hardness	7	Moh's Hardness Scale
Stain Resistance	Passes	ANSI Z124.6
Flammability	Class A	ASTM E84
Fungal and Bacterial Resistance	No Growth	ASTM G21

- C. Joint Sealant: Type recommended by manufacturer.
- D. Perimeter Sealant: Silicone, as specified in Section 07 90 00.

2.2 FABRICATION

- A. Fabricate components by mold to achieve shape and configuration indicated on Drawings.
 - 1. Thickness: 1-1/8 inch.
 - 2. Color: As selected.
 - 3. Corners: Square, eased.
 - 4. Edges: Eased
- B. Provide counter tops with cut-outs for sinks and plumbing fixtures as indicated on Drawings.
- C. Provide turned-down surface on side of cabinets, as indicated on Drawings. Adhere to counter tops with manufacturers color matched silicone sealant.

- D. Cure components prior to shipment.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated on shop drawings.
- B. Verify that joint preparation and affected dimensions are acceptable.

3.2 PREPARATION

- A. Provide anchoring devices for installation.

3.3 INSTALLATION

- A. Install components in accordance with shop drawings and manufacturer's instructions.
- B. Align work plumb and level.
- C. Rigidly anchor to substrate to prevent misalignment.
- D. Seal perimeter of fabrication to adjacent construction in accordance with Section 07 90 00.

3.4 TOLERANCES

- A. Maximum Variation From True Dimension: 1/8 inch.
- B. Maximum Offset From True Position: 1/8 inch.

3.5 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Clean fabrication surfaces in accordance with manufacturer's instructions.

END OF SECTION

SECTION 07 13 00
SHEET WATERPROOFING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Bituminous sheet waterproofing at foundation walls.
 - 2. Protective Cover
- B. Refer to Section 014335 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SYSTEM DESCRIPTION

- A. Waterproofing System: Capable of resisting water head of preventing moisture migration to interior.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
- C. Product Data: Submit data for surface conditioner, flexible flashings, joint cover sheet, and joint and crack sealants, with temperature range for application of waterproofing membrane.
- D. Manufacturer's Installation Instructions: Submit special procedures and perimeter conditions requiring special attention.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. 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. Test material samples in accordance with ASTM D449.

1.5 QUALIFICATIONS

- A. Membrane Manufacturer: Company specializing in waterproofing sheet membranes with minimum three years documented experience.
 - 1. Manufacturing Location: Within 500 miles of Project site for final assembly of components into Products.
- B. Applicator: Company specializing in performing the work of this section with minimum three years experience. approved by manufacturer.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Maintain ambient air and substrate temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.

1.7 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Provide minimum five year manufacturer labor and material 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 & Co.; Bituthene 3000 or Bituthene 3000 Low Temperature.
 - 2. W.R. Meadows; Mel-Rol or Me-Rol Low Temp.
 - 3. Carlisle Coatings & Waterproofing; CCW MiraDRI-860 or CCW MiraDRI 861.
 - 4. CETCO Envirosheet or Envirosheet LT.
 - 5. Substitutions: Section 01 60 00 - Product Requirements.
- B. Waterproofing Membrane: Self adhering, 60 mil thick, rubberized asphalt sheet laminated to 4 mil thick polyethylene film; smooth surfaced; nominal 36 inch wide roll; with compatible seam tape and termination bar; conforming to the following criteria:

Properties	Test	Results
Tensile Strength	ASTM D412	300 psi minimum
Elongation	ASTM D412	300 percent minimum
Water Absorption	ASTMD570	0.1 percent maximum

Moisture Vapor(perms)	ASTM E96	0.05 perms maximum
Exposure at Low TemperatureStandard Temperature Membrane	ASTM D1970	Unaffected at minus 20 degrees F
Exposure at Low Temperature Low Temperature Membrane	ASTM D1970	Unaffected at minus 45 degrees F

1. Use standard temperature products when ambient air and substrate temperature is greater than 50 degrees F.
2. Use low temperature products when ambient air and substrate temperature is between 25 and 60 degrees F.

C. Seaming Materials: As recommended by membrane manufacturer.

D. Flexible Flashings: As recommended by manufacturer.

2.2 ACCESSORIES

A. Surface Conditioner: Type recommended by manufacturer, compatible with membrane and substrate.

B. Sealant: As recommended by membrane manufacturer.

C. Protection Board: 1/8 inch thick polystyrene foam sheet bitumen or impregnated glass fiberboard.

D. Cant Strips: Premolded composition material or bitumen impregnated fiberboard; as recommended by manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.

C. Verify items which penetrate surfaces to receive waterproofing are securely installed.

D. Verify substrate surface slopes to drain for horizontal waterproofing applications.

3.2 PREPARATION

A. Protect adjacent surfaces not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing.

- 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.
- E. Apply surface conditioner at a rate recommended by manufacturer. Protect conditioner from rain or frost until dry.

3.3 INSTALLATION - SHEET WATERPROOFING

- A. Install waterproofing in accordance with manufacturer's instructions.
- B. Roll out membrane. Minimize wrinkles and bubbles.
- C. Remove release paper layer. Roll out on substrate with a mechanical roller to encourage full contact bond.
- D. Lap sides and ends.
- E. Overlap edges and ends and seal as recommended by manufacturer, minimum 3 inches. Seal permanently waterproof.
- F. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.
- G. Weather lap joints on sloped substrate in direction of drainage. Seal joints and seams. Coordinate with drainage installation.
- H. Install flexible flashings. Seal watertight to membrane.
- I. Seal membrane and flashings to adjoining surfaces.
- J. Extend membrane over cants and up intersecting surfaces at membrane perimeter minimum 6 inches above horizontal surface for first ply and 6 inches at subsequent plies laid in shingle fashion.
- K. Seal items protruding to or penetrating through membrane and install Counterflashing membrane material.

3.4 INSTALLATION - PROTECTION BOARD

- A. Place protection board directly against membrane; butt joints.
- B. Adhere protection board to substrate with mastic. Scribe and cut boards around projections, penetrations, and interruptions.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Protection of installed construction.
- B. Protect membrane from exposure to elements.
- C. Coordinate backfilling operations to occur within 7 days of installing waterproofing.

END OF SECTION

SECTION 07 18 00
TRAFFIC COATINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Fluid applied pedestrian traffic waterproof coating.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit product characteristics, limitations, and identify dissolving solvents, fuels, and potential destructive compounds.
- C. Samples: Submit two samples of waterproof coating system applied to plywood, 24 x 24 inch in size illustrating color, surface texture, and variations of each.
- D. Manufacturer's Installation Instructions: Submit special environmental conditions required to install the Product and potential incompatibilities with adjacent materials.
- E. Manufacturer's Certificate: Certify applicator is approved by manufacturer.
- F. Manufacturer's Field Reports:
 - 1. Submit reports certifying installation was completed in accordance with the specifications and manufacturer's warranty conditions.
 - 2. Include supplemental installation instructions issued for site specific conditions.

1.3 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Operation and Maintenance Data: Submit procedures for stain removal, repairing surface, and cleaning.
- C. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.4 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 approved by manufacturer.

1.5 MOCK-UP

- A. Section 01 40 00 - Quality Requirements: Requirements for mock-up.
- B. Provide field sample panel, 100 square feet in size, with waterproof coating system applied to representative substrate.
- C. Locate where directed by Architect.
- D. Accepted sample may remain as part of the Work.

1.6 PRE-INSTALLATION MEETING

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing Work of this section.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Maintain ambient storage temperature of 55 degrees F.
- C. Keep away from fire or open flame.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Do not install materials when temperature is below 50 degrees F or above 90 degrees F.
- C. Maintain this temperature range, 24 hours before, during and 72 hours after application.
- D. Restrict traffic from area where materials are being installed or are curing.

1.9 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Provide ten year manufacturer warranty coverage for delamination of system from substrate, degradation of waterproofing ability, color fading, and deterioration and loss of adhesion of entire waterproof coating system including joint sealers.

PART 2 PRODUCTS

2.1 PEDESTRIAN TRAFFIC WATERPROOF COATING

- A. Manufacturers:
 - 1. Andek Corporation.
 - a. Base Coat: Aim #1.
 - b. Topcoat: Wearcoat 66.
 - 2. Substitutions: Section 01 60 00 - Product Requirements.
- B. Filler and Primer: As recommended by coating manufacturer.
- C. Sealant and Backer Rod, Control and Expansion Materials: Types, compatible with system and adjacent materials, as recommended by coating manufacturer.
- D. Flashing Reinforcing: As recommended by coating manufacturer.
- E. Cleaning Solution/Solvent: Type recommended by coating manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify that substrate is ready to receive work, surface is clean, dry and free of substances which could affect bond.
- C. Do not begin work until wood substrate has dried to a maximum moisture content of 12 percent.

3.2 PREPARATION

- A. Clean substrate surface free of foreign matter.
- B. Patch wood substrate with latex filler to produce surface conducive to bond.
- C. Protect adjacent surfaces.
- D. Prior to installation test, for compatibility of new materials and existing materials. All materials must be compatible.

3.3 INSTALLATION - TRAFFIC SURFACES

- A. Apply primer to prepared substrate at a rate as recommended by waterproof coating manufacturer's recommendation.

- B. Install expansion and construction joints where indicated in accordance with coating manufacturer's recommendations.
- C. Apply sealant to junction of horizontal and intersecting surfaces to achieve watertight seal.

3.4 MANUFACTURER'S FIELD SERVICES

- A. Section 01 40 00 - Quality Requirements: Requirements for manufacturer's field services.
- B. Require manufacturer to be present during installation of traffic waterproof coating.
- C. Inspect traffic waterproof coating installation immediately before concealing with subsequent construction.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Protection of installed construction.
- B. Do not permit traffic over unprotected surfaces.

END OF SECTION

SECTION 07 21 00

THERMAL INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Board insulation at underside of floor slabs.
 - 2. Firesafing batt insulation in fire rated partitions.
- B. Refer to Section 014335 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data on product characteristics, performance criteria, and limitations.
- C. Manufacturer's Installation Instructions: Submit special environmental conditions required for installation and installation techniques.
- D. Manufacturer's Certificate:
 - 1. Certify that products meet or exceed specified requirements.
 - 2. Certify cavity insulation is compatible with dampproofing specified in Section 07 11 00 used as an adhesive.

1.3 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.

1.4 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Do not install adhesives when temperature or weather conditions are detrimental to successful installation.

1.5 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

PART 2 PRODUCTS

2.1 BOARD INSULATION

- A. Manufacturers:
 - 1. Dow Chemical Company; Styrofoam; Square Edge.
 - 2. Owens Corning; FOAMULAR 250.
 - 3. Pactiv Building Products; Greenguard CM Insulation Board.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Board Insulation (Type 1): ASTM C578, Type IV extruded polystyrene labeled by an approved agency, conforming to the following:
 - 1. Thermal Resistance: R of 5.0 per inch thickness, minimum at 75 degrees F, ASTM C518.
 - 2. Compressive Strength: Minimum 25 psi, ASTM D1621.
 - 3. Water Absorption: Maximum 0.1 percent by volume, ASTM C272.
 - 4. Edges: Square edges.
 - 5. Flame/Smoke Properties: 25/450 maximum in accordance with ASTM E84.
- C. Thickness: Indicated on Drawings.

2.2 FIRESAFING BATT INSULATION

- A. Manufacturers:
 - 1. United States Gypsum Company; Thermafiber Sound Attenuation Fire Blankets (SAFB).
 - 2. Fibrex Insulations Inc.; Safing Insulation.
 - 3. Owens Corning; Safing Insulation Mineral Wool.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Batt Insulation (Type 5): ASTM C665, Type I, unfaced semi rigid mineral fiber batt type, 2.5 pcf density, 3 inches thick, with maximum flame/smoke properties of 15/0 in accordance with ASTM E84.
- C. Batt Size: Friction fit of sizes to fit stud spacings.

2.3 ACCESSORIES

- A. Adhesive: Type recommended by insulation manufacturer for application.
 - 1. Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
- B. Insulation Fasteners: Impale clip of galvanized steel; type recommended by insulation manufacturer for particular use intended.

- C. Ventilation Baffles: Formed plastic, sized to fit full width of rafter spaces.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify that 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 that may impede adhesive bond.

3.2 INSTALLATION - UNDER CONCRETE SLABS - BOARD INSULATION

- A. Place insulation from top of slab to bottom of slab and horizontally under slabs on grade after base for slab has been compacted.
- B. Cut and fit insulation tight to protrusions or interruptions to the insulation plane.
- C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.3 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Protection of installed construction.
- B. Do not permit work to be damaged prior to covering insulation.

END OF SECTION

SECTION 07 21 29
SPRAYED INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Cellulose insulation applied in wall cavities.
- B. Refer to Section 014335 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data:
 - 1. Submit data on materials, describing insulation and acoustic properties and required primer.
- C. Shop Drawings: Show application, thicknesses, terminations, and other details.
- D. Manufacturer's Certificate:
 - 1. Certify products meet or exceed specified requirements.
 - 2. Certify installer is approved by manufacturer.

1.3 QUALITY ASSURANCE

- A. Surface Burning Characteristics: ASTM E84.
 - 1. Flame Spread Index: 25, maximum.
 - 2. Smoke Developed Index: 450, maximum.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

- B. Do not install insulation when ambient and surface temperatures are lower than 40 degrees F.
- C. Maintain acceptable ambient and substrate surface temperatures prior to, during, and after installation of primer and insulation materials.

PART 2 PRODUCTS

2.1 SPRAYED INSULATION

- A. Manufacturers:
 - 1. International Cellulose Corporation; K-13.
 - 2. Substitutions: Section 01 60 00 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

- A. Acoustical Performance:

Thickness Inches	125HZ	250HZ	500HZ	1000HZ	2000HZ	4000HZ	NRC
1.00	0.08	0.29	0.75	0.98	0.93	0.96	0.75
2.00	0.26	0.68	1.05	1.10	1.03	0.98	0.95
3.00	0.57	0.99	1.04	1.03	1.00	1.00	1.00

2.3 COMPONENTS

- A. Cellulose Fiber Insulation: ASTM E1042, treated cellulose fiber, color as indicated; conforming to the following test requirements:
 - 1. Bond Strength: ASTM E736; minimum 400 psf or 600 times insulation dead weight at 1 inch thick, whichever is greater.
 - 2. Corrosion: ASTM E739; non-corrosive.
 - 3. Bond Deflection: ASTM E759; 6 inches deflection in span of 10 feet without spalling or delamination.

2.4 ACCESSORIES

- A. Primer: As required by insulation manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify surfaces are clean, dry, and free of matter capable of inhibiting adhesion.
- C. Verify other Work on and within spaces to be insulated is complete prior to application.

3.2 PREPARATION

- A. Mask and protect adjacent surfaces from overspray or damage.
- B. Test substrate adhesion to determine if primer is required. Apply primer in accordance with manufacturer's instructions when required by test results.

3.3 INSTALLATION

- A. Apply insulation to a uniform monolithic density without voids.
- B. Apply to minimum cured thickness as indicated on Drawings.
- C. Cure insulation by continuous ventilation of space where insulation is installed.
- D. Remove and dispose overspray. Repair damage to adjacent materials caused by overspray.

3.4 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements.
- B. Inspection includes verification of insulation thickness and density in accordance with ASTM E605.

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 26 00
VAPOR RETARDERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Vapor retarders under slabs-on-grade.
- B. Refer to Section 014335 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data for vapor retarder, seam tape, adhesive, and accessories indicating material characteristics, performance criteria, and limitations.
- C. Manufacturer's Installation Instructions: Submit preparation and installation requirements, techniques.

1.3 QUALITY ASSURANCE

- A. Perform Work in accordance with SWRI - Sealant Specification requirements for materials and installation.

1.4 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.

1.5 SEQUENCING

- A. Section 01 10 00 - Summary: Requirements for sequencing.
- B. Sequence Work to permit installation and inspection of insulation and materials concealed by vapor retarder before beginning vapor retarder installation.
- C. Do not install vapor retarder until items penetrating vapor retarder are in place.

PART 2 PRODUCTS

2.1 VAPOR RETARDERS - UNDER SLABS-ON-GRADE

- A. Manufacturers:
 - 1. Reef Industries, Inc.; Griffolyn 15.
 - 2. Raven Industries; Vapor Block 15.
 - 3. Stego Industries; Stego Wrap 15.
 - 4. Fortifiber Building Systems Group; Moistop Ultra 15.
 - 5. W.R. Meadow; Perminator 15.
 - 6. Substitutions: Section 01 60 00 - Product Requirements.

- B. Vapor Retarder - Type 1: ASTM E1745, Class A, 0.015 inches thick, plastic sheet membrane.
 - 1. Water Vapor Permeance: ASTM E96/E96M, Procedure B; maximum 0.025 gr/hr•sf•in•Hg.
 - 2. Tensile Strength: ASTM D882; minimum 60 lbs/in
 - 3. Puncture Resistance: ASTM D1709, Method B; minimum 5.3 lbs
 - 4. Sheet Width: 12 feet, minimum 12 feet

- C. Seam Tape: Self-adhering, vapor retarding type as recommended by vapor retarder manufacturer, minimum 4 inches wide.

- D. Penetration Seal: Mastic, vapor retarding type as recommended by vapor retarder manufacturer.

2.2 ACCESSORIES

- A. Sealant: ASTM C1311, butyl or polyisobutylene, nondrying, non-skinning, non-curing.
- B. Primer and Backer Rods: Recommended by sealant manufacturer to suit application.
- C. Cleaner: Non-corrosive type; recommended by sealant manufacturer; compatible with adjacent materials.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify substrate materials are dry and clean.
- B. Verify items penetrating vapor retarder are in place.

3.2 PREPARATION

- A. Remove loose or foreign matter which might impair adhesion.
- B. Clean and prime substrate surfaces to receive adhesive and sealants.

3.3 INSTALLATION: UNDER-SLABS-ON-GRADE

- A. Install vapor retarder membrane in accordance with ASTM E1643 and manufacturer's instructions.
- B. Unroll vapor retarder membrane with longest dimension parallel to direction of slabs-on-grade concrete pour.
- C. Lap vapor retarder membrane over footings and seal to foundation walls.
- D. Lap vapor retarder membrane joints a minimum of 6 inches and seal with seam tape.
- E. Seal vapor retarder membrane penetrations by applying penetration seal or by constructing boots using from vapor retarder membrane and seam tape.
- F. Repair damaged areas by cutting patches of vapor retarder membrane, extending 6 inches, minimum, beyond damaged area. Seal patch perimeter with seam tape.

END OF SECTION

SECTION 07 42 13
METAL WALL PANELS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes preformed metal panel system for walls, related flashings and accessory components.
- B. Refer to Section 014335 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 PERFORMANCE REQUIREMENTS

- A. Components: Design and size to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of panel as calculated in accordance with ASCE 7.
- B. Maximum Allowable Deflection of Panel: 1/180.
- C. Movement: Accommodate movement within system without damage to system, components, or deterioration of seals; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
- D. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
- E. Tolerances: Accommodate tolerances of building structural framing.

1.3 SUBMITTALS

- A. Shop Drawings: Indicate dimensions, panel profile and layout, spans, joints, expansion joints, construction details, methods of anchorage, method and sequence of installation and interface with adjacent materials.
- B. Product Data: Submit data on assembled panel system structural capabilities.
- C. Samples: Submit two samples of each, 24 x 24 inch in size illustrating finish color, sheen, and texture.
- D. Design and Performance Data: Submit panel profile characteristics and dimensions, and structural properties. Submit design calculations.

- E. Manufacturer's Installation Instructions: Submit special handling criteria, installation sequence, and cleaning procedures.

1.4 QUALITY ASSURANCE

- A. Insulation Surface Burning Characteristics: ASTM E84.
 - 1. Flame Spread Index: 25, maximum.
 - 2. Smoke Developed Index: 450, maximum.
- B. Apply label from agency approved by authority having jurisdiction to identify each foam plastic insulation material.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
 - 1. Manufacturing Location: Within 500 miles of Project site for final assembly of components into Products.
- B. Installer: Company specializing in performing Work of this section with minimum three years experience approved by manufacturer.
- C. Design panel system under direct supervision of a professional engineer experienced in design of this Work and licensed in the Commonwealth of Pennsylvania.

1.6 PRE-INSTALLATION MEETING

- A. Convene minimum one week prior to starting Work of this section.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
- B. Store pre-finished material off ground with weather protection to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials which may cause discoloration or staining.

1.8 COORDINATION

- A. Coordinate Work with placement of anchors.
- B. Coordinate Work with installation of adjacent components and materials.

PART 2 PRODUCTS

2.1 EXTERIOR METAL WALL PANELS

- A. Manufacturer: Zalmag Steel Roof/Wall Tiles
 - 1. Individual wall tiles with 4-sided interlocking design, self-aligning tabs, and concealed nailing strips.

2.2 COMPONENTS

- A. Exterior Skin: Smooth 22 gauge steel, ASTM A653/A653M; hot rolled steel sheet, G90 zinc coating; 0.17 inch thick steel; with manufacture's standard zinc finish coating, color as selected.
- B. Size: 15 inches by 9-5/8 inches.
- C. Fire Rating: Class A.

2.3 ACCESSORIES

- A. Coil Stock: Manufacturer's matching coil stock for site-formed components.
- B. Gaskets: Manufacturer's standard type suitable for use with panel system, permanently resilient; ultraviolet and ozone resistant; color as selected.
- C. Starter strips, end wall, side wall, outside corner flashing, j-channel, and other standard manufacturer's trims to provide complete installation.
- D. Sealants: Specified in Section 07 90 00; color as selected.
- E. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized.
- F. Field Touch-up Paint: As recommended by panel manufacturer.

2.4 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest practicable lengths.
- C. Panel Profile: Manufacturer's standard profile for specified system.
- D. Fabricate corners in one continuous piece with minimum 18 inch returns.
- E. Fabricate profiles on-site as required to complete installation.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify building framing members are ready to receive panel system.

3.2 INSTALLATION

- A. Protect panel surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.
- B. Permanently fasten panel system to structural supports; aligned, level, and plumb, within specified tolerances.
- C. Locate panel joints over supports. Lap panel ends minimum 2 inches.
- D. Use concealed fasteners.
- E. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.3 ERECTION TOLERANCES

- A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line:
1/16 inch.
- B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

3.4 CLEANING

- A. Remove site cuttings from finish surfaces.
- B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION

SECTION 07 46 00
FIBER CEMENT SIDING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Fiber cement siding.
 - 2. Weather barrier.
 - 3. Related trim, flashings, accessories, and fastenings.
- B. Refer to Section 014335 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data indicating materials, component profiles, fastening methods, jointing details, sizes, surface texture, finishes, and accessories.
- C. Samples:
 - 1. Submit two siding panel samples 12 x 12 inch in size illustrating surface texture and color.
 - 2. Submit two additional samples to Section 09 90 00 for application of field applied coatings.

1.3 QUALITY ASSURANCE

- A. Lumber Grading: Certified by
 - 1. ALSC - American Lumber Standards Committee - Softwood Lumber Standards.
- B. Plywood Grading: Certified by APA/EWA - APA/ Engineered Wood Association.

1.4 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Furnish thirty year manufacturer's warranty including coverage for fiber cement siding products from deterioration of finish and delamination.

PART 2 PRODUCTS

2.1 FIBER CEMENT SIDING MATERIALS - CERTAINTEED

- A. Manufacturers: Provide Colormax Prefinished Fiber Cement Siding by CertainTeed Corporation.
 - 1. No substitutions permitted.
 - 2. Refer to Drawings for locations.
- B. Fiber Cement Material: ASTM C1186, fiber reinforced cement composite board for exterior use, labeled by an agency acceptable to authorities having jurisdiction.
 - 1. Siding: Grade II, or better.
 - 2. Trim: Grade I, or better.
- C. Panel Siding: Flush type; fiber cement siding, 5/16 inches thick, smooth finish, panel size as indicated on Drawings; factory finished.
 - 1. CertainTeed; Smooth Vertical Siding.
 - 2. Refer to Drawings for locations.
- D. Trim: Fiber cement board trim, 7/16 inch thick, smooth finish, width indicated; Harditrim, factory primed.
 - 1. CertainTeed; CertainTeed Composite Trim.
 - a. Finish: To match siding unless otherwise indicated.

2.2 FIBER CEMENT SIDING MATERIALS - CBF

- A. Manufacturers: Provide SIL LEED Prefinished Fiber Cement Board Siding Panels by Cement Board Fabricators.
 - 1. No substitutions permitted.
 - 2. Refer to Drawings for locations.
- B. Fiber Cement Material: ASTM C1186; fiber reinforced, treated, cement composite board for exterior use, labeled by an agency acceptable to authorities having jurisdiction.
 - 1. Siding: Cement, sand, cellulose fibers, and fillers.
 - 2. Panel Thickness: 5/16 inch.
 - 3. Size panels as required for layout as indicated on Drawings.
 - 4. Color as selected by Architect.

2.3 WEATHER BARRIER

- A. Refer to Section 062000 Finish Carpentry for requirements.

2.4 ACCESSORIES

- A. Fasteners: Exposed tamper proof, stainless steel fasteners as indicated on Drawings, appropriate to installation details per manufacturer's recommendations.
 - 1. Other screw fasteners as required and recommended by siding manufacturer.
- B. Reglets: Provide reglets, minimum 3/8 inch.
 - 1. Aluminum material with chemical conversion coating.

2. Field paint to match fiber cement siding.
- C. Gasket and cushion as recommended by manufacturer.
- D. Trim: PVC, composite, and stainless steel trim shapes suitable for trim conditions.
- E. Wood furring materials in conformance with requirements in Section 06100 and 061053.
- F. Flashings: Prefinished aluminum as specified in Section 07 62 00.
- G. Accessory Components: Facias, starter strips, trim, and corner boards; of same material and finish as siding.

2.5 FABRICATION

- A. Panel Siding:
 1. Sheet Size: As indicated on Drawings.
 2. Sheet profiles and joinery as indicated on Drawings.
 3. Surface Texture: Sanded.

2.6 SHOP FINISHING

- A. Pre-finish Colors: Colors as selected.

PART 3 EXECUTION

3.1 PREPARATION

- A. Verify weather barrier is installed and laps are sealed, refer to Section 064000 Finish Carpentry.

3.2 INSTALLATION

- A. Install fiber cement siding in accordance with manufacturer's instructions.
- B. Install sheets as indicated. Butt joints gapped as indicated..
- C. Install on wood furring as recommended by manufacturer, allowing air space behind panels for ventilation.
- D. Align level, and plumb. Locate cut board edges and ends over bearing.
- E. Install metal flashings at internal and external corners, sills, head of wall openings, at windows, and horizontal joints of sheet and panel materials.
- F. Install sealant as specified in Section 07 90 00 Joint Protection, to prevent weather penetration. Maintain neat appearance.

- G. Touch-up damaged prefinished paint surfaces with 100 percent acrylic paint. Refer to Section 09 90 00 Painting and Coating.

3.3 PREPARATION FOR SITE FINISHING:

- A. Sand work smooth and set exposed nails and screws.
- B. Site Finishing: Specified in Section 09 90 00.

END OF SECTION

SECTION 07 52 00

MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Sheathing over deck surface.
 - 2. Modified bitumen membrane roofing and flashings.
 - 3. Recovery board.
 - 4. Insulation.
 - 5. Roofing membrane expansion joints.
 - 6. Cant strips.
 - 7. Protective covering.
 - 8. Electric field vector mapping and testing for main roof.
 - 9. Required flood testing and electric field vector mapping testing prior to and following installation of vegetative roof assemblies.
 - 10. Vegetative roof assemblies as specified in Section 329500 Vegetative Roof Assembly.
 - 11. Testing.
- B. Refer to Section 014335 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SYSTEM DESCRIPTION

- A. Modified Bitumen Conventional Roofing System: Two ply membrane system with recovery board, and granulated surface finish at parapet vertical and where membrane is exposed.

1.3 PERFORMANCE REQUIREMENTS

- A. Conform to applicable code for roof assembly fire hazard requirements.
 - 1. UL: Class A Fire Hazard Classification.
- B. FM: Roof Assembly Classification, Class 1 Construction, windstorm classification of 1-90, in accordance with FM Construction Bulletin 1-28.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate plan for layout of seams, direction of laps, layout and thicknesses of insulation, base flashing details, blocking and nailer sizes and locations, electric vector mapping locations, connections, and details.

- C. Product Data: Submit membrane materials, base flashing materials, mastics, and recovery board.
- D. Samples: Submit two samples minimum 12 x 12 inches of each type of membrane material.
- E. Manufacturer's Installation Instructions: Submit special precautions required for seaming the membrane.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements. Certify applicator is approved by manufacturer.
- G. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures and wind velocity during application.

1.5 QUALITY ASSURANCE

- A. Single Source Responsibility: Roofing system materials and components shall be supplied and warranted by membrane manufacturer.
- B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
- C. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.
- D. Fire-Resistance Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- E. Perform Work in accordance with NRCA Roofing and Waterproofing Manual.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
 - 1. Manufacturing Location: Within 500 miles of Project site.
- B. Applicator: Company specializing in performing Work of this section with minimum five years documented experience approved by manufacturer.

1.7 PRE-INSTALLATION MEETING

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing Work of this section.
- C. Review installation procedures and coordination required with related Work.

1.8 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, seals and labels intact.
- C. Store products in weather protected environment, clear of ground and moisture.
- D. Stand roll materials on end.

1.9 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 ambient temperatures below 40 degrees F or above 90 degrees F.
- C. Do not apply roofing membrane to damp or frozen deck surface.
- D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

1.10 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate the Work with installing associated metal flashings as the work of this section proceeds.

1.11 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Provide twenty year manufacturer's no dollar limit, material and labor warranty to cover failure to prevent penetration of water. Cover damage to building resulting from failure to prevent penetration of water.

PART 2 PRODUCTS

2.1 MODIFIED BITUMINOUS ROOFING

2.2 COMPONENTS

- A. Sheet Materials:
 - 1. Dry Sheathing Paper: Clean, white-cellulose paper, unsaturated.
 - 2. Glass Fiber Felts: ASTM D2178, Type IV.

- B. Bituminous Materials:
 - 1. Asphalt Bitumen: ASTM D312, Type III.
 - 2. Asphalt Primer: ASTM D41, asphaltic primer suitable for use with roofing, for application to concrete or masonry surfaces.
 - 3. Flashing Cement: Manufacturer's standard one-part or two-part SBS modified bitumen cement.
- C. Recovery Board: High density wood fiber board with asphalt coated facer; 3/8 inch thick, as recommended by roof membrane manufacturer.
- D. Insulation: ASTM C1289, Type II, Class 1, Grade 3; polyisocyanurate rigid board, both faces surfaced with felt or glass fiber mat.
 - 1. Minimum 6 inch thickness at low point of roof taper.
 - 2. Insulation Board Thickness: Maximum 2 inches thick for each board.
 - 3. Compressive Strength: Minimum 25 psi.
 - 4. Tapered Insulation: Slope 1/4 inch per foot for drainage pattern indicated on Drawings.
 - a. Thickness: As indicated on Drawings and required to achieve performance requirements.
- E. Flexible Flashings: Same material as membrane except where exposed- exposed flashing to have granulated surface top sheet; color same as primary membrane.
- F. Counterflashings: Metal, as specified in Section 07 62 00.
- G. Prefabricated Control or Expansion Joint Flashing: Sheet butyl over closed cell foam backing seamed to galvanized flanges.

2.3 ACCESSORIES

- A. Wood Nailers: Preservative treated wood as specified in Section 06 10 00.
- B. Fiber Cant and Tapered Edge Strips: Asphalt impregnated wood fiberboard, preformed to configuration as detailed.
- C. Sheathing Joint Tape: Heat resistant type.
- D. Roofing Nails: Galvanized , hot dipped or non-ferrous type, size as required to suit application.
- E. Sealants: As recommended by membrane manufacturer.
- F. Strip Reglet Devices: Galvanized steel; surface or recess mounted s required, binder bars, maximum possible length per location, with attachment flanges.
- G. Penetration Seals: Preformed, polyester resin, 2 inches high, straight and curved, perimeter curb sections; structural sealant adhesive, and single component pourable polyurethane sealer fill material.
 - 1. Manufacturer: Chem Link Inc.; ChemCurb System.
 - 2. Substitutions: 01600 - Product Requirements.

- H. Molded Pipe Flashing: Factory molded neoprene base flashing for pipe penetration. Subject to compliance with requirements, provide the following:
 - 1. Pipe Boots, by Portals Plus, Inc.
- I. Electric Field Vector Mapping (EFVM) Loop – Leak Detection System:
 - 1. Stationary EFVM impulse conductor wire consisting of braided polyethylene (1.5 mm diameter) interwoven with a minimum of 9 strands of stainless steel wire.
 - a. Manufactured by International Leak Detection, Ltd.
 - 2. Provide roofing membrane manufacturers grounding screen that serves as a grounding layer used in conjunction with electronic leak detection.
- J. Walkway Pavers:
 - 1. Pavers
 - a. Concrete Pavers shall be Hanover Architectural Products, Inc. Concrete Patio Pavers, or equivalent. Hanover Architectural Products, Inc. Concrete Patio Pavers, or equivalent. Direct-washed exposed hydraulically pressed concrete pavers. Color to be selected from manufactures standards. Pavers shall satisfy the following specification: Color shall be selected from manufacture's standards, and pavers shall satisfy the following specifications:
 - 1) Size: 24"x 24" x 2" (nominal)
 - 2) Weight: ≤ 25 lb/ft²
 - 3) Absorption (ASTM C-140): $\leq 5\%$
 - 4) Loss during freeze/thaw (ASTM 67): $\leq 1\%$ Color as approved by Architect

2.4 VEGETATED ROOF GROWTH MEDIUM AND PLANTINGS

- A. As specified in Division 32 Section "Vegetated Roof Assemblies".
- B. General: Provide vegetated roof system by Roofmeadow as Basis of Design.
 - 1. Fabrics, protection layers, drainage conduit, drainage media, growth media, sheet drains and other system components as specified by the System Provider to complete assembly.
 - 2. Pre-Grown Sedum Mats: Custom grown Sedum mats, containing Sedum varieties as specified by the System Provider and approved by the Architect.
 - 3. Additional Mediums and Plantings: As specified by Landscape Architect.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify that surfaces and site conditions are ready to receive work.
- C. Verify deck is supported and secured.
- D. Verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped to drains.

- E. Verify deck surfaces are dry and free of snow or ice.
- F. Confirm dry deck by moisture meter with 12 percent moisture maximum.
- G. Verify roof openings, curbs, pipes, conduit, sleeves, ducts, and vents through roof are solidly set, and wood cant strips, wood nailing strips and reglets are in place.

3.2 PREPARATION

- A. Wood Deck:
 - 1. Verify flatness and tight joints of wood decking.
 - 2. Seal joints of plywood with tape.
 - 3. Fill knot holes with latex filler.

3.3 APPLICATION

- A. Install wood nailers in accordance with membrane manufacturer's instruction to achieve performance requirements and conform to warranty conditions for sloped roof.
- B. Insulation Installation:
 - 1. Ensure substrates are properly installed and prepared per manufacturer's instructions.
 - 2. Apply adhesive to deck. Embed insulation into adhesive with full contact.
 - 3. Apply adhesive to the top surface of insulation. Embed the second layer of insulation into adhesive, with joints staggered minimum **6 inch** from joints of first layer.
 - 4. Place the constant thickness first layer and the tapered thickness insulation second layer to the required slope pattern.
 - 5. Mechanically fasten insulation to deck where indicated.
- C. Recovery Board Installation:
 - 1. Install recovery board per roofing membrane manufacturer's written instructions.
- D. Membrane Application:
 - 1. Apply membrane and primer.
 - 2. Apply membrane; lap and seal edges and ends permanently waterproof.
 - 3. Apply membrane smooth, free from air pockets, wrinkles, or tears. Ensure full bond of membrane to substrate.
 - 4. Extend membrane up cant strips and minimum of 8 inches onto vertical surfaces unless otherwise indicated.
 - 5. Extend membrane over vapor and air barrier of wall construction and seal.
 - 6. Mop and seal membrane around roof protrusions and penetrations.
 - 7. Provide waterproof cut-off to membrane at end of day's operation. Remove cut-off before resuming roofing.
- E. Grounding Screen Installation:
 - 1. Contractor to coordinate with manufacturers to verify correct location of grounding screen and vector mapping components within the roof system.
 - a. Secure written confirmation from manufacturers of correct location of vector mapping components.
 - 2. Install grounding screen in accordance with membrane manufacturer's instructions.

- F. Flashings And Accessories:
 - 1. Apply flexible sheet base flashings to seal membrane to vertical elements.
 - 2. Secure to nailing strips at 4 inches oc and reglets.
 - 3. Coordinate installation of roof drains, curbs, and related flashings.
 - 4. Seal flashings and flanges of items penetrating or protruding through the membrane.
- G. Penetration Seals:
 - 1. Install penetration seals in accordance with manufacturer's instructions.
 - 2. Adhere perimeter curb sections to roof membrane and to each other with structural sealant.
 - 3. Fill curb with sealer.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Roof Inspection: Arrange for roofing system manufacturer's technical personnel to be present at the site and to inspect roofing at completion of installation and at the following times prior to and during construction:
 - 1. Attend preconstruction conference.
 - 2. Daily for the first two weeks of roofing installation.
 - 3. Weekly for the remainder of roofing installation.
 - 4. Perform final inspection of completed roof assembly. Verify seam and termination integrity and water tight construction.
- C. Roof Membrane Testing: Test roofs before and after for leaks using electronic field vector mapping testing or flood testing at Contractor's option. If electronic field vector mapping testing is not used a flood test is still required.
 - 1. Flood Testing: Flood test according to recommendations in ASTM D 5957, before and after completing roofing but before overlaying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
 - a. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of sheet flashings.
 - b. Flood each area for 48 hours.
 - 2. Electric Field Vector Mapping Testing: Manufacturer's standard method for detecting leaks.
 - a. Survey entire roof surface for potential leaks before and after completing roofing.
 - 3. After testing, repair leaks, repeat tests, and make further repairs until waterproofing installation is watertight.
 - 4. Annotate record drawings to indicate areas where repairs are made and type of repair that was completed.

3.5 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.

- C. Repair or replace defaced or disfigured finishes caused by work of this section.

3.6 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Protection of 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 62 00

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Metal coping at masonry firewall.
 - 2. Masonry reglets and flashing.
 - 3. Flashings and counterflashings.
 - 4. Downspouts and scuppers(rain water collectors).
 - 5. Parapet caps and copings.
 - 6. Prefinished metal panels.
 - 7. Metal flashings, drip caps, jamb finish at windows.
 - 8. Reglets and accessories.
 - 9. Other fabricated sheet metal items, as scheduled.
- B. Refer to Section 014335 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 DESIGN REQUIREMENTS

- A. Sheet Metal Flashings: Conform to the following criteria of SMACNA "Architectural Sheet Metal Manual."
- B. Downspout Components: Conform to applicable code for size and method of rain water discharge and collection.
 - 1. Refer to Drawings for requirements to coordinate with roof drains.
 - 2. Refer to Civil Drawings for requirements to coordinate with rain collection systems.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Product Data: Submit data on manufactured component metal types, finishes, and characteristics.
- D. Field Tests:
 - 1. Submit report for gutter leak test.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with SMACNA Architectural Sheet Metal Manual and NRCA Roofing and Waterproofing Manual.
- B. Perform Work in accordance with SPRI ES-1 for metal edge securement systems for low slope membrane roof systems.
 - 1. Basic Wind Speed: In accordance with applicable code.

1.5 QUALIFICATIONS

- A. Fabricator and Installer: Company specializing in sheet metal work with minimum three years documented experience.

1.6 PRE-INSTALLATION MEETING

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing Work of this section.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials which may cause discoloration or staining.

1.8 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate with the Work of Section 04 20 00 for installing recessed flashing reglets.

1.9 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Finish Warranty: Include coverage for aluminum finishes degradation including color fading.
 - 1. Painted Finish: Provide a twenty year manufacturer's warranty.

PART 2 PRODUCTS

2.1 COPING

- A. Manufacturers:
 - 1. W. P. Hickman Co.; Permasnap or Permasnap Plus Coping.

2. Metal-Era Inc.; Perma-Tite Coping.
 3. MM Systems Corporation; Snap-Lok Coping Systems.
 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Coping: Factory fabricated coping system with anchor plate, cover, fastenings with provisions for expansion and contraction compensation; meeting FM 1-90 wind uplift requirements.
- C. Material: Minimum 0.050 inch thick prefinished aluminum sheet, PVDF factory finish.

2.2 DOWNSPOUTS

- A. Manufacturers:
1. Southern Aluminum Finishing Company.
 2. Substitutions: Section 01 60 00 - Product Requirements.
- B. Downspouts: Factory fabricated downspouts system with matching starter sections and elbows.
1. Downspouts: Round, smooth finish, size and profile as indicated on Drawings.
 2. Supports: Exposed straps, matching downspouts.
- C. Scuppers: Factory or site fabricated scuppers, sizes, locations, and connections as indicated on Drawings.
- D. Material: Minimum 0.032 inch thick prefinished aluminum sheet, thickness as required for size of component to maintain shape, PVDF factory finish.
- E. Downspout configuration to be compatible with rain water collection system. Refer to Drawings.
- F. Accessory shapes and components to attach to roof drains and water collection system.

2.3 REGLETS AND SPRING LOCKED FLASHING

- A. Manufacturers:
1. Fry Reglet Co.
 2. Substitutions: Section 01 60 00 - Product Requirements.
- B. Reglets: Furnish with Springlok Flashing System:
1. Stucco and EIFS: Type STX. Refer to Section 092423 Portland Cement Stucco.
 2. Built Into Masonry: Type MA.
 3. Cast in Concrete: Type CO.
 4. Surface Applied: Type SM.
- C. Material:
1. Where exposed to view from ground, or adjacent to prefinished roofing or coping: Minimum 0.025 inch thick prefinished aluminum sheet, PVDF factory finish.
 2. Where not exposed to view from ground: Minimum 0.020 inch thick, type 304 stainless steel.

2.4 SHEET METAL FLASHING MATERIALS

- A. Prefinished Aluminum Sheet: ASTM B209/B209M; 3003 alloy, H14 temper; minimum 0.032 inch thick; smooth surface, polyester finish.
- B. Stainless Steel: ASTM A240/A240M or ASTM A666; Type 304, dead soft fully annealed, minimum 0.015 inch thick; smooth surface, Number 2D finish.

2.5 TRIMS ASSOCIATED WITH METAL PANEL WALL SYSTEM

- A. Provide proprietary coil stock for site-fabrications as indicated. Refer to Section 07 42 13 Metal Wall Panels for requirements.

2.6 ACCESSORIES

- A. Fasteners: Type recommended by roofing manufacturer , with soft neoprene washers.
- B. Underlayment: ASTM D226; Type I, No. 15 unperforated asphalt felt.
- C. Slip Sheet: Rosin sized building paper.
- D. Primer: Zinc molybdate type.
- E. Protective Backing Paint: Zinc molybdate alkyd.
- F. Sealant: Type E butyl sealant specified in Section 07 90 00.
- G. Plastic Cement: ASTM D4586, Type I.
- H. Draw Bands: Stainless steel with required hardware to secure flashing to roof penetrations.
- I. Solder: ASTM B32; type suitable for application and material being soldered.

2.7 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Fabricate cleats of same material as sheet metal, interlocking with sheet.
- C. Form pieces in longest possible lengths.
- D. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- E. Form material with wide hook flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- F. Form expansion joints with slip joints using 12 inch wide backup plate in accordance with SMACNA Architectural Manual. Form backup plate to profile matching face.
- G. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

- H. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.
- I. Fabricate downspouts and scuppers to profile and size indicated.
- J. Fabricate accessories in profile and size to suit downspouts and rain water collection system.
 - 1. Anchorage Devices: In accordance with SMACNA requirements. Type recommended by fabricator.
 - 2. Downspout Supports: Brackets.
- K. Factory fabricate prefinished metal panels to profile indicated. Provide method to weep moisture and condensation that can collect on interior face of fabricated shapes to exterior. Provide weep openings at 24 inches on center maximum.
- L. Seal metal joints.

2.8 FACTORY FINISHING

- A. Fluoropolymer Finish: 2 coat Kynar 500 or Hylar 5000 system, thermally cured, conforming to AAMA 2605; color as selected from manufacturer's full range.
- B. Washcoat: Finish concealed side of metal sheets with washcoat compatible with finish system, as recommended by finish system manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- C. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.
- C. Paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.3 INSTALLATION

- A. See Section 04 20 00 - Unit Masonry for installation of concealed reglets.

- B. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
- C. Apply plastic cement compound between metal flashings and felt flashings.
- D. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- E. Seal metal joints watertight.
- F. Secure downspouts in place using fasteners.
- G. Connect downspouts to roof drainage system and rainwater collection system. Seal connection watertight.
- H. Seal metal joints watertight.

3.4 INSTALLATION - PREFINISHED METAL PANELS

- A. Install metal panels in accordance with manufacturer's instructions.
- B. Coordinate installation with window system specified in Section 08 51 13 and building insulation specified in Section 07 21 00 to ensure watertight installation and continuity of thermal barrier.
- C. Protect panel surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.
- D. Permanently fasten panel system; aligned, level, and plumb, within specified tolerances.
- E. Locate panel joints over supports. Seal panel end joints in accordance with manufacturer's instructions.
- F. Use concealed fasteners unless otherwise approved by Architect.
- G. Place gaskets and seal joint to prevent weather penetration.

3.5 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Testing and Inspection Services.
- B. Inspection will involve surveillance of Work during installation to ascertain compliance with specified requirements.
- C. Perform leak test for internal gutter system to verify watertight construction.
- D. Plug internal gutter drains at point inside building, beyond soffits.
- E. Flood gutters to full depth of gutter. Test individual gutter sections to allow minimum 2 inches of water depth in flooded gutter. Maintain flooded condition for 24 hours.

- F. Record water level at beginning and end of each test. Inspect for leaks.
- G. Repair leaks and retest until no leaks are detected.
- H. Submit report of initial tests and retests indicating the following:
 - 1. Date of tests.
 - 2. Name of person responsible for conducting test and inspecting for leaks.
 - 3. Section of gutter tested.
 - 4. Water level at start and end of test.
 - 5. Location of identified leaks.
 - 6. Description of repair performed.

END OF SECTION

SECTION 07 84 00

FIRESTOPPING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Firestopping for through penetrations and joints in fire rated assemblies.
 - 2. Firestopping of devices penetrating one face of fire rated partition that are not separated by minimum code required distance.
 - 3. Fire resistant joints in fire rated floor, roof, and wall assemblies.
 - 4. Fire resistant joints between floor slabs and exterior walls.
- B. Refer to Section 014335 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SYSTEM DESCRIPTION

- A. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479 or ASTM E814 with 0.10 inch water gage minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
 - 1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1-hour.
 - 2. Floor and Roof Penetrations: Fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
 - a. Floor Penetrations Within Wall Cavities: T-Rating is not required.
- B. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.
- C. Fire Resistant Joints Between Floor Slabs and Exterior Walls: ASTM E119 with 0.10 inch water gage minimum positive pressure differential to achieve fire resistant rating as indicated on Drawings for floor assembly.

1.3 PERFORMANCE REQUIREMENTS

- A. Firestopping Designs: Conform to assemblies listed with Underwriters Laboratories or Intertek Testing Services (Warnock Hersey Listed).
- B. Firestopping Designs: Conform to requirements of City of Philadelphia.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of materials used, where required.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data:
 - 1. Submit data on product characteristics, performance and limitation criteria.
 - 2. Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings and to maintain fire resistance rating of adjacent assembly.
 - 3. Submit descriptions of tested designs listed in submitted schedule.
- C. Manufacturer's Installation Instructions: Submit preparation and installation instructions.
- D. Manufacturer's Certificate: Certify products meet or exceed applicable code requirements. Certify applicator is approved by manufacturer.

1.5 QUALITY ASSURANCE

- A. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.
 - 1. Smoke Barrier Joints Air Leakage: Maximum 5 cfm per foot 0.30 inches water gage pressure differential
- B. Surface Burning Characteristics: ASTM E84.
 - 1. Flame Spread Index: 25, maximum.
 - 2. Smoke Developed Index: 450, maximum.

1.6 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 approved by manufacturer.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Do not apply materials when temperature of substrate material and ambient air is below 60 degrees F.
- C. Maintain this minimum temperature before, during, and for minimum 3 days after installation of materials.

PART 2 PRODUCTS

2.1 FIRESTOPPING

- A. Manufacturers:
 - 1. 3M Fire Protection Products.
 - 2. Specified Technologies, Inc.
 - 3. Hilti Corporation.
 - 4. Nelson FireStop Products.
 - 5. RectorSeal; Metacaulk Firestopping Products.
 - 6. Bio Fireshield Firestopping Products.
 - 7. Substitutions: Section 01 60 00 - Product Requirements.

- B. Product Description: Listed as components of tested design, appropriate for the physical configuration of each penetration and as required by the fire resistance rating indicated and the provisions of Article: **SYSTEM DESCRIPTION**.
 - 1. Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.

- C. Color: As selected from manufacturer's full range of colors.

2.2 FILL, VOID, AND CAVITY MATERIALS

- A. Fill, Void, and Cavity Materials: One or more of the following types, as appropriate for particular construction conditions:
 - 1. Silicone sealant material, except on finished surfaces to be painted.
 - a. Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
 - 2. Caulk type material.
 - 3. Putty type material.
 - 4. Composite sheet type material, 1/4 inch nominal thickness, foil-faced.
 - 5. Mortar as specified in Section 04 05 03 where permitted by applicable code.

- B. Packing Materials: One or more of the following types, as appropriate for particular construction conditions:
 - 1. Mineral wool batt insulation, 6.0 lb/cu ft minimum density.

- C. Forming Materials: As required by tested design for particular construction conditions.

2.3 ACCESSORIES

- A. Metal Sleeves: Selected from the following as most appropriate for the application:
 - 1. Rigid steel conduit, galvanized.

- B. Restraining Mesh: No. 9 SWG, galvanized steel wire, twisted to 1 inch hexagons, with additional straight No. 9 SWG galvanized steel wires woven into the mesh 12 inches on center for stiffness.

- C. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.

1. Flat and Non-Flat Paints: Maximum volatile organic compound content in accordance with GS-11.
- D. 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

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify openings are ready to receive firestopping.
- C. Verify that penetrating elements are securely fixed and properly located; with a minimum of 1/2 inch space between penetrations and surfaces of openings unless otherwise required or permitted by tested design.

3.2 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.
- B. Remove incompatible materials which may affect bond.
- C. Install backing materials to arrest liquid material leakage.

3.3 APPLICATION

- A. Install material at fire rated construction perimeters and openings which contain penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.
- B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.
- C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating, to uniform density and texture.
 1. Install mortar to full thickness of masonry walls and concrete floors.
- D. Compress fibered material to maximum 40 percent of its uncompressed size.
- E. Place intumescent coating in sufficient coats to achieve rating required.
- F. Remove dam or forming material not required to remain as part of the system, after firestopping material has cured sufficiently to remain in place.

3.4 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Testing and Inspection Services.
- B. Inspect installed firestopping for compliance with specifications and submitted schedule.
- C. Inspect firestopping systems, minimum 48 hours after installation, for adhesion and set of sealant materials.
- D. Correct deficiencies and reinspect to verify compliance with requirements.

3.5 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Clean adjacent surfaces of firestopping materials.
- C. Remove excess firestopping materials for neat appearance in areas left exposed to view in finished construction.

3.6 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Protection of installed construction.
- B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 90 00
JOINT PROTECTION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Sealants and joint backing.
 - 2. Spray polyurethane foam gap and crack sealer.
- B. Refer to Section 014335 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Products Data:
 - 1. Submit data for sealant materials, performance, and substrate preparation.
 - 2. Indicate available colors for each sealant type for selection.
- C. Samples: Submit two sets of samples, 3 inches long illustrating sealant colors for selection.
- D. Manufacturer's Installation Instructions: Submit special procedures, surface preparation, and perimeter conditions requiring special attention.

1.3 QUALITY ASSURANCE

- A. Laboratory Pre-Construction Testing: Test exterior and interior sealants, joint accessories, and joint substrates in accordance with the following, before starting work of this section
 - 1. Obtain samples of joint substrate products specified in other sections.
 - 2. Adhesion: ASTM C794; determine surface preparation and required primer.
 - 3. Compatibility: ASTM C1087; determine materials forming joints and adjacent materials do not adversely affect sealant materials and do not affect sealant color.
 - 4. Staining: ASTM C510, or ASTM C1248; determine sealants will not stain joint substrates.
 - 5. Pre-construction testing is not required when sealant manufacturer can furnish data acceptable to Architect based on previous testing for materials matching those of the Work.
- B. Field Pre-Construction Testing: Test each exterior sealant and joint substrate in accordance with the following, before beginning work of this section.
 - 1. Install sealants in mockups using joint preparation methods determined by laboratory pre-construction testing.
 - 2. Install field-test joints in inconspicuous location as approved by Architect.

3. Test Method: Manufacturer's standard field adhesion test to verify joint preparation and primer required to obtain optimum adhesion of sealants to joint substrate.
4. When test indicates sealant adhesion failure, modify joint preparation, primer, or both and retest until joint passes sealant adhesion test.

1.4 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.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Maintain temperature and humidity recommended by sealant manufacturer during and after installation.

1.6 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work with sections referencing this section.

1.7 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Provide five year manufacturer's warranty for installed polyurethane sealants and accessories which fail to achieve airtight seal or watertight seal, exhibit loss of adhesion or cohesion, and sealants which do not cure.
- C. Provide twenty year manufacturers warranty for installed non-traffic silicone sealants and accessories which fail to achieve airtight seal or watertight seal, exhibit loss of adhesion or cohesion, and sealants which do not cure.

PART 2 PRODUCTS

2.1 JOINT SEALERS

- A. Silicone Sealant Manufacturers:
 1. Pecora Corporation.
 2. GE Sealants and Adhesives.
 3. Dow Corning.
 4. Tremco Inc.
 5. Substitutions: Section 01 60 00 - Product Requirements.

- B. Other Sealant Manufacturers:
 - 1. Pecora Corporation.
 - 2. BASF Building Systems.
 - 3. Tremco Inc.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.

- C. Type A - Polyurethane Exterior Joints: ASTM C920, Type M, Grade NS, Class 25; Uses NT, M, A, and O; two component, chemical curing, nonstaining, nonbleeding, color as selected:
 - 1. Tremco; Dymeric 240.
 - 2. Pecora; Dynatrol II.
 - 3. BASF Building Systems; Sonneborn; NP 2.
 - 4. Applications: Use for exterior non-traffic bearing joints.
 - a. Control, expansion, and soft joints in masonry.
 - b. Joints between metal frames and other materials.

- D. Type B - Silicone Exterior Joints: ASTM C920, Type S, Grade NS, Class 25; NT, M, G, A and O: single component, neutral or moisture curing, nonstaining, nonbleeding, color as selected:
 - 1. General Electric; SilPruf LM SCS2700 for EIFS joints or SilPruf NB SCS9000 for other joints.
 - 2. Dow Corning; 790 for EIFS joints or 795 for other joints.
 - 3. Pecora; 890NST Silicone for EIFS joints; 864NST Silicone for other joints.
 - 4. Tremco; Spectrem 1 for EIFS joints; Spectrem 2 for other joints.
 - 5. Applications: Use for exterior non-traffic bearing joints.
 - a. Control and soft joints in masonry.
 - b. Joints between concrete or stone and other materials.
 - c. Joints between metal frames and other materials.
 - d. Other exterior non-traffic bearing joints for which no other sealant is indicated.

- E. Type C - Polyurethane Traffic Joints: ASTM C920, Type M, Grade P, Class 25; self leveling, two component, chemical curing, nonstaining, nonbleeding, capable of continuous water immersion, color as selected; manufactured by:
 - 1. Tremco, Inc.; THC-900.
 - 2. Pecora; Urexpan NR-200.
 - 3. BASF Building Systems; Sonneborn; Sonolastic SL2.
 - 4. Applications: Use for interior and exterior horizontal traffic bearing joints:
 - a. Joints in concrete floors and paving.
 - b. Other traffic bearing joints for which no other sealant is indicated.

- F. Type E - Acrylic Interior Joints: ASTM C834; single component, nonstaining, nonbleeding, nonsagging; color as selected; manufactured by:
 - 1. Tremco, Inc.; Tremflex 834.
 - 2. Pecora; AC-20.
 - 3. BASF Building Systems; Sonneborn; Sonolac.
 - 4. Applications: Use for interior joints, except where sanitary sealant is required.
 - 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.
 - d. Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

- G. Type F - Silicone Interior Sanitary Joints: ASTM C920; single component, solvent or neutral curing, non-sagging, nonstaining, fungus resistant, nonbleeding; color as selected; manufactured by:
1. GE Sealants and Adhesives; Sanitary SCS1701.
 2. Dow Corning; 786 Silicone Mildew Resistant Sealant.
 3. Pecora; 898; Sanitary Mildew Resistant Silicone Sealant.
 4. Tremco, Inc.; Tremsil 200.
 5. Substitutions: Section 01 60 00 - Product Requirements
 6. Applications: Use for kitchens, bathrooms, toilet rooms, lockers, and other wet areas:
 - a. Joints between plumbing fixtures and floor and wall surfaces.
 - b. Joints between kitchen and bath countertops and wall surfaces.
 - c. Joints between sanitary wall panels and adjacent or penetrating materials.
 - d. Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
- H. Type G - Exterior Metal Lap Joint Sealant: ASTM C1311, butyl or polyisobutylene, nondrying, non-skinning, non-curing.
1. Tremco, Inc.; Tremco Butyl Sealant.
 2. Pecora; BC-158; Butyl Rubber Sealant.
 3. Applications: Concealed sealant bead in sheet metal and flashing work.
 - a. Concealed sealant bead in sheet metal work.
- I. Type H - Acoustic Sealant: Nonsag, paintable, nonstaining, butyl-free, latex sealant complying with ASTM C834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90. Furnish fire rated sealant for use in fire rated assemblies.
1. Non-Fire Rated Sealants:
 - a. OSI Sealants, Inc.; SC 175 Acoustical Sound Sealant Non-Flammable - Latex.
 - b. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
 - c. Tremco, Inc.; Tremflex 834.
 - d. Substitutions: Section 01 60 00 - Product Requirements.
 - e. Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
 2. Fire Rated Sealants:
 - a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
 - b. Tremco, Inc.; TremStop Acrylic.
 - c. Substitutions: Section 01 60 00 - Product Requirements.
 - d. Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
- J. Sprayed Polyurethane Foam Gap and Crack Sealer: AAMA 812; one- or two-component, foamed-in-place, polyurethane foam with the following characteristics:
1. Density: 2.9 PCF maximum.
 2. Surface Burning Characteristics: ASTM E84.
 - a. Flame Spread Index: 25, maximum.
 - b. Smoke Developed Index: 450, maximum.
 3. Initial R-Value: ASTM C518; 4 per inch thickness, minimum.
 4. Maximum Pressure: 1.25 psig.
 5. Acceptable materials:

- a. The Dow Chemical Company; Great Stuff Pro Window and Door Insulating Foam Sealant.
- b. Tremco; TremGlaze Low Expansion Polyurethane Foam Sealant.

2.2 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
 1. 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; oversized 30 to 50 percent larger than joint width; recommended by sealant manufacturer to suit application
- 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: Verification of existing conditions before starting work.
- 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 which might impair adhesion of sealant.
- B. Clean and prime joints.
- C. Perform preparation in accordance with ASTM C1193.
- D. Protect elements surrounding the Work of this section from damage or disfiguration.

3.3 INSTALLATION - SEALANTS

- A. Perform installation in accordance with ASTM C1193.
- B. 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.
- C. Install bond breaker where joint backing is not used.

- D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- F. Tool joints: As detailed.

3.4 INSTALLATION - SPRAY POLYURETHANE FOAM

- A. Install spray polyurethane foam gap and crack sealer in accordance with manufacturer's instructions.
- B. Fill cracks and gaps at wall framing openings to provide continuous thermal barrier.
- C. Install foam without causing deflection in adjacent window and door frames in excess of allowable tolerances for proper operation and performance of windows and doors.
- D. Trim excess foam flush with adjacent surfaces.

3.5 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Clean adjacent soiled surfaces.

3.6 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Protection of installed construction.
- B. Protect sealants until cured.

END OF SECTION

SECTION 080671 – DOOR HARDWARE SCHEDULE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section references specification sections relating to commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Sliding Doors.
 - 3. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
- C. Related Sections:
 - 1. Pre-Hung Door and Frame assemblies for hardware indicated in the Hardware Sets to be provided as part of the door and frame assembly.
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ICC/IBC - International Building Code.
 - 2. NFPA 80 - Fire Doors and Windows.
 - 3. NFPA 101 - Life Safety Code.
 - 4. NFPA 105 - Installation of Smoke Door Assemblies.
 - 5. State Building Codes, Local Amendments.

1.2 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

- C. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type and variety of Door Hardware specified in the Related Sections from a single source, qualified supplier unless otherwise indicated.
- B. Regulatory Requirements: Comply with requirements and guidelines as directed in the applicable model building code.
- C. Pre-Submittal Conference: Conduct coordination to review proper methods and the procedures for receiving, handling, and installing door hardware.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.5 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door and Frame Preparation: Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.6 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1.7 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets at the end of Part 3 of each referenced section that products are to be supplied under.
 - 1. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
 - a. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

- B. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.3 FINISHES

- A. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 or traditional U.S. finishes shown by certain manufacturers for their products.

PART 3 - EXECUTION

1. 00 – By Other
2. PE – Pemko
3. RO – Rockwood
4. NO – Norton

Hardware Schedule

Set: 1.0

Doors: T205

1	All Hardware	By Door Supplier		00
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Set: 2.0

Doors: T105

3	Hinges	By Pre-Hung Door Supplier		00
1	Passage Set	S10002	32D	ET
1	Deadbolt	S50001	32D	ET
1	Surface Closer	1601 1600P	689	NO
1	Kick Plate	K1050 6" 4BE	US32D	RO
1	Door Stop	519	US26D	RO

1	Threshold	By Pre-Hung Door Supplier		00
1	Gasketing	By Pre-Hung Door Supplier		00
1	Sweep	By Pre-Hung Door Supplier		00
1	Viewer	622	US26D	RO

Set: 3.0

Doors: T201

3	Hinges	By Pre-Hung Door Supplier		00
1	Entry Set	S40101 - Stuttgart	32D	ET
1	Kick Plate	K1050 6" 4BE	US32D	RO
1	Door Stop	519	US26D	RO
1	Threshold	By Pre-Hung Door Supplier		00
1	Gasketing	By Pre-Hung Door Supplier		00
1	Sweep	By Pre-Hung Door Supplier		00
1	Viewer	622	US26D	RO

Set: 4.0

Doors: T405

3	Hinges	By Pre-Hung Door Supplier		00
1	Passage Set	S10002	32D	ET
1	Deadbolt	S50001	32D	ET
1	Door Stop	519	US26D	RO
1	Threshold	By Pre-Hung Door Supplier		00
1	Gasketing	By Pre-Hung Door Supplier		00
1	Sweep	By Pre-Hung Door Supplier		00

Set: 5.0

Doors: T101.1, T103.1, T104.1, T104.2, T104.3, T105.2, T201.1, T203.1, T203.2, T301.1, T301.2, T302, T303.1, T304.1

3	Hinges	By Pre-Hung Door Supplier		00
1	Passage Set	S10002	32D	ET
1	Door Stop	519	US26D	RO
3	Silencer	608CA		RO

Set: 6.0

Doors: T102, T204, T301, T305, T404

3	Hinges	By Pre-Hung Door Supplier		00
1	Privacy Set	S20002	32D	ET
1	Door Stop	519	US26D	RO
3	Silencer	608CA		RO

Set: 7.0

Doors: T305.1, T305.2, T401.1, T401.2

6	Hinges	By Pre-Hung Door Supplier		00
2	Dummy Lever	S30002		ET
2	Door Stop	519	US26D	RO
2	Silencer	608CA		RO

Set: 8.0

Doors: T304, T401, T403

1	Pocket Door Hdwe	PF28200A7280		PE
1	Pocket Door Latch	891	US26D	RO

END OF SECTION 080671

SECTION 08 12 14
STANDARD STEEL FRAMES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Non-rated steel door frames.
 - 2. Fire rated steel door frames.
 - 3. Frames for glazed lights.
- B. Refer to Section 014335 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate frame elevations, reinforcement, anchor types and spacing, and location of cut-outs for hardware.
- 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.

1.3 QUALITY ASSURANCE

- A. Perform Work in accordance with ANSI A250.8.
- B. Fire Rated Frame Construction: Conform to one of the following:
 - 1. NFPA 252; with neutral pressure level at 40 inches maximum above sill at 5 minutes into test.
 - 2. UL 10C.
- C. Installed Fire Rated Frame Assembly: Conform to NFPA 80 for fire rated class same as fire door.
- D. Attach label from agency approved by authority having jurisdiction to identify each fire rated door frame.
- E. Accessibility Requirements: Conform to ICC A117.1.

1.4 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.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept frames on site in manufacturer's packaging. Inspect for damage.
- C. Break seal on-site to permit ventilation.

1.6 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- 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, Inc.
 - 2. Pioneer Industries, Inc.
 - 3. Curries Co.
 - 4. Ceco Door Products.
 - 5. Steelcraft.
 - 6. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: ANSI A250.8; standard shop fabricated steel frames:
 - 1. Fire rated.
 - 2. Non-rated types.
 - 3. Exterior Frames: Nominal 14 gage/0.067 inch thick material, base metal thickness.
 - 4. Interior Frames: Nominal 16 gage/0.053 inch thick material, base metal thickness.
- C. Sheet Metal for Frames:
 - 1. Exterior Frames: Galvanized to ASTM A653/A653M G90 zinc coating.
 - 2. Interior Frames: ASTM A1008/A1008M, Commercial Steel Type B, non-galvanized.

2.2 ACCESSORIES

- A. Removable Glazing Stops: Rolled steel channel shape, mitered corners; prepared for countersink style tamper proof screws.
- B. Bituminous Coating: Non-asbestos fibered asphalt emulsion.
- C. Primer: ANSI A250.10 rust inhibitive type.
 - 1. Interior Anti-Corrosive Paints: Maximum volatile organic compound content in accordance with GC-03.
- D. Silencers: Specified in Section 08 71 00.
- E. Weatherstripping: Specified in Section 08 71 00.

2.3 FABRICATION

- A. Fabricate Frames As:
 - 1. Welded unit.
- B. Mullions for Double Doors: Fixed type, of same profiles as jambs.
- C. Fabricate frames with hardware reinforcement plates welded in place.
 - 1. Provide mortar guard boxes for frames built into masonry construction.
- D. Reinforce frames wider than 48 inches with roll formed steel channels fitted tightly into frame head, flush with top.
- E. 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.
- F. Fabricate frames to suit masonry wall coursing with 4 inch head member.

2.4 SHOP FINISHING

- A. Primer: Baked-on type.
- B. Coat inside of frame profile with bituminous coating to minimum thickness of 1/16 inch for frames built into masonry walls and partitions.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify opening sizes and tolerances are acceptable.

3.2 INSTALLATION

- A. Install frames in accordance with ANSI A250.8.
 - 1. Install fire rated frames in accordance with NFPA 80 and fire rating label requirements.
- B. Coordinate frame installation with wall construction for anchor placement.
- C. Fill frames built into masonry walls and partitions with grout as specified in Section 04 20 00.
- D. Coordinate installation of glass and glazing specified in Section 08 80 00.
- E. Coordinate installation of frames with installation of hardware specified in Section 08 71 00 and doors in Section 08 13 14 and 08 14 16.
- F. Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.
- G. Finish paint as specified in Section 09 90 00.

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.

END OF SECTION

SECTION 08 13 14
STANDARD STEEL DOORS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Exterior thermally insulated steel doors.
 - 2. Interior fire rated steel doors.
 - 3. Interior non-fire rated steel doors.
- B. Refer to Section 014335 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate door elevations, internal reinforcement, closure method, cut-outs, and hardware reinforcements.
- C. Product Data: Submit door configurations, location of cut-outs for hardware reinforcement.
- D. Manufacturer's Installation Instructions: Submit special installation instructions.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

- A. Perform Work in accordance with ANSI A250.8.
- B. Fire Rated Door Construction: Conform to one of the following:
 - 1. NFPA 252; with neutral pressure level at 40 inches maximum above sill at 5 minutes into test.
 - 2. UL 10C.
- C. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as indicated on Drawings.
- D. Attach label from agency approved by authority having jurisdiction to identify each fire rated door.
- E. Surface Burning Characteristics:
 - 1. Foam Insulation: Maximum 75/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

- F. Apply label from agency approved by authority having jurisdiction to identify each foam plastic insulation board.
- G. Accessibility Requirements: Conform to ICC A117.1.

1.4 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.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.
- C. Break seal on site to permit ventilation.

1.6 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate Work with door opening construction, door frame, and door hardware installation.
- C. Coordinate installation to accommodate door hardware electric wire connections.

PART 2 PRODUCTS

2.1 STANDARD STEEL DOORS

- A. Manufacturers:
 - 1. Amweld Building Products, Inc.
 - 2. Pioneer Industries, Inc.
 - 3. Curries Co.
 - 4. Ceco Door Products.
 - 5. Steelcraft.
 - 6. Substitutions: Section 01 60 00 - Product Requirements.
- B. Exterior Doors: ANSI A250.8, 1-3/4 inch thick, thermally insulated.
 - 1. Level 3 - Extra heavy Duty, Model 1, full flush design.
- C. Interior Doors - Non Fire-Rated: ANSI A250.8, 1-3/4 inch thick.
 - 1. Level 2 - Heavy Duty, Model 1, full flush design.
- D. Interior Doors - Fire Rated: ANSI A250.8, 1-3/4 inch thick.
 - 1. Level 2 - Heavy Duty, Model 1, full flush design.

2.2 COMPONENTS

- A. Face: Steel sheet in accordance with ANSI A250.8.
 - 1. Exterior Doors: ASTM A653/A653M G90, zinc coating.
 - 2. Interior Doors: ASTM A1008/A1008M, Commercial Steel Type B, non-galvanized.
- B. End Closure: Channel, 0.04 inches thick.
- C. Core:
 - 1. Thermally Insulated Doors: Polyurethane.
 - 2. Non-Rated Doors: Cardboard honeycomb.
 - 3. Fire Rated Doors: Manufacturer's standard.
- D. Thermally Insulated Door: Door assembly minimum insulation R-Value of 2.1, measured in accordance with ASTM C1363.

2.3 ACCESSORIES

- A. Removable Glazing Stops: Rolled steel, channel shape, mitered corners; prepared for countersink style tamper proof screws.
- B. Primer: ANSI A250.10 rust inhibitive type.

2.4 FABRICATION

- A. Fabricate doors with hardware reinforcement welded in place.
- B. Close top and bottom edge of exterior doors with flush steel channel closure. Seal joints watertight.
- C. Close top and bottom edge of interior doors with inverted steel channel closure.

2.5 SHOP FINISHING

- A. Primer: Baked-on type.

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 doors in accordance with ANSI A250.8.
 - 1. Install fire rated doors in accordance with NFPA 80 and fire rating label requirements.

- B. Coordinate installation of glass and glazing specified in Section 08 80 00.
- C. Coordinate installation of doors with installation of frames specified in Section 08 12 14 and hardware specified in Section 08 71 00.
- D. Finish paint as specified in Section 09 90 00.

3.3 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.4 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for adjusting.
- B. Adjust door for smooth and balanced door movement.

END OF SECTION

SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Non-rated flush wood doors.
 - 2. Fire rated flush wood doors.
- B. Refer to Section 014335 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate Work with door opening construction, door frame and door hardware installation.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data:
 - 1. Submit data for door core materials and construction.
 - 2. Submit data for veneer species, type and characteristics.
 - 3. Submit data for factory finishes.
- C. Shop Drawings:
 - 1. Indicate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, and factory machining criteria.
 - 2. Indicate cutouts for glazing.
- D. Samples:
 - 1. Submit samples of door construction, minimum 5 x 5 inch in size, cut from corner of door to illustrate door construction.
 - 2. Submit two sets of three samples of door veneer, 12 x 12 inch in size illustrating expected range of wood grain, stain color, and sheen.
- E. Manufacturers' Instructions: Submit special installation instructions.
- F. Qualification Statements:
 - 1. Submit manufacturer experience qualifications.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with AWI AWS Section 9, Custom Grade.
- B. Finish doors in accordance with AWI AWS Section 5, Custom Grade.
- C. AWI Quality Certification:
 - 1. Provide AWI Quality Certification Program labels or certificate indicating woodwork complies with specified grade requirements.
 - 2. Register the Work under this section with AWI Quality Certification Program.
- D. Fire Rated Door Construction: Conform to one of the following positive pressure tests:
 - 1. NFPA 252; with neutral pressure level at 40 inches maximum above sill at 5 minutes into test.
 - 2. UL 10C.
- E. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as indicated on Drawings.
- F. Attach label from agency approved by authority having jurisdiction to identify each fire rated door.
- G. Accessibility Requirements: Conform to ICC A117.1.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience and current member of AWI.
- B. Forest Stewardship Council accredited certification agencies.
 - 1. Rainforest Alliance SmartWood Program.
 - 2. Scientific Certification Systems.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Package, deliver and store doors in accordance with AWI AWS Section 2.
- C. Marking: Mark each door on top rail with opening number.
- D. Protect doors with resilient packaging sealed with heat shrunk plastic.
- E. Delivery:
 - 1. Deliver doors after building is enclosed, HVAC system is operational, and interior environment is stabilized with air temperature between 50 and 90 degrees F and relative humidity between 25 and 55 percent.
 - 2. Maintain interior environment as indicated for occupied conditions until Substantial Completion.

- F. Storage:
 - 1. Do not store in damp or wet locations; or where light might bleach veneer.
 - 2. Store doors flat and level, off floor, in a dry, well ventilated location. Do not store on edge.
 - 3. Protect doors from dirt, water and abuse.
- G. Handling:
 - 1. Handle doors to prevent soiling or damaging finishes.

1.7 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.
- C. Warranty:
 - 1. Interior Doors: Furnish manufacturer's life of installation warranty.

PART 2 PRODUCTS

2.1 FLUSH WOOD DOORS

- A. Manufacturer List:
 - 1. Algoma Hardwoods, Inc.
 - 2. Eggers Industries.
 - 3. Graham Manufacturing Corp.
 - 4. Marshfield Door Systems Inc.
 - 5. Mohawk Flush Doors, Inc.
 - 6. Substitutions: Section 01 60 00 - Product Requirements.
- B. Flush Interior Doors: Solid core.
 - 1. Thickness: 1-3/8 inches
 - 2. Core: SCL.
 - 3. Fire Rated Core: FD.
 - 4. Face Construction: Five or seven ply.
 - 5. Performance Duty Level: Heavy duty.
 - 6. Quality Grade: Custom.
- C. Sustainability Requirements:
 - 1. Composite Wood and Agrifiber Products: Contain no added urea-formaldehyde resins.
- D. Performance / Design Criteria:
 - 1. Performance Duty Level: WDMA I.S. 1A.
 - 2. Fire Resistance: As indicated on Drawings.
 - 3. Sound Transmission Resistance: ASTM E413; minimum STC 35 for door and frame assemblies indicated as acoustically rated.

2.2 MATERIALS

- A. Door Cores: AWI AWS Section 9.
 - 1. Solid Core, Non-Fire Rated:
 - a. Type: SCL; structural composite lumber.
 - 2. Solid Core, Fire Rated: Category A for positive pressure fire test.
 - a. 45 Minute Rating and Greater: Type FD; fire resistive composite.
 - b. Rating Less than 45 Minute: Match solid core non-rated construction.
- B. Interior Door Faces:
 - 1. Opaque Finished Faces: Close-grain hardwood veneer hardboard.
- C. Facing Adhesive: Type I - waterproof.

2.3 FABRICATION

- A. Fabricate doors in accordance with AWI AWS Section 9 requirements.
- B. Fabricate fire rated doors in accordance with AWI AWS Section 9 requirements and fire rating label requirements.
 - 1. Fabricate pairs of doors so metal astragals are not required to maintain fire rating.
- C. Provide blocking for hardware reinforcement for all solid core doors:
 - 1. Top Block: Minimum 5 inches wide for doors with surface mounted closers
 - 2. Lock Block: Minimum 5 x 18 inches at lock stile, Provide lock blocks at both stiles for doors with exit devices.
 - 3. Bottom Block: Minimum 5 inches wide for doors with surface mounted or mortised hardware within 6 inches of floor.
- D. Fit door edge trim to edge of stiles after applying veneer facing.
- E. Bond edge banding to cores.
- F. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.
- G. Factory fit doors for frame opening dimensions identified on shop drawings.
- H. Provide edge clearances in accordance with AWI AWS Section 9.

2.4 FINISHES

- A. Finish work in accordance with AWI AWS Section 5; Custom Grade.
- B. Opaque Finish System: Primed with manufacturer's standard primer, for opaque field finishing.
 - 1. Refer to Section 099000 Painting And Coating.
- C. Seal door top edge with color sealer to match door facing.

2.5 ACCESSORIES

- A. Door Glazing:
 - 1. Glazing Stops: Wood with metal clips for rated doors.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

- A. Install doors in accordance with AWI AWS Section 9 and manufacturer's instructions.
 - 1. Install fire rated doors in accordance with NFPA 80 and fire rating label requirements.
- B. Coordinate installation of doors with installation of frames specified in Section 08 11 13 and hardware specified in Section 08 71 00.
- C. Coordinate installation of glass and glazing specified in Section 08 80 00.

3.3 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Conform to AWI AWS Section 9 requirements for the following:
 - 1. Fit and clearance tolerances.
 - 2. Gaps.
 - 3. Flushness.
 - 4. Flatness.
 - 5. Squareness.
- C. Maximum Vertical Distortion (Bow): 1/8 inch measured with straight edge or taut string, top to bottom, over an imaginary 36 x 84 inches surface area.
- D. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taut string, edge to edge, over an imaginary 36 x 84 inches surface area.

3.4 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for starting and adjusting.
- B. Adjust door for smooth and balanced door movement.
- C. Adjust closer for full closure.

END OF SECTION

SECTION 08 14 26

MOLDED-HARDBOARD-FACED WOOD DOORS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Prehung interior embossed wood swing doors.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate door and frame elevations
- C. Product Data: Indicate door and frame configurations, location of hardware reinforcement, factory installed hardware.
- D. Manufacturer's Installation Instructions: Indicate special installation instructions.

1.3 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Provide manufacturer's two year warranty against delamination of face, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.1 MATERIALS:

- A. Manufacturers:
 - 1. Craftmaster Manufacturing Inc.
 - 2. Masonite International, Inc.
 - 3. Substitutions: Section 01 60 00 - Product Requirements.
- B. Door Design: Ass elected by Architect.
- C. Interior Doors:
 - 1. Solid Core Doors: 1-3/4 inches thick.
- D. Door Construction:
 - 1. Solid Core: Medium density fiberboard.

- E. Flush Door Facing:
 - 1. Face Panel: Hardboard, 1/8 inch thick; embossed face, design as selected by Architect.
- F. Frame:
 - 1. Jamb and Head: PS 20; white pine, finger joints are permitted.
 - 2. Door Casing: As specified in Section 06 20 00 for standing and running trim.
- G. Hardware: As specified in Section 08 71 00.

2.2 FABRICATION

- A. Fabricate doors with hardware reinforcement blocking in place.
- B. Factory machine doors for finish hardware.
- C. Factory pre-fit doors for frame opening dimensions identified on shop drawings.
- D. Factory hang swing doors in frames. Brace frames for shipment and installation to prevent racking.

2.3 FINISH

- A. Factory Finish:
 - 1. Factory paint with manufacturer's standard acrylic paint finish, white color.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Verify that opening sizes and tolerances are acceptable.

3.2 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions.
- B. Coordinate installation of doors with installation of hardware specified in Section 08 71 00.
- C. Adjust door for smooth and balanced door movement.

3.3 INSTALLATION TOLERANCES

- A. Maximum Diagonal Distortion: 1/4 inch measured with straight edge, corner to corner.

END OF SECTION

SECTION 08 14 27

ALUMINUM-FACED WOOD DOORS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes
 1. Factory fabricated prehung metal clad wood french doors.
 2. Glazed transom panels.
 3. Door frames, thresholds, and door hardware.
- B. Refer to Section 014335 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SYSTEM DESCRIPTION

- A. Wood Doors: Metal clad wood door and frame sections, factory fabricated, vision glass, related flashings, anchorage and attachment devices.
- B. Configuration: Inswing hinged door with fixed transom panels.

1.3 PERFORMANCE REQUIREMENTS

- A. Primary Performance Requirements: AAMA/NWWDA 101/I.S.2; hinged glass door HGD-HC40 or better.
- B. System Design: Design and size components to withstand dead loads and live loads caused by positive and negative wind loads acting normal to plane of wall as calculated in accordance with BOCA code and ASCE.
 1. Basic Wind Speed: 80 mph.
 2. Wind Load Importance Factor: 1.10.
 3. Wind Exposure
 - a. Components and Cladding (Area Less Than 700SF): Exposure C.
- C. Member Deflection: Limit member deflection to flexure limit of glass or 1/175 which ever is less, with full recovery of glazing materials.
- D. Lintel Deflection: Accommodate deflection of lintel without damage to components, deterioration of seals, or movement between door and perimeter framing.
- E. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound.
- F. Thermal Movement: Design sections to permit thermal expansion and contraction of components to match perimeter opening construction.

- G. Air Infiltration: Limit air infiltration through assembly to 0.3 cfm/sq ft of wall area, measured at reference differential pressure across assembly of 6.24 psf as measured in accordance with ASTM E283.
- H. Thermal Performance: Maximum U-Value Class of U60 when measured in accordance with AAMA 1503.1 or NFRC 100.
- I. Water Leakage: None, when measured in accordance with ASTM E331 with test pressure difference as defined by AAMA/NWWDA 101/I.S.2.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work; and installation requirements.
- C. Product Data: Submit component dimensions, anchorage and fasteners, glass, hardware and accessories.
- D. Submit one corner sample door unit illustrating door frame section mullion section, simulated divided lites, muntins, brick molding, nailing flange, factory finished surfaces, glass units, and glazing materials.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements. performance criteria tests.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with the following:
 - 1. Doors: Fabricate doors in accordance with AAMA/NWWDA 101/I.S.2.
 - 2. Insulated Glass: Fabricate insulated glass units in accordance with Insulating Glass Certification Council or Insulating Glass Manufacturers Alliance.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing commercial aluminum clad wood doors with minimum five years documented experience.
 - 1. Manufacturing Location: Within 500 miles of Project site for final assembly of components into Products.
- B. Installer: Company specializing in performing commercial installation of wood doors for with minimum three years documented experience.
- C. Forest Stewardship Council accredited certification agencies.
 - 1. Rainforest Alliance SmartWood Program.
 - 2. Scientific Certification Systems.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Protect factory finished surfaces with wrapping or strippable coating. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

1.8 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Furnish ten year manufacturer warranty for door and glass units.
- C. Warranty: Include coverage for
 - 1. Insulated glass units from seal failure, interpane dusting or misting, and replacement of same.
 - 2. Degradation of color finish.
 - 3. Delamination or separation of finish cladding from door member.

PART 2 PRODUCTS

2.1 WOOD DOORS

- A. Manufacturers: Provide Sitaline 300 Series Patio Doors as manufactured by Jeld-Wen Windows and Doors as Basis of Design or approved comparable products.
 - 1. Pella Corporation; Clad Wood French Doors.
 - 2. Marvin Windows & Doors; Clad Wood Doors.
 - 3. Hurd Millwork Company; Aluminum Clad Swinging Patio Doors.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Commercial quality wood doors and prehung in wood frame, metal clad exterior finish, glass and glazing with extruded aluminum brick molding, threshold, and related flashings.
- C. Transom and Sidelight Panels: Fixed clad wood windows as specified in Section 08 52 13.

2.2 COMPONENTS

- A. Interior Exposed Wood: Clear Eastern White Pine or Northern White Pine, clear preservative treated, of type suitable for transparent finish.
- B. Concealed Wood: Manufacturer's standard, preservative treated.
- C. Aluminum Cladding (Exterior Surface): Extruded aluminum, minimum 0.050 inch thick, factory fit to profile or exterior exposed surface; factory finished.
- D. Door: Wood construction, 1-3/4 inches thick, aluminum clad exterior; doweled joints, minimum 4-3/4 inch wide stiles and top rail, minimum 11-3/8 inch wide bottom rail.

- E. Frame: Wood construction, nominal 4-1/2 inches deep, aluminum clad exterior.
- F. Insulating Glass: Sealed double pane units, 3/4 inch total thickness, with internal spacers aligned with muntins; conform with requirements in Section 08 80 00.
- G. Glass Stops: Solid wood to match doors.
- H. Brick Molding: Extruded aluminum with nailing flange; profile as indicated on Drawings; one piece full length of jamb and head openings, mitered corners.
- I. Muntins: Applied type to simulate divided lites, 7/8 inches wide, profile as selected.
 - 1. Interior: Unfinished wood same as door interior.
 - 2. Exterior: Aluminum to match exterior cladding.
- J. Door Hardware:
 - 1. Threshold: Extruded aluminum thermally broken, mill finish; Pemko Model 253x4AFG.
 - 2. Door Shoe: Extruded aluminum with replaceable weather seal, bright dip clear anodized; Pemko Model 216BDCFG.
 - 3. Weather Strip: Resilient, double bulb weather strip.
 - 4. Remainder of Hardware: As specified in Section 08 71 00.

2.3 ACCESSORIES

- A. Anchors: Stainless steel or hot dip galvanized steel
- B. Fasteners: Comply with NWWDA I.S.2 for fabrication and with manufacturer's recommendations for type and size of installation fasteners.
 - 1. Use galvanized or non-ferrous nails and screws for door fabrication and installation

2.4 FABRICATION

- A. Fabricate doors to produce units that are reglazable without dismantling door framing. Provide openings and mortises precut where possible to receive hardware and other items.
 - 1. Comply with requirements of NWWDA I.S.2 for moisture content of lumber at time of fabrication.
- B. Fabricate door members with doveled and glued joints.
- C. Ensure joints and connections are flush, hairline, and weather-tight.
- D. Finger joints in interior exposed wood are not permitted.
- E. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet allowing installation and dynamic movement of perimeter seal.
- F. Arrange fasteners to be concealed from view.
- G. Factory install glass in door units in accordance with manufacturer's standard method conforming with GANA Glazing Manual and to achieve performance criteria specified.

- H. Factory install hinges, door shoe, weatherstripping, and other door hardware as required to hang door in frame. Brace door and frame to prevent racking during shipment and installation.
 - 1. Weatherstrip full door frame perimeter.

2.5 SHOP FINISHING

- A. Exterior Surfaces: AAMA 2605; PVDF (polyvinylidene fluoride) coating; high performance organic finish, minimum two coat system, thermally cured fluoropolymer finish system Kynar 500 or Hylar 5000; color as selected.
- B. Interior Surfaces: Unfinished for field transparent finishing. Grilles finished as directed.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this section, and opening dimensions and clearances are as indicated on shop drawings.

3.2 INSTALLATION

- A. Attach door frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- B. Align door plumb, level, and square free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- C. Set threshold in bead of sealant. Secure threshold to substrate.
- D. Install brick moldings. Adjust trim to achieve hairline joints. Seal joints watertight.
- E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- F. Coordinate attachment and seal of perimeter air and vapor barrier materials.

3.3 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation from Level and from Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.
- C. Maximum Variation from Square: 1/8 inch difference in diagonal dimension of door frame.

3.4 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Remove protective material from factory finished surfaces.
- C. Remove labels and visible markings.
- D. Wash surfaces by method recommended and acceptable to sealant and door manufacturer; rinse and wipe surfaces clean.

END OF SECTION

SECTION 08 16 13
FIBERGLASS DOORS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Fiberglass reinforced plastic (FRP) doors.
 - 2. Wood door frames.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SYSTEM DESCRIPTION

- A. Flame Spread:
 - 1. Interior Door Faces: 25 maximum in accordance with ASTM E84.
 - 2. Exterior Door Faces: Manufacturer's standard.
- B. Thermal Transmission: Maximum U-value of 0.09 in accordance with AAMA 1503.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate door elevations, internal reinforcement, cutouts for glazing.
- C. Product Data: Indicate door configurations, and hardware reinforcement.
- D. Samples: Submit samples 3 x 3 inches in size indicating door face material, color and texture for selection.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Accessibility Requirements: Conform to ICC A117.1.

1.5 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.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Store door assemblies in manufacturer's standard packaging, on end, to prevent damage to face corners and edges.

1.7 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Manufacturer's Warranty: Manufacturer's 10 year warranty against failure of materials or workmanship including deterioration of finish and delamination.

PART 2 PRODUCTS

2.1 FIBERGLASS DOORS

- A. Manufacturers:
 - 1. Special-Lite Inc. SL-17.
 - 2. Commercial Door Systems.
 - 3. Substitutions: Section 01 60 00 - Product Requirements.
- B. Fiberglass Doors: Flush, seamless FRP faced doors with insulated core, extruded aluminum stiles and rails, and glazing as indicated on Drawings.
 - 1. Thickness: 1-3/4 inches.
- C. Door Frames: Manufacturer's standard wood, primer finish.

2.2 MATERIALS

- A. Facing: 0.120 inch thick fiberglass reinforced polyester sheet, color as selected from manufacturer's full range.
- B. Core: Manufacturer's standard honeycomb type.
- C. Stiles and Rails: Aluminum, alloy and temper to suit application, minimum 0.125 inch wall thickness.
 - 1. Extrusions: ASTM B221.
 - 2. Sheet and Plate: ASTM B209.
- D. Door Frames: Manufacturer's standard wood frames with exterior glues, primer coat finish.
- E. Fasteners: Manufacturer's standard aluminum or stainless steel.
- F. Frame Anchors: Manufacturer's standard aluminum or stainless steel to suit application.
- G. Glazing: Type specified in Section 08 80 00 ; factory installed.

1. Glazing Gaskets: Manufacturer's standard neoprene or PVC.
- H. Perimeter Sealant: Specified in Section 07 90 00.

2.3 FABRICATION

- A. Fabricate doors with stile and rail frame with mitered corners and tie rods to maintain door shape and rigidity.
- B. Lock face sheet into stiles and rails with extruded edges of stiles and rails.
- C. Provide cutouts for glazing as indicated on Drawings. Factory install glass.
- D. Fabricate frames to sizes and profiles indicated with hardware reinforcement factory installed.
- E. Fabricate frame anchors to suit application.
- F. Factory machine doors and frames for finish hardware in accordance with hardware requirements and dimensions.
- G. Factory fit doors and frames for opening dimensions identified on shop drawings.

2.4 FIELD FINISHING

- A. Painted Finish: Field finish in accordance with Section 09 90 00 Painting and Coating..
 1. Color: As selected or as indicated on Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify dimensions, tolerances, and method of attachment with other Work.

3.2 INSTALLATION

- A. Install door opening assemblies in accordance with manufacturer's instructions.
- B. Apply bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar metals.
- C. Set thresholds in bed of mastic and secure.
- D. Coordinate installation of doors with installation of hardware specified in Section 08 71 00.

3.3 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.4 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for starting and adjusting.
- B. Adjust door for smooth and balanced door movement.

END OF SECTION

SECTION 08 31 13

ACCESS DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Fire rated access doors and panels with frames.
 - 2. Non-rated access doors and panels with frames.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate location of access door units.
- C. Product Data: Submit literature indicating:
 - 1. Sizes, types, finishes, hardware, scheduled locations, and details of adjoining Work.
 - 2. Fire resistance listings.
- D. Manufacturer's Installation Instructions: Submit installation requirements and rough-in dimensions.

1.3 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record locations of access units.

1.4 QUALITY ASSURANCE

- A. Fire Rated Access Door Construction: Conform to one of the following:
 - 1. Wall Access Doors: NFPA 252 or UL 10B.
- B. Installed Fire Rated Access Door Assembly: Conform to NFPA 80 for fire rated class as indicated on Drawings.
- C. Attach label from agency approved by authority having jurisdiction to identify each fire rated access door.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified with minimum three years documented experience.

1. Manufacturing Location: Within 500 miles of Project site for final assembly of components into Products.

1.6 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work to provide for access to controls, valves, traps, dampers, cleanouts, and similar items requiring operation behind inaccessible finished surfaces.

PART 2 PRODUCTS

2.1 ACCESS DOORS AND PANELS

- A. Manufacturers:
 1. J. L. Industries.
 2. Nystrom Products Co.
 3. Milcor LTD, Partnership.
 4. Karp Associates, Inc.
 5. Substitutions: Section 01 60 00 - Product Requirements.
- B. Sizes: 16 x 16 inches at masonry walls and 12 x 12 inches at other locations, unless larger size is required for access to device.
- C. Gypsum Board Access Doors (Type 1): 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.
 1. J. L. Industries; Model WB.
 2. Nystrom Products Co; Model NW.
 3. Milcor LTD, Partnership; Style DW.
 4. Karp Associates, Inc.; KDW.
- D. Recessed Wall Access Doors (Type 2): Frames and nominal 1 inch wide flanges of 16 gage steel and door panels of 16 gage steel. Design flanges to be concealed by gypsum board joint finishing compound specified in Section 09 21 16.
 1. Nystrom Products Co; Model RW.
 2. Karp Associates, Inc.; RDW.
- E. 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 to match cylinders specified in Section 08 71 00. Attach label to fire rated doors for rating indicated.
 1. J. L. Industries; Model FD.
 2. Nystrom Products Co; Model IT.
 3. Milcor LTD, Partnership; Style UFR.
 4. Karp Associates, Inc.; KRP-150FR.
- F. 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 to match cylinders specified in Section 08 71 00. Attach label to fire rated doors for rating indicated.

1. J. L. Industries; Model FDWB.
 2. Nystrom Products Co; Model IW.
 3. Karp Associates, Inc.; KRP-350FR.
- G. Hardware: Stainless steel hinges with removable pin, screw driver slot with quarter turn cam lock, except for fire rated access doors.

2.2 SHOP FINISHING

- A. Steel Access Doors: Prime coat units with baked on primer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- 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 37 00
WOOD PATIO DOORS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Wood sliding patio doors.
- B. Refer to Section 014335 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate Work with door opening construction, door frame and door hardware installation.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data:
 - 1. Submit data for door core materials and construction.
 - 2. Submit data for wood species, type and characteristics.
 - 3. Submit data for factory finishes.
- C. Shop Drawings:
 - 1. Indicate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, and factory machining criteria.
 - 2. Indicate cutouts for glazing.
- D. Samples:
 - 1. Submit samples of door construction, minimum 5 x 5 inch in size, cut from corner of door to illustrate door construction.
 - 2. Submit two sets of three samples of door panels, 12 x 12 inch in size illustrating expected range of wood grain, stain color, and sheen.
- E. Manufacturers' Instructions: Submit special installation instructions.
- F. Qualification Statements:
 - 1. Submit manufacturer experience qualifications.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with AWI AWS Section 9, Custom Grade.
- B. Finish doors in accordance with AWI AWS Section 5, Custom Grade.
- C. AWI Quality Certification:
 - 1. Provide AWI Quality Certification Program labels or certificate indicating woodwork complies with specified grade requirements.
 - 2. Register the Work under this section with AWI Quality Certification Program.
- D. Accessibility Requirements: Conform to ICC A117.1.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience and current member of AWI.
- B. Forest Stewardship Council accredited certification agencies.
 - 1. Rainforest Alliance SmartWood Program.
 - 2. Scientific Certification Systems.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Package, deliver and store doors in accordance with AWI AWS Section 2.
- C. Marking: Mark each door on top rail with opening number.
- D. Protect doors with resilient packaging sealed with heat shrunk plastic.
- E. Delivery:
 - 1. Deliver doors after building is enclosed, HVAC system is operational, and interior environment is stabilized with air temperature between 50 and 90 degrees F and relative humidity between 25 and 55 percent.
 - 2. Maintain interior environment as indicated for occupied conditions until Substantial Completion.
- F. Storage:
 - 1. Do not store in damp or wet locations; or where light might bleach veneer.
 - 2. Store doors flat and level, off floor, in a dry, well ventilated location. Do not store on edge.
 - 3. Protect doors from dirt, water and abuse.
- G. Handling:
 - 1. Handle doors to prevent soiling or damaging finishes.

1.7 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.
- C. Warranty:
 - 1. Interior Doors: Furnish manufacturer's life of installation warranty.

PART 2 PRODUCTS

2.1 WOOD PATIO DOORS

- A. Provide Premium Wood Siteline 300 Series Patio Door as manufactured by Jeld-Wen Windows and Doors, or approved comparable products.
 - 1. Substitutions: Section 01 60 00 - Product Requirements.
- B. Panel Core: Manufacturer's standard engineered wood core.
- C. Exterior Wood: Preservative treated western pine, manufacturer's standard.
- D. Interior Wood: Kiln Dried Western Pine.
- E. Jamb and Frame: Kiln Dried Western Pine.
- F. Sustainability Requirements:
 - 1. Composite Wood and Agrifiber Products: Contain no added urea-formaldehyde resins.
- G. Performance / Design Criteria:
 - 1. Performance Duty Level: WDMA I.S. 1A.
 - 2. Fire Resistance: As indicated on Drawings.
 - 3. Sound Transmission Resistance: ASTM E413; minimum STC 35 for door and frame assemblies indicated as acoustically rated.
- H. Weatherstripping:
 - 1. Head: Rigid vinyl parting stop with flexible leaves and rigid vinyl track at operating head.
 - 2. Meeting Stiles: Rigid vinyl interlock sealed with thermoplastic strip and dense pile dust plug at bottom.
 - 3. Side Jambs: Rigid vinyl parting stop with flexible leaves.
 - 4. Sill: Integral wrapped foam.
 - 5. Color: Manufacturer's standard Ivory color unless otherwise indicated.
- I. Sill: Pultruded fiberglass with anodized aluminum track and oak threshold.
 - 1. Color: Fiberglass and aluminum: Bronze.
- J. Hardware:

1. Sliding System: Adjustable, tandem, steel ball bearing rollers on head jamb, interior mounted rigid vinyl track.
 2. Lock: Manufacturer's standard single point positive locking mechanism with adjustable throw latch.
 3. Handle Set: Manufacturer's standard handle set with oak wood interior handle and exterior hand pull, colors as selected.
- K. Glazing: Manufacturer's standard tempered, insulated glass, with Low E coating and air vacuum interstitial space.
- L. Accessories: Manufacturer's standard grilles and screens.

2.2 FABRICATION

- A. Fabricate doors in accordance with AWI AWS Section 9 requirements.
- B. Provide blocking for hardware reinforcement for all solid core doors:
1. Top Block: Minimum 5 inches wide for doors with surface mounted closers
 2. Lock Block: Minimum 5 x 18 inches at lock stile, Provide lock blocks at both stiles for doors with exit devices.
 3. Bottom Block: Minimum 5 inches wide for doors with surface mounted or mortised hardware within 6 inches of floor.
- C. Fit door edge trim to edge of stiles after applying veneer facing.
- D. Bond edge banding to cores.
- E. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.
- F. Factory fit doors for frame opening dimensions identified on shop drawings.
- G. Provide edge clearances in accordance with AWI AWS Section 9.

2.3 FINISHES

- A. Finish work in accordance with AWI AWS Section 5; Custom Grade.
- B. Opaque Finish System: Primed with manufacturer's standard primer, for opaque field finishing.
1. Refer to Section 099000 Painting And Coating.
- C. Seal door top edge with color sealer to match door facing.

2.4 ACCESSORIES

- A. Door Glazing:
1. Glazing Stops: Wood with metal clips for rated doors.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

- A. Install doors in accordance with AWI AWS Section 9 and manufacturer's instructions.
- B. Coordinate installation of doors with installation of frames specified in Section 08 11 13 and hardware specified in Section 08 71 00.
- C. Coordinate installation of glass and glazing specified in Section 08 80 00.

3.3 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Conform to AWI AWS Section 9 requirements for the following:
 - 1. Fit and clearance tolerances.
 - 2. Gaps.
 - 3. Flushness.
 - 4. Flatness.
 - 5. Squareness.
- C. Maximum Vertical Distortion (Bow): 1/8 inch measured with straight edge or taut string, top to bottom, over an imaginary 36 x 84 inches surface area.
- D. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taut string, edge to edge, over an imaginary 36 x 84 inches surface area.

3.4 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for starting and adjusting.
- B. Adjust door for smooth and balanced door movement.
- C. Adjust closer for full closure.

END OF SECTION

SECTION 08 54 13

FIBERGLASS WINDOWS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes
 - 1. Factory fabricated fiberglass framed windows, factory glazed, operating hardware and insect screens.
- B. Refer to Section 014335 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SYSTEM DESCRIPTION

- A. Windows: Extruded or pultruded fiberglass frames, factory fabricated, vision glass, related flashings, anchorage and attachment devices.
- B. Configuration: Casement, awning, and fixed, as indicated on Drawings.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work; and installation requirements.
- C. Product Data: Submit component dimensions, anchorage and fasteners, glass, and window hardware and accessories.
- D. Submit one full sized complete sample window unit illustrating all features specified herein and indicated on drawings. Including factory finished surfaces, glass units, and glazing materials. Sample will be returned.
- E. Submit two samples of exposed operating window hardware.
- F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- G. Manufacturer's Installation Instructions: Submit special procedures and perimeter conditions requiring special attention.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with the following:
 - 1. Windows: Fabricate windows in accordance with AAMA/NWWDA 101/I.S.2.

2. Insulated Glass: Fabricate insulated glass units in accordance with SIGMA.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing commercial aluminum clad wood windows with minimum five years documented experience.
- B. Installer: Company specializing in performing commercial installation of similar type windows for with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Protect factory finished surfaces with wrapping or strippable coating. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

1.7 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. System Warranty: Include coverage for complete system for failure to meet specified requirements.
 1. Provide two year manufacturer's warranty.
- C. Glass Warranty: As specified in Section 08 80 00.

PART 2 PRODUCTS

2.1 FIBERGLASS WINDOWS

- A. Manufacturers:
 1. Provide Ultrex Integrity Windows and Doors as manufactured by Marvin Windows & Doors, or approved equal products.
 2. Substitutions: Section 01 60 00 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

- A. Primary Performance Requirements: AAMA/NWWDA 101/I.S.2.
- B. System Design: Design and size components to withstand dead loads and live loads caused by positive and negative wind loads acting normal to plane of wall as calculated in accordance with IBC code and ASCE.
 1. Basic Wind Speed: As indicated on Drawings.
 2. Wind Load Importance Factor: 1.10.
 3. Wind Exposure
 - a. Components (Area Less Than 700SF): Exposure C.

- C. Member Deflection: Limit member deflection to flexure limit of glass or 1/175 which ever is less, with full recovery of glazing materials.
- D. Lintel Deflection: Accommodate deflection of lintel without damage to components, deterioration of seals, or movement between window and perimeter framing.
- E. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound.
- F. Thermal Movement: Design sections to permit thermal expansion and contraction of components to match perimeter opening construction.
- G. Air Infiltration: Limit air infiltration through assembly to 0.3 cfm/sq ft of wall area, measured at reference differential pressure across assembly of 1.57 psf as measured in accordance with ASTM E283.
- H. Thermal Performance:
 - 1. Maximum U-Value of 0.31 when measured in accordance with AAMA 1503.1 or NFRC 100.
 - 2. R-Value: 3.23 at center of glazing panel.
- I. Water Leakage: None, when measured in accordance with ASTM E330 with test pressure difference as defined by AAMA/NWWDA 101/I.S.2.

2.3 COMPONENTS

- A. Frame: Pultruded reinforced fiberglass.
 - 1. Thickness: Minimum 0.070 inch.
 - 2. Frame Depth: 3 - 3/32 inches minimum.
 - 3. Jamb Depth: Minimum 2 inches.
- B. Sash: Pultruded reinforced fiberglass.
 - 1. Thickness: Minimum 0.070 inch.
 - 2. Sash Thickness: 15/16 inch.
- C. Glazing: Sealed double pane glazing, as per ASTM C 1036 insulating glass in conformance with Section 08 80 00 Glazing.
 - 1. Tempered glass where indicated on Drawings.
 - 2. Glass Type: LoE 272, Argon filled.
 - 3. Glazing Seals: Exterior, wet sealed with silicone bedding.
- D. Unit Frame and Intermediate Mullions: Wood construction with mortise and tenon joint construction.
- E. Fixed and Operable Sash Construction: Wood with mortise and tenon joint construction.
- F. Sills: Pultruded fiberglass, sloped for positive wash; fit under sash; profile as indicated on Drawings; one piece full width of opening.
- G. Hardware:

1. Operator: Lever action handle or geared rotary handle fitted to projecting sash arms with limit stops.
2. Projecting Sash Arms: Cadmium plated steel, friction pivot joints with nylon bearings, removable pivot clips for cleaning.
3. Pulls: As selected.
4. Sash lock: Lever handle with cam lock.

2.4 ACCESSORIES

- A. Anchors: Stainless steel or hot dip galvanized steel
- B. Fasteners: Comply with NWWDA I.S.2 for fabrication and with manufacturer's recommendations for type and size of installation fasteners.
 1. Use galvanized or non-ferrous nails and screws for window fabrication and installation.

2.5 FABRICATION

- A. Fabricate windows to produce units that are reglazable without dismantling sash framing. Provide openings and mortises precut where possible to receive hardware and other items.
- B. Fabricate framing and sash members with pultruded or welded joints.
- C. Ensure joints and connections are flush, hairline, and weather-tight.
- D. Form sills in one piece. Slope sills for wash.
- E. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet allowing installation and dynamic movement of perimeter seal.
- F. Arrange fasteners to be concealed from view.
- G. Permit internal drainage weep holes and channels to migrate moisture to exterior. Provide internal drainage of glazing spaces to exterior through weep holes.
- H. Assemble insect screen frame, miter and reinforced frame corners. Fit mesh taut into frame and secure. Fit frame with retainers.
- I. Double weatherstrip operable units.
- J. Factory install glass in window units in accordance with manufacturer's standard method conforming with GANA Glazing Manual and to achieve performance criteria specified.

2.6 SHOP FINISHING

- A. Exterior and Interior Surfaces: Manufacturer's standard, factory applied, backed-on acrylic urethane.
 1. Color: As selected by Architect from manufacturer's full range.
- B. Screens: Match window frame color for exterior screens; as selected for interior screens.

- C. Exposed Hardware:
 - 1. Hinges: Stainless steel track with injection molded shoes.
 - 2. Manufacturer's standard multi-point locking mechanism.
 - 3. Manufacturer's standard roto-type operator.
- D. Weatherstripping:
 - 1. Manufacturer's standard weather stripping package for each type of window, including but not limited to:
 - a. Extruded foam filled bulb seal.
 - b. Hollow bulb secondary seal.
 - c. Color: Black, unless otherwise indicated.
- E. Insect Screens:
 - 1. Factory or site-installed screen panels:
 - a. Screen Mesh: 18 by 16 charcoal fiberglass.
 - b. Frame: Manufacturer's standard aluminum with standard finish.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this section, and opening dimensions and clearances are as indicated on shop drawings.

3.2 INSTALLATION

- A. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- B. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- C. Install sills; adjust trim to achieve hairline joints; seal joints watertight.
- D. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- E. Coordinate attachment and seal of perimeter air and vapor barrier materials.

3.3 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation from Level and from Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

3.4 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for starting and adjusting.
- B. Adjust hardware for smooth operation and secure weathertight closure.

3.5 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Remove protective material from factory finished surfaces.
- C. Remove labels and visible markings.
- D. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.

END OF SECTION

SECTION 08 62 00

UNIT SKYLIGHTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Manufactured skylights.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 PERFORMANCE REQUIREMENTS

- A. Exterior Walls: Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall, including building corners.
 - 1. As calculated in accordance with applicable code, as measured in accordance with ASTM E330.
- B. Size components to withstand design loads as indicated on Drawings.
- C. Allow for expansion and contraction within system components caused by a cycling surface temperature range of 170 F degrees without causing detrimental effects to system or components.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate configurations, dimensions, locations, fastening methods, and installation details.
- C. Product Data: Submit structural, thermal, and daylighting performance values.
- D. Manufacturer's Installation Instructions: Submit special procedures, and perimeter conditions requiring special attention.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.5 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

- B. Coordinate Work with installation of canopy and flexible flashing systems.

1.6 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Furnish five year manufacturer warranty for unit skylights.

PART 2 PRODUCTS

2.1 UNIT SKYLIGHTS

- A. Manufacturers:
 - 1. Velux Model VCE Series.
 - 2. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Factory-assembled glazing in aluminum frame; single venting insulated glazing panel, curb mounted skylights.
 - 1. Unit Configuration: As indicated on Drawings.
 - 2. Nominal Size: As indicated on Drawings.

2.2 COMPONENTS

- A. Dual Pane Insulated Glazing: Tinted safety glazing as indicated by manufacturer's designations, as selected by Architect.
- B. Frames: ABS frame and sash components with roll formed, 15 gauge aluminum frame and sash covers, manufacturer's standard color as selected.

2.3 ACCESSORIES

- A. Operators:
 - 1. Electric:
 - a. Motor: 120V, 40W, 60 Hz rated assembly.
 - b. Manufacturer's standard drive system.
 - c. 2.4 GHz remote control.
- B. Anchorage Devices: Type recommended by manufacturer, concealed.
- C. Counterflashings: Same metal type and finish as skylight frame.
- D. Sealant: Manufacturer's recommended sealants integral with each unit skylight installation, nonhardening, nonskinning, nondrying, nonmigrating butyl based sealants.

2.4 FABRICATION

- A. Factory-assembled unit consisting of glazing, extruded aluminum glazing retainer, gaskets, inner frame designed to mount on separate curb, and self-contained flashing.

- B. Fabricate free of visual distortion and defects.
- C. Fabricate to achieve leakproof, and weathertight assemblies.
- D. Fabricate components to allow for expansion and contraction with minimum clearance and shim spacing around perimeter of assembly.

2.5 FINISHES

- A. Factory finished, manufacturers standard, color as selected.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify openings and substrate conditions are ready to receive Work of this section.

3.2 PREPARATION

- A. Apply protective back coating on aluminum surfaces of skylight units to be in contact with cementitious materials or dissimilar metals.

3.3 INSTALLATION

- A. Install curb assembly in strict accordance with manufacturer's instructions, where indicated on drawings.
- B. Place unit skylights and secure to curb assembly. Install integral setting sealant and counterflashing for watertight installation.
- C. Only waterproof and weathertight assemblies will be acceptable.

3.4 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Remove protective material from prefinished aluminum surfaces.
- C. Wash down exposed surfaces; wipe surfaces clean.
- D. Remove excess sealant.

END OF SECTION

SECTION 08 80 00

GLAZING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes glass:
 - 1. Glass and glazing for doors, windows, and glazed openings.
 - 2. Glass and glazing materials and installation requirements are included in this section for other sections referencing this section.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 PERFORMANCE REQUIREMENTS

- A. Provide glass and glazing materials for continuity of building enclosure vapor retarder and air barrier:
 - 1. To utilize the inner pane of multiple pane sealed units for the continuity of the air barrier and vapor retarder seal.
- B. Glass Thickness: Select minimum thickness in accordance with ASTM E1300 to resist specified design loads with the following maximum probability of breakage:
 - 1. Vertical Glass: 8 lites per 1000 for wind loads with 3 seconds maximum load duration.
 - 2. Sloped Glass: 1 lite per 1000 for wind and snow loads with 30 days maximum load duration.
 - 3. Minimum Thickness: 1/4 inch for exterior glass.
- C. Structural Design: Design in accordance with applicable code for most critical combination of wind, snow, seismic, and dead loads.
- D. Roof Loads: Design sloped glass to resist live and dead loads.
 - 1. Live Loads: As indicated on Drawings.
 - 2. Roof Snow Loads: As calculated in accordance with applicable code and ASCE 7.
 - 3. Dead Loads: Actual weight of materials incorporated into Work.
- E. Exterior Glass Deflection: Maximum of 1/175 of glass edge length or 3/4 inch, which ever is less with full recovery of glazing materials.
- F. Interior Glass Deflection: Maximum differential deflection for two adjacent unsupported edges less than thickness of glass when 50 plf force is applied to one panel at any point up to 42 inches above finished floor.
- G. Thermal and Solar Optical Performance: Measured or calculated in accordance with the following:
 - 1. U-Values: NFRC 100.
 - 2. Solar Heat Gain Coefficients: NFRC 200.

3. Solar Optical Properties: NFRC 300.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings:
 1. Signed and sealed by professional engineer.
 2. Indicate sizes, layout, thicknesses, and loading conditions for glass.
- C. Product Data:
 1. Glass: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
 2. Glazing Sealants, Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors where exposed.
- D. Design Data: Signed and sealed by professional engineer.
 1. Submit design calculations for glass thicknesses.
- E. Samples:
 1. Glass: Submit two samples 12 x 12 inch in size, illustrating each glass unit, coloration and design.
 2. Glazing Materials: Submit 4 inch long bead of glazing sealant and gaskets, color as selected.
- F. Manufacturer's Certificate: Certify the following glass type, meets or exceeds specified requirements.
 1. Sealed insulating
- G. Installer's Certificate: Certify glass furnished without identification label is installed in accordance with Construction Documents and applicable code.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual, GANA Sealant Manual and IGMA for glazing installation methods.
- B. Fire Rated Door Glazing: Tested in accordance with one of the following and complying with NFPA 80.
 1. NFPA 252; with neutral pressure level at 40 inches maximum above sill at 5 minutes into test.
 2. UL 10C.
- C. Labeling: Apply label from agency approved by authority having jurisdiction to identify each glass lite. Apply labels to lower right corner of glass lite when viewed as installed from interior of room or building.
 1. Label each safety glass lite.
 2. Label each fire rated glass lite.

1.5 QUALIFICATIONS

- A. Installer: Company specializing in performing Work of this section with minimum three years documented experience approved by manufacturer.
- B. Design glass under direct supervision of Professional Engineer experienced in design of this Work and licensed at Project location.

1.6 PRE-INSTALLATION MEETING

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week before starting Work of this section.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Do not install glazing when ambient temperature is less than 50 degrees F.
- C. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

PART 2 PRODUCTS

2.1 FLOAT GLASS MATERIALS

- A. Annealed Glass: ASTM C1036, Type 1 transparent flat, Quality Q3, float glass.
 - 1. Furnish annealed glass except where heat strengthened or tempered glass is required to meet specified performance requirements.
- B. Heat Strengthened Glass: ASTM C1048, Type 1 transparent flat, Quality Q3, Kind HS heat strengthened, Condition A uncoated, float glass.
 - 1. Furnish heat strengthened glass where annealed glass cannot meet specified performance requirements.
 - 2. Fabricate heat treated glass with roller-wave distortion parallel to bottom edge of glass as installed.
- C. Tempered Glass: ASTM C1048, Type 1 transparent flat, Quality Q3, Kind FT fully tempered, Condition A uncoated, float glass with horizontal tempering.
 - 1. Furnish tempered glass where heat strengthened glass cannot meet specified performance requirements.
 - 2. Fabricate tempered glass with roller-wave distortion parallel to bottom edge of glass as installed.
 - 3. Furnish tempered glass conforming to CPSC 16 CFR 1201 Category II at locations where safety glass is required by applicable code.

2.2 FLOAT GLASS PRODUCTS

- A. Float Glass Manufacturers:
 - 1. AFG Industries, Inc.
 - 2. Guardian Industries Corp.
 - 3. PPG Industries.
 - 4. Pilkington North America, Inc.
 - 5. Substitutions: Section 01 60 00 - Product Requirements.
- B. Clear Glass: Float glass as specified; Class 1 clear.
 - 1. Clear annealed glass.
 - 2. Clear heat strengthened glass.
 - 3. Clear tempered glass.
 - 4. Minimum Thickness: 1/4 inch unless otherwise indicated.
- C. Low E Glass: Float glass as specified.

2.3 FIRE RESISTIVE GLASS PRODUCTS

- A. Fire Resistive Glass Manufacturers:
 - 1. Pilkington.
 - 2. Technical Glass Products.
 - 3. SAFTI First.
 - 4. Vetrotech Saint-Gobain North America, Inc.
 - 5. Substitutions: Section 01 60 00 - Product Requirements.
- B. Fire-Resistive Ceramic Glazing: Transparent polished both surfaces.
 - 1. Firelite manufactured by Technical Glass Products.
 - 2. Fire Rating: 45 and 60 minute rating as listed in UL Building Materials Directory and approved by applicable authorities for applications indicated.
 - 3. Thickness: Manufacturer's standard.

2.4 INSULATING GLASS PRODUCTS

- A. Insulating Glass Manufacturers:
 - 1. AFG Industries, Inc.
 - 2. Guardian Industries Corp.
 - 3. J.E. Berkowitz L.P.
 - 4. PPG Industries.
 - 5. Viracon.
 - 6. Substitutions: Section 01 60 00 - Product Requirements.
- B. (G-1)Insulating Glass: ASTM E2190 certified by Insulating Glass Certification Council or Insulating Glass Manufacturers Alliance; with Low E coating on surface 2 and glass elastomer edge seal; purge interpane space with Argon gas.
 - 1. Insulating Glass Unit Edge Seal Construction: Aluminum, bent and spot welded corners.
 - 2. Double Pane Insulating Glass:
 - a. Product: Manufacturer's standard.
 - b. Total Unit Thickness: 1 inch unless otherwise indicated.

- c. Outer Pane: Glass Type Clear Low-E, heat strengthened as required.
- d. Inner Pane: Glass Type Clear heat strengthened.

2.5 GLAZING SEALANTS

- A. Silicone Glazing Sealant: ASTM C920, Type S, Grade NS, Class and Use suitable for glazing application indicated; single component; solvent curing; capable of water immersion without loss of properties; non-bleeding, non-staining, cured Shore A hardness of 15 to 25; color as selected.
 - 1. Dow Corning; 795 Silicone Building Sealant.
 - 2. Pecora; 864NST.
 - 3. General Electric Silicones; SilPruf.
 - 4. Interior Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
- B. Dense Gaskets: Resilient extruded shape to suit glazing channel retaining slot; color as selected.
 - 1. Neoprene: ASTM C864.
 - 2. EPDM: ASTM C864.
 - 3. Silicone: ASTM C1115.
- C. Soft Gaskets: ASTM C509; resilient extruded shape to suit glazing channel retaining slot; color as selected.
 - 1. Neoprene.
 - 2. EPDM.
 - 3. Silicone.
- D. Pre-Formed Glazing Tape: Size to suit application.
 - 1. Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; black color.
 - a. Butyl Corner Sealant: Single component non-skinning butyl compatible with glazing tape; color to match tape.
 - 2. Interior Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

2.6 GLAZING ACCESSORIES

- A. Setting Blocks: Elastomeric material recommended by glass manufacturer, 80 to 90 Shore A durometer hardness, length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
- B. Spacer Shims: Elastomeric material recommended by glass manufacturer, 50 to 60 Shore A durometer hardness, minimum 3 inch long x one half the height of glazing stop x thickness to suit application, self adhesive on one face.
- C. Glazing Clips: Manufacturer's standard type.
- D. Glazing Channels: Extruded aluminum, for concealed mounting.

- E. Fire-Resistant Glazing Materials: Materials used to obtain required fire-resistant rating.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify openings for glazing are correctly sized and within acceptable tolerance.
- C. Verify surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.2 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant.

3.3 INSTALLATION

- A. Perform installation in accordance with GANA Glazing Manual.
 - 1. Glazing Sealants: Comply with ASTM C1193.
 - 2. Fire Rated Openings: Comply with NFPA 80.
- B. Exterior Wet Method (Sealant and Sealant) Installation:
 - 1. Place setting blocks at maximum 1/3 points with edge block no more than 6 inches from corners and install glazing pane or unit.
 - 2. Install removable stops with glazing centered in space by inserting spacer shims both sides at 24 inches intervals, 1/4 inch below sight line.
 - 3. Fill gaps between glazing and stops with elastomeric glazing sealant to depth of bite on glazing, but not more than 3/8 inch below sight line to ensure full contact with glazing.
 - 4. Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.
- C. Interior Wet/Dry Method (Tape and Sealant) Installation:
 - 1. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch above sight line.
 - 2. Place setting blocks at maximum 1/3 points with edge block no more than 6 inches from corners.
 - 3. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.
 - 4. Install removable stops, spacer shims inserted between glazing and applied stops at 24 inch intervals, 1/4 inch below sight line.
 - 5. Fill gaps between pane and applied stop with elastomeric glazing sealant to depth equal to bite on glazing, to uniform and level line.

6. Trim protruding tape edge.

3.4 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Remove glazing materials from finish surfaces.
- C. Remove labels after Work is complete.
- D. Clean glass and adjacent surfaces.

END OF SECTION

SECTION 08 83 00

MIRRORS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Glass mirrors
 - 2. Accessories.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Provide data for mirrors, mastic and accessories.
- C. Shop Drawings: Indicate locations, sizes, and required clearances.
- D. Samples: Two samples of mirrors 12 x 12 inch in size.

1.3 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual for glazing installation methods.
- B. Fabricate, store, transport, receive, install, and clean mirrors in accordance with NAMM - Tips for the Professional on the Care and Handling of Mirrors.

1.4 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Provide a five year manufacturer's warranty.
- C. Warranty: Include coverage for reflective coating on mirrors and replacement of same.

PART 2 PRODUCTS

2.1 MIRRORS

- A. Clear Glass Mirrors: ASTM C1503, Mirror Select Quality; 6.0 mm thick.
- B. Mirror Edges: Square, polished, unless otherwise indicated.

2.2 ACCESSORIES

- A. Mirror Adhesive: Mirror manufacturer's standard type, chemically compatible with mirror coating and wall substrate.
 - 1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
- B. Mirror Attachment Accessories: Stainless steel clips and stainless steel J-profile channels as indicated.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Verify existing conditions and surfaces before starting work.
- B. Clean contact surfaces with solvent and wipe dry.
- C. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

3.2 INSTALLATION

- A. Set glazing channels along bottom edge of mirror in bead of silicone sealant specified in Section 07 90 00.
- B. Set mirrors with adhesive, applied in accordance with adhesive manufacturer's instructions free of optical distortion.
- C. After mirrors have been installed, secure in place with clips, in accordance with manufacturer's instructions.
- D. Place plumb and level without visible distortion.
- E. Store, protect, and install mirrors in accordance with NAMM.

3.3 CLEANING

- A. Remove labels after Work is complete.
- B. Clean mirrors and adjacent surfaces.

END OF SECTION

SECTION 09 21 16

GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Metal framing where indicated.
 - 2. Metal channel ceiling framing.
 - 3. Direct suspension ceiling framing.
 - 4. Shaftwall wall system.
 - 5. Gypsum board and joint treatment.
 - 6. Tile backer board and joint treatment.
 - 7. Acoustic insulation.
 - 8. Reveal moldings.

- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 PERFORMANCE REQUIREMENTS

- A. Stud Selection: Select stud thickness so unbraced span does not exceed heights permitted by SSMA with maximum deflection of 1/360 for 5 psf uniform load.

- B. Acoustic Attenuation for Interior Partitions: STC rating as indicated on Drawings, measured in accordance with ASTM E90.

1.3 SUBMITTALS

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

- B. Shop Drawings:
 - 1. Indicate special details associated with fireproofing, acoustic seals, and shaft wall assemblies.

- C. Product Data:
 - 1. Submit data on metal framing, gypsum board, joint tape; and acoustic accessories.
 - 2. Indicate maximum unbraced height permitted for each stud gage and yield strength.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM C840. GA-214, GA-216 and GA-600.

- B. Fire Rated Wall Construction: Rating as indicated on Drawings.
 - 1. Tested Rating: Determined in accordance with ASTM E119.
 - 2. Prescriptive Rating: Determined in accordance with applicable code.

- C. Surface Burning Characteristics:
 - 1. Textile Wall Coverings: Comply with one of the following:
 - a. Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
 - b. Requirements of applicable code when tested in accordance with NFPA 265 Method B test protocol.
 - c. Requirements of applicable code when tested in accordance with NFPA 286.

1.5 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.
- C. Design partitions and ceilings under direct supervision of professional engineer experienced in design of this Work and licensed at Project location.

1.6 PRE-INSTALLATION MEETING

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing Work of this section.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

- A. Metal Framing Manufacturers:
 - 1. Current member of SSMA.
- B. Direct Suspension System Manufacturers: United States Gypsum Company as Basis of Design or approved comparable products.
 - 1. Chicago Metallic Corp.
 - 2. Substitutions: Section 01 60 00 - Product Requirements.
- C. Gypsum Board and Joint Treatment Manufacturers: United States Gypsum Company as Basis of Design or approved comparable products.
 - 1. Georgia Pacific.
 - 2. Lafarge North America.
 - 3. National Gypsum.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- D. Acoustic Insulation Manufacturers:
 - 1. Thermafiber; Thermafiber Sound Attenuation Fire Blankets (SAFB).
 - 2. Owens Corning; Sound Attenuation Batts (Mineral Wool) or Sound Attenuation Batts.
 - 3. CertainTeed; Thermafiber Sound Attenuation Fire Blankets (SAFB) or CertaPro AcoustaTherm Batts.

4. Johns Manville; MinWool-1200 Sound Attention Fire Batts or Sound Control Batts.
 5. Substitutions: Section 01 60 00 - Product Requirements.
- E. Reveal Molding Manufacturers:
1. Fry Reglet Corporation.
 2. Gordon, Inc.
 3. MM Systems Corporation.
 4. Pittcon Industries.
 5. Substitutions: Section 01 60 00 - Product Requirements.

2.2 COMPONENTS

- A. Wood Framing Materials: Refer to Section 06 10 00 Rough Carpentry for requirements.
- B. Metal Framing Materials:
1. Studs and Tracks: ASTM C645; galvanized sheet steel, size as indicated on Drawings, 'C' shape with the following minimum base metal thicknesses:
 - a. Studs with Tile Wall Finish: Minimum 30 mils (20 gage).
 - b. Other Studs: Minimum 18 mils (25 gage).
 - c. Studs and tracks with thicknesses equivalent to those specified are permitted, provided structural properties meet or exceed properties of studs with specified thickness.
 2. Shaft Wall Studs and Accessories: Manufacturers standard shape for rating indicated.
 3. Deep Leg Deflection Track: ASTM C645 top runner with 2 inch deep flanges.
 4. Furring, Framing and Accessories: ASTM C645.
 5. Fasteners for Framing: ASTM C1513.
 6. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.
- C. Blocking Material Options:
1. 6 inch wide, 16 gage steel with 1-1/4 inch legs, pre notched 1/2 inch to fit 16 or 24 inch on center stud.
 - a. Standard backing; as manufactured by Perfect Wall, Inc.
 2. Framing lumber as required, cut for tight fitting joints between structural and partition members. Refer to Section 061053 Miscellaneous Rough Carpentry.
 3. 6 inch wide by 48 inches long, pre notched fire- retardant treated plywood with flexible connector plate including trimable plates for off-module backing, to fit 16 or 24 inch on center stud.
 - a. Danback; as manufactured by Dietrich.
- D. Ceiling Suspension System Framing:
1. Channels: Hot or cold rolled; G40 hot dipped galvanized steel channel; minimum 1-1/2 inches size and minimum 0.475 lb/ft in accordance with ASTM C754.
 2. Fasteners for Framing: ASTM C1513.
 3. Hanger Wire: ASTM A641 soft temper, Class 1 galvanized steel, minimum 8 gage.
 4. Hanger Rods: Mild steel rod, with zinc coating, minimum 7/32 inches diameter.
 5. Angle Hangers: minimum 7/8 x 7/8 inches, 16 gage ASTM A653/A653M; structural steel sheet, G90 zinc coating, formed angles with 5/16 inches diameter bolted connections.

6. Anchorage Devices: Screws, clips, bolts, concrete inserts, and other devices of type and size to suit application; to rigidly secure materials in place. Size devices for 5x calculated load for concrete inserts and 3x calculated load for other devices.
 7. Adhesive: ASTM C557. GA-216.
 - a. Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
- E. Direct Suspension System Framing:
1. Grid Suspension System: ASTM C635; manufacturer's standard zinc coated system of interlocking furring runners, furring tees, and accessories designed for concealed modular supporting network for gypsum board ceilings.
 2. Channels: Hot or cold rolled; G90 hot dipped galvanized steel channel; minimum 1-1/2 inch size and minimum 0.475 lb/ft in accordance with ASTM C754.
 3. Hanger Wire: ASTM A641 soft temper, Class 1 galvanized steel, minimum 12 gage.
 4. Anchorage Devices: Screws, clips, bolts, concrete inserts, and other devices of type and size to suit application; to rigidly secure materials in place. Size devices for 5x calculated load for concrete inserts and 3x calculated load for other devices.
- F. Gypsum Board Materials: ASTM C1396/C1396M of the following types; thickness as indicated on Drawings; Type X fire resistant unless otherwise indicated on Drawings; maximum available length in place; ends square cut, tapered edges, unless specified otherwise.
1. Standard Gypsum Board.
 2. Exterior Gypsum Soffit Board.
 3. Gypsum Base: Square edges, ends square cut.
 4. Gypsum Shaftliner: 1 inch thick; square edges, ends square cut.
 5. Mold and Moisture Resistant Gypsum Board: ASTM D3274 mold resistance score of 10 when tested according to ASTM D3273.
 - a. Georgia-Pacific; Mold-Guard.
 - b. Lafarge North America; Mold Defense.
 - c. National Gypsum; XP Gypsum Board.
 - d. United States Gypsum Company; Mold Tough.
- G. Tile Backer Boards: Thickness and fire resistance as indicated on Drawings.
1. Gypsum Tile Backer Board: ASTM C1178/C1178M; maximum available length in place; ends square cut, tapered edges.
 - a. Georgia-Pacific; Dens Shield.

2.3 ACCESSORIES

- A. Acoustic Sealant: Nonsag, paintable, nonstaining, butyl-free, latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90. Furnish fire rated sealant for use in fire rated assemblies.
1. Non-Fire Rated Sealants:
 - a. Ohio Sealants, Inc.; SC 175 Acoustical Sound Sealant Non-Flammable - Latex.
 - b. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
 - c. Tremco, Inc.; Tremflex 834.
 - d. Substitutions: Section 01 60 00 - Product Requirements.
 2. Fire Rated Sealants:

- a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
 - b. Tremco, Inc.; TremStop Acrylic.
 - c. Substitutions: Section 01 60 00 - Product Requirements.
 3. Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
- B. Junction Box Pads: 6 x 8 inches in size, 1/8 inch thick, resilient sealer pads used to seal side and backs of junction boxes in acoustically rated partitions. Provide one of the following:
1. Lowry Electrical Box Pads.
 2. Dottie Sealant Insul Pads.
 3. Substitutions: Section 01 60 00 - Product Requirements.
- C. Metal Trim: ASTM C1047; hot-dipped galvanized steel; with or without paper facing.
1. Corner beads.
 2. Edge Beads: Profile to suit application.
 3. Expansion joints.
- D. Plastic Edge Trim (where indicated):
1. Premasked L Bead: Vinyl type with removable masking or tear away masking leg.
 - a. Trim-Tex; Pullaway Premask L Bead or Tearaway L Bead.
- E. Reveal Moldings: Extruded aluminum, 0.050 inch thick, type and size indicated.
- F. Joint Materials:
1. For Gypsum Tile Backer Board: 2 inch wide, coated alkali-resistant fiberglass mesh tape intended for use with tile backer board; approved by tile backer board manufacturer for use with their backer board product; tile setting material as specified in Section 09 30 00.
 2. For Other Gypsum Board: ASTM C475/C475M; reinforcing tape, joint compound, and water.
 - a. Use setting type joint compound for exterior locations.
- G. Fasteners for Gypsum Board:
1. Metal Framing 33 mils Thick and Less: ASTM C1002, Type S.
 2. Metal Framing Greater than 33 mils Thick: ASTM C1513.
 3. Wood Framing: ASTM C1002, Type W.
- H. Fasteners for Tile Backer Board: Board manufacturer's standard, corrosion resistant steel.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify that site conditions are ready to receive work and opening dimensions are as indicated on shop drawings.

3.2 INSTALLATION

- A. Wood and Metal Stud Installation:
1. Spacing: As indicated on Drawings.
 2. Extend studs minimum 6 inches above ceilings, unless otherwise specified or otherwise indicated on Drawings.
 3. Metal Framing: Extend stud framing through the ceiling to the structure above for fire rated partitions, acoustically rated partitions, and other partitions indicated on Drawings.
 - a. Provide deep leg deflection track as top runner.
 - b. Maintain clearance under structural building members to avoid deflection transfer to studs.
 - c. Brace studs within 12 inches of top track.
 - d. Do not fasten studs to top track.
 - e. Blocking: Screw blocking to studs in accordance with manufacturers instructions. Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, handrails, grab bars, and other fittings and fixtures supported by gypsum board partitions.
 - 1) Provide continuous blocking, minimum 12 inches wide, along length of bumper rails.
- B. Wall Furring Installation:
1. Erect wood furring strips tight to walls, attached by fasteners appropriate to substrate.
 2. Erect metal stud framing tight to walls, attached by adjustable furring brackets.
- C. Furring For Fire Ratings: Install furring as required for fire resistance ratings indicated and to GA-600 requirements.
- D. Shaft Wall Framing: Install in accordance with GA-600.
- E. Ceiling Framing Installation:
1. Install in accordance with ASTM C754. GA-216.
 2. Coordinate location of hangers with other work.
 3. Install ceiling framing independent of walls, columns, and above ceiling work.
 4. Install framing members at following maximum spacings:
 - a. Wire Hangers: 4 feet on center.
 - b. Carrying Channels: 4 feet on center.
 - c. Rigid Furring Channels: 16 inches on center.
 - d. Metal Framing: 16 inches on center.
 - e. Diagonal Bracing: Maximum 4 feet bays.
 - f. Cross Framing: 4 feet on center.
 5. Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels, with lateral channel bracing. Extend bracing minimum 24 inches past each end of openings.
 6. Laterally brace entire suspension system.
- F. Direct Suspension Ceiling Installation:
1. Install system in accordance with ASTM C636.

2. Install grid suspension system with perimeter wall track or angle where grid meets vertical surface. Mechanically join main beams and cross furring members to each other and but cut to fit into wall track.
 3. Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels, with lateral channel bracing.
- G. Acoustic Accessories Installation:
1. Comply with ASTM C919 and manufacturer's instructions to achieve STC ratings indicated on Drawings.
 2. Install resilient channels at maximum 24 inches on center. Locate joints over framing members.
 3. Install acoustic sealant at gypsum board perimeter at following locations:
 - a. Metal Framing: One bead.
 - b. Wood Framing: One bead.
 - c. Base Layer: One bead.
 - d. Face Layer: One bead.
 - e. Seal partition face layer at openings for items penetrating partition.
 4. Close off sound flanking paths around or through gypsum board assemblies including sealing partitions above acoustic ceilings.
- H. Gypsum Board Installation:
1. Install gypsum board in accordance with GA-216 and GA-600.
 2. Erect single layer gypsum board vertically, with edges occurring over firm bearing.
 3. Double Layer Applications:
 - a. Secure second layer to first with fasteners.
 - b. Place second layer parallel to first layer. Offset joints of second layer from joints of first layer.
 4. At stairwell and other walls extending for heights greater than one floor, install gypsum board horizontally with ends staggered and occurring over framing. Install horizontal control joint at floor lines.
 5. Use screws when fastening gypsum board to metal furring or framing.
 6. Treat cut edges and holes in water resistant gypsum board and tile backer board with sealant.
- I. Joint Treatment:
1. Finish in accordance with the following GA-214 Levels:
 - a. Level 4: Typical wall and ceiling surfaces exposed to view, except where otherwise indicated.
 - b. Tile Backer Board:
 - 1) Bed joint tape in tile setting material for joints concealed by tile in finished installation.
 - 2) Bed joint tape in joint compound for perimeter joints exposed to view in finished installation.

2. Joints Exposed to View: Feather coats on to adjoining surfaces so that camber is maximum 1/32 inch.

3.3 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 24 23

PORTLAND CEMENT STUCCO

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Exterior portland cement stucco.
 - 2. Waterproofing/air barrier membranes.
- B. Refer to Section 01 43 35 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 DESIGN REQUIREMENTS

- A. Design for maximum allowable system deflection, normal to the plane of the wall, of $L/360$.
- B. Design for wind load in conformance with code requirements. Consult applicable code compliance report.
- C. Moisture Control
 - 1. Prevent the accumulation of water into or behind the stucco, either by condensation or leakage into the wall construction, in the design and detailing of the wall assembly.
 - 2. Provide corrosion resistant flashing to direct water to the exterior where it is likely to penetrate components in the wall assembly, including, above window and door heads, beneath window and door sills, at roof/wall intersections, decks, abutments of lower walls with higher walls, above projecting features, and at the base of the wall.
 - 3. Air Leakage Prevention: Prevent excess air leakage in the design and detailing of the wall assembly. Provide continuity between air barrier components in the wall assembly.
 - 4. Vapor Diffusion and Condensation: Perform a dew point analysis of the wall assembly to determine the potential for accumulation of moisture in the wall assembly as a result of water vapor diffusion and condensation. Adjust insulation thickness and/or other wall assembly components accordingly to minimize the risk of condensation. Avoid the use of vapor retarders on the interior side of the wall in warm, humid climates.
- D. Joints
 - 1. Provide two piece expansion joints in the stucco system where building movement is anticipated: at joints in the substrate or supporting construction, where the system is to be installed over dissimilar construction or substrates, at changes in building height, at floor lines, at columns and cantilevered areas. Provide one piece expansion/control joints every 144 sq/ft. Do not exceed length to width ratio of 2-1/2:1 in expansion joint layout and do not exceed more than 18 feet in any direction without an expansion joint. Cut and wire tie lath to the expansion/control joint accessory so lath is discontinuous beneath the accessory. At expansion joints, back the joint with barrier membrane.

2. Provide one piece expansion/control joints at through wall penetrations and above and below doors or windows.
3. Provide minimum 3/8 inch wide joints where the system abuts windows, doors and other through wall penetrations.
4. Provide appropriate accessories at stucco terminations and joints.
5. Provide appropriate sealant at stucco terminations.
6. Indicate location of joints, accessories and accessory type on architectural drawings.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data on plaster materials, characteristics and limitations of products specified.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver all materials in their original sealed containers bearing manufacturer's name and identification of product.
- B. Protect coatings from freezing and temperatures in excess of 90°F. Store away from direct sunlight.
- C. Protect Portland cement based materials from moisture and humidity. Store under cover off the ground in a cool, dry location.

1.6 ENVIRONMENTAL CONDITIONS

- A. Maintain ambient and surface temperatures above 40°F during application and drying period of waterproofing/air barrier. Maintain ambient and surface temperatures above 40°F during application and for 24 hours after set of stucco.
- B. Prevent uneven or excessive evaporation of moisture from stucco during hot, dry or windy weather.
- C. Provide protection of surrounding areas and adjacent surfaces from application of materials.

1.7 WARRANTY

- A. Provide manufacturer's standard warranty.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT PLASTER

- A. Manufacturers
 - 1. Sto Corp.; Powerwall NExT System as basis of design.
 - 2. Substitutions: Section 01600 - Product Requirements.

2.2 WATERPROOFING/AIR BARRIER

- A. Manufacturers standard fluid applied waterproofing/air barrier for cmu substrate.
 - 1. Locations: At wood frame walls with OSB or plywood sheathing.
- B. Permeable Weather Resistive Barrier: Two layers, installed per manufacturer's recommendations.
 - 1. 1 Ply asphalt saturated kraft Grade D sheathing paper.
 - 2. Type 1, Grade D, Style 2, per UU-B790a.
 - 3. Moisture Vapor Transmission: 35 grams minimum per ASTM E96.
 - 4. Water Resistance: 20 minums per ASTM D779.
 - 5. Locations:
 - a. At wood frame walls with OSB or plywood sheathing.
 - b. At frame walls with Zip System sheathing.

2.3 STUCCO COMPONENTS

- A. Plaster Base Materials:
 - 1. Premixed Base and Scratch Coat: Factory mixed, fiber reinforced, Portland cement, grey color; lime and sand.
 - a. Lime: ASTM C206, Type S.
 - b. Aggregate: In accordance with ASTM C897.
 - 2. Water: Clean and potable.
- B. Primer: Manufacturers standard for type of system specified.
- C. Finish Coat: Factory proportioned, pre-sanded fiber reinforced portland cement based stucco for trowel or pump application, field mixed with water.
 - 1. Color as selected by Architect.

2.4 ACCESSORIES

- A. Lath: Minimum 2.5 lb./sq.yd. self-furred galvanized steel diamond mesh metal lath in compliance with ASTM C 847.
- B. Fasteners: Appropriate non-corroding fasteners.
- C. Tie Wire: 18 gauge galvanized and annealed low-carbon steel in compliance with ASTM A 641 with Class I coating.
- D. Joints and Trim: Zinc in compliance with ASTM B 69, all accessories to meet the requirements of ASTM C 1063, profiles as required to suit application.

2.5 MIXING

- A. Primer: Mix with a clean, rust-free high speed mixer to a uniform consistency.
- B. Finish Coat: Mix with a clean, rust-free high speed mixer to a uniform consistency. A small amount of water may be added to adjust workability. Limit addition of water to amount needed to achieve the finish texture.
- C. Mix only as much material as can readily be used.
- D. Do not use anti-freeze compounds or other additives.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify substrates are prepared to receive stucco finish.
- B. Mechanical and Electrical: Verify services penetrating walls have been tested and approved.

3.2 AIR BARRIER INSTALLATION

- A. Apply air barrier by spray or roller over substrate surface, including the dry joint treatment, to a uniform wet mil thickness of 10 mils in one coat. Protect from rain and freezing until dry.
- B. Apply second coat. Protect from rain and freezing until dry.
- C. Coordinate installation of connecting waterproofing/air barrier components to provide a continuous air tight membrane and moisture protection.
- D. Coordinate installation of flashing and other moisture protection components to achieve complete moisture protection so that water is directed to the exterior, not into the wall assembly, and drained to the exterior.

3.3 STUCCO INSTALLATION

- A. Casing Bead and Expansion Joint Installation
 - 1. Install casing beads at stucco terminations—doors, windows and other through wall penetrations. Install two piece expansion joints or back-to-back casing beads at building expansion joints, where the stucco is to be installed over dissimilar construction or substrates, at changes in building height, at floor lines, columns, and cantilevered areas. Install full accessory pieces where possible and avoid small pieces. Seal adjoining pieces by embedding ends in sealant. Abut horizontal into vertical joint accessories. Attach at no more than 7 inches into framing with appropriate fasteners.
- B. Lath Installation
 - 1. Diamond Mesh Metal Lath

- a. General: Install metal lath with the long dimension at right angles to structural framing. Terminate lath at expansion joints. Do not install continuously beneath joints.
- b. Seams/Overlaps: Overlap side seams minimum 1/2 inch and end seams minimum 1 inch. Stagger end seams. Overlap casing beads and two piece expansion joints minimum 1 inch over narrow wing accessories, minimum 2 inches over expanded flange accessories. Do not install lath continuously beneath expansion joints.
- c. Attachment: Fasten securely through sheathing into structural framing at 7 inches on center maximum vertically and 16 inches on center horizontally*. Wire tie at no more than 9 inches on center at: side laps, accessory overlaps, and where end laps occur between supports.

C. Control Joint Installation

1. Cut lath in a straight line with shears at expansion/control joint location. Do not cut into or damage moisture barrier. Install one piece expansion/control joints over lath at through wall penetrations and above and below doors or windows. Install one piece expansion/control joints over lath every 144 sq./ft. Wire tie one piece expansion/control joints to cut lath at no more than 7 inches on center. Make certain lath is discontinuous beneath joints. Do not exceed length to width ratio of 2 -1/2:1 in expansion/control joint layout and do not exceed more than 18 feet in any direction without an expansion/control joint.

D. Inside and Outside Corners

1. Bend lath at inside corners and extend minimum 24 inches past corner. Attach through lath into framing at no more than 7 inches on center with appropriate fasteners. Alternatively, butt lath at corners and attach corner lath at no more than 7 inches on center into framing with appropriate fasteners. Install corner bead at outside corners over lath. Attach at no more than 7 inches on center into framing with appropriate fasteners.

E. Stucco Installation

1. Scratch Coat: apply stucco with sufficient pressure to key into and embed the metal lath. Apply sufficient material, 3/8 - 1/2 inch, to cover the metal lath and to permit scoring the surface. Horizontally score the stucco upon completion of each panel in preparation for a second coat.
2. Brown Coat: as soon as the first coat is firm enough to receive the second coat without damage, apply the second coat. Alternatively, moist cure the first coat up to 48 hours and dampen the scratched surface with water immediately before applying the second coat. Apply the second coat with sufficient pressure to ensure intimate contact with the first coat and as needed to bring the stucco to a uniform thickness that matches the grounds of the accessories. Use a rod or straight edge to bring the surface to a true, even plane. Fill depressions in plane with stucco. Final thickness of stucco shall be minimum 1/2 inch, maximum 7/8 inch as required by project conditions and specifications. Stucco shall be uniform in thickness throughout the wall area.
3. After the stucco has become slightly firm float the surface lightly with a darby or wood float to densify the surface and to provide a smooth, even surface.
4. Moist cure after the stucco has set by lightly fogging for at least 48 hours. Fog as frequently as required during the 48 hour period to prevent loss of moisture from the

stucco. Avoid eroding the stucco surface with excess moisture. If relative humidity exceeds 75% the frequency of moist curing can be diminished.

F. Primer Installation

1. Apply primer evenly with brush, roller or proper spray equipment over the clean, dry stucco and allow to dry thoroughly before applying finish.

G. Finish Installation

1. Apply finish directly over the primed stucco when dry. Apply finish by spraying or troweling with a stainless steel trowel, depending on finish selected.
2. Avoid application in direct sunlight.
3. Apply finish in a continuous application, and work a wet edge towards the unfinished wall area. Work to an architectural break in the wall before stopping to avoid cold joints.
4. Weather conditions affect application and drying time. Hot or dry conditions limit working time and accelerate drying. Adjustments in the scheduling of work may be required to achieve desired results; cool or damp conditions extend working time and retard drying and may require added measures of protection against wind, dust, dirt, rain and freezing.
5. Do not install separate batches of finish side-by-side.
6. Do not apply finish into or over joints or accessories. Apply finish to outside face of wall only.
7. Do not apply finish over irregular or unprepared surfaces, or surfaces not in compliance with the requirements of the project specifications.

3.4 PROTECTION

- A. Provide protection of installed waterproofing/air barrier from dust, dirt, precipitation, freezing, and continuous high humidity until fully dry. Promptly install stucco wall covering once waterproofing/air barrier is dry. Do not allow waterproofing/air barrier to remain exposed to weather for more than 30 days.
- B. Provide protection of installed stucco from dust and dirt. Provide protection from precipitation and freezing for at least 24 hours after initial set of stucco. Provide protection from precipitation into or behind the stucco during and after construction.
- C. Provide protection of installed primer and finish from dust, dirt, precipitation, freezing and continuous high humidity until fully dry.
- D. Provide protection of finished installation from water infiltration into or behind it.

END OF SECTION

SECTION 09 30 00

TILING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Ceramic tile floor.
 - 2. Ceramic base.
 - 3. Ceramic wall finish.
 - 4. Threshold at door openings.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicating tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, thresholds, and setting details.
- C. Product Data: Indicating material specifications, characteristics, and instructions for using setting materials and grouts; include grout colors for selection.
- D. Samples:
 - 1. Submit two full size tile samples for each type of ceramic wall tile and base tile.
 - 2. Submit two 12 x 12 size samples for each type of ceramic mosaic tile and base.

1.3 QUALITY ASSURANCE

- A. Conform to ANSI A137.1
- B. Conform to TCNA Handbook for Ceramic Tile Installation.

1.4 OPERATION AND MAINTENANCE DATA

- A. Section 01 78 53 - Operation and Maintenance Data: Material manual submittals.
- B. Operation and Maintenance Data: Include recommended cleaning and stain removal methods, cleaning materials, and polishes and waxes.

PART 2 PRODUCTS

2.1 TILE MATERIALS

- A. Provide porcelain tile products by Crossville Ceramics or approved comparable products from one of the following:
- B. Manufacturers:
 - 1. American Olean.
 - 2. Dal Tile.
 - 3. Summitville Tile.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- C. Floor Tile: ANSI A137.1.
 - 1. Sizes:
 - a. 12 by 12 inches unless otherwise indicated.
 - b. 12 by 24 inches where indicated.
 - c. 4 by 8 inches where indicated on shower floors.
 - 2. Square and rectangle shapes.
 - 3. Finish: Unglazed surface finish.
 - 4. Colors: As selected from range available.
 - 5. Coefficient of Friction: ASTM C1028, minimum 0.6 dry.
- D. Wall Tile: ANSI A137.1.
 - 1. Sizes:
 - a. 6 by 6 inches
 - b. 12 by 24 inches where indicated.
 - 2. Finish: . Bright or matte glazed.
 - 3. Color and Pattern: As selected from range available.
- E. Wall Base: ANSI A137.1.
 - 1. Size: 3 inches unless otherwise indicated.
 - 2. Finish: Bright or matte glazed.
 - 3. Color and Pattern: As selected from range available.

2.2 ADHESIVES

- A. Organic Adhesive: ANSI A136.1 thinset bond type, Type I.
 - 1. Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

2.3 MORTAR AND GROUT

- A. Manufacturers:
 - 1. Mapei Corporation.
 - 2. Custom Building Products.
 - 3. Laticrete International, Inc.
 - 4. Merkrete.
 - 5. Substitutions: Section 01 60 00 - Product Requirements.

- B. Mortar Bond Coat Materials: Latex-Portland Cement type: ANSI A118.4.
 - 1. Mapei; Kerabond with Keralastic additive.
 - 2. Laticrete International, Inc; Laticrete 272 Floor N' Wall Thin-Set with Laticrete 3701 Mortar Admix.
 - 3. Custom Building Products: Master-Blend with Acrylic Mortar Admix.
 - 4. Merkrete: Two Part Thinset mortar system consisting of 200 Krete Latex Admix and 211 Krete Filler.
 - 5. Merkrete: 735 Premiumflex Single component thinset mortar.

- C. Sanded Grout: ANSI A118.6; Portland cement, sand, latex additive, and water, color as selected.
 - 1. Mapei; Keracolor S, Sanded Polymer-Modified Portland Cement Tile Grout.
 - 2. Merkrete: Colorgrout, Sanded Tile Grout.
 - 3. Laticrete International, Inc; Laticrete 1500 Series with Laticrete 1776 Grout Admix.
 - 4. Custom Building Products: Polyblend Sanded Tile Grout.

- D. Unsanded Grout: ANSI A118.6; Portland cement, latex additive, and water, color as selected.
 - 1. Mapei; Keracolor U, Unsanded Polymer-Modified Portland Cement Tile Grout.
 - 2. Merkrete: Colorgrout, Unsanded Tile Grout.
 - 3. Laticrete International, Inc; Laticrete 1600 Series with Laticrete 1776 Grout Admix.
 - 4. Custom Building Products: Polyblend Non-sanded Tile Grout.

2.4 WATERPROOFING MATERIALS

- A. Manufacturers:
 - 1. Mapei Corporation.
 - 2. Merkrete.
 - 3. Custom Building Products.
 - 4. Laticrete International, Inc.
 - 5. Substitutions: Section 01 60 00 - Product Requirements.

- B. Liquid Membrane Materials:
 - 1. Installed in all laundry areas, full and master baths.
 - 2. No membrane installed in powder room areas.
 - 3. Waterproof Membrane: Latex based liquid rubber membrane.
 - a. Laticrete; 9235 Waterproofing Membrane.
 - b. Mapei; Mapelastix 400.
 - c. Custom Building Products; Custom 9240 Waterproofing and Anti-Fracture Membrane.
 - d. Merkrete; Hydro-Guard SP1.
 - 4. Waterproof Membrane Reinforcing: Manufacturer's standard fabric reinforcing.

- C. Shower Pan Waterproofing:
 - 1. Manufacturer:
 - a. The Noble Co.; Chloraloy Sheet Waterproofing.
 - 2. Shower Pan Sheet Waterproofing: ASTM D 4068, non plasticized chlorinated polyethylene sheet, nominal thickness of 40 mils with water vapor transmission rate of 5.2 ng (.090 perms) minimum per ASTM E96.

3. Accessories: Use only products approved in writing by the manufacturer when installing membrane.

2.5 ACOUSTIC SOUND SUPPRESSION

- A. Refer to Section 06 16 29 Acoustical Underlayment.

2.6 ACCESSORIES

- A. Crack Isolation Membrane: Composite sheet membrane, non-plastisized Chlorinated Polyethylene (CPE), with non woven fabric laminated on both surfaces.
 1. Product:
 - a. The Noble Company: NobleSeal CIS.
 - b. Laticrete; Blue 92.
 - c. Merkrete; Fracture Guard 5000 Crack Isolation Membrane.
- B. Thresholds: Marble, ASTM C503, color as selected, honed finish, profile as indicated on Drawings, by full width of wall or frame opening, beveled one side, radiused edges from bevel to vertical face.
- C. Floor Transition Strips: Extruded aluminum, color as selected; profile to suit application conditions.
 1. Schluter; Schiene or Reno Series.

2.7 MORTAR MIX AND GROUT MIX

- A. Mix and proportion premix setting bed and grout materials in accordance with manufacturer's instructions.

PART 3 EXECUTION

3.1 PREPARATION

- A. Protect surrounding work from damage or disfiguration.
- B. Vacuum clean substrate and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

3.2 TILE INSTALLATION

- A. Install tile, grout and thresholds to TCNA Handbook for Ceramic Tile Installation as follows:
 1. Thin Set Floor Tile: TCNA Method F113, latex portland cement bond coat; sanded grout.
 2. Thin Set Wall Tile: TCNA Method W243 or W244 or W245, latex portland cement bond coat; unsanded grout.
 3. Thin Set Floor Tile: TCNA Method F122, waterproofing membrane; latex portland cement bond coat, sanded grout.

4. Medium Bed Set Floor Tile: Based On TCNA Method F122, liquid membrane materials; latex portland cement bond coat, sanded grout. Full contact mortar of substrate and tile backing. Back butter tile to thickness needed. Voids are not permitted on substrate or tile backing.
- B. Install shower pan to achieve water tight installation in accordance with manufacturer's instructions. Flash shower pan to floor drain. Seal shower pan to wall construction.
- C. Install waterproof membrane at wall and shower wet areas in accordance with manufacturer's instructions.
 1. Extend membrane up vertical surfaces full height to ceiling at shower areas, minimum of 4 inches up wall at other locations.
 2. Embed waterproof membrane reinforcing in membrane at internal and external corners and other areas subject to cracking as recommended by manufacturer.
 3. Flash membrane to floor drains and floor sinks to maintain watertight installation.
 4. Cure membrane minimum 24 hours before setting tile.
 5. Prohibit traffic on membrane while curing.
- D. Test integrity of waterproofing membrane. Dam floor drain and perimeter where required. Flood membrane to minimum 2 inches for minimum 24 hours. Mark water level at start of test. Observe standing water for air bubbles as indication of leaks. Observe spaces surrounding and under waterproofing for leaks. Measure water level at completion of test to determine any leakage. Correct leaks and retest until membrane proves watertight. Repair damage caused to other spaces and materials by water leaking from tests.
- E. Install acoustic sound suppression in accordance with manufacturer's instructions at locations indicated on Drawings.
- F. Install crack isolation membrane in accordance with manufacturer's instructions at locations indicated on Drawings and centered over substrate cracks and control joints.
 1. Install membrane with sufficient width so minimum three full sized tiles are installed on crack isolation membrane.
 2. Extend membrane continuous for full length of crack.
 3. Bond membrane to substrate.
- G. Lay tile to pattern indicated on Drawings. Do not interrupt tile pattern through openings.
- H. Place thresholds at exposed tile edges.
- I. Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align floor, and base joints.
- J. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
- K. Sound tile after setting. Replace hollow sounding units.
- L. Allow tile to set for a minimum of 48 hours prior to grouting
- M. Grout tile joints.

1. Keep tile joints surrounding substrate cracks and control joints free of grout.
 2. Install sealant in tile joints surrounding substrate cracks and control joints.
- N. Apply sealant to junction of tile and dissimilar materials and at junction of dissimilar planes.

3.3 CLEANING AND PROTECTION

- A. Clean tile surfaces. Remove excess grout and mortar materials from tile and surrounding finishes.
- B. Do not permit traffic over finished floor surface.

END OF SECTION

SECTION 09 64 00
WOOD FLOORING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Prefinished hardwood flooring, nailed on wood subfloor over slip sheet.
 - 2. Prefinished hardwood flooring adhered to concrete substrates.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings:
 - 1. Indicate floor joint pattern, grain direction, and termination details.
 - 2. Indicate provisions for expansion and contraction, base, and base corner details.
- C. Product Data: Provide data for resilient blocks, floor materials, and floor finish care.
- D. Samples: Submit two samples 12 x 12 inch in size illustrating floor finish, color, and sheen.

1.3 QUALITY ASSURANCE

- A. Work: In accordance with the following:
 - 1. Lumber Grading Agency: Certified by ALSC.
 - 2. Plywood Grading Agency: APA or other code approved quality control agency.

1.4 MOCKUP

- A. Section 01 40 00 - Quality Requirements: Requirements for mockup.
- B. Construct mockup, 10 x 10 feet, which includes accessories and finish.
- C. Locate where directed.
- D. Accepted mockup may remain as part of the Work.

1.5 MAINTENANCE DATA

- A. Section 01 78 53 - Operation and Maintenance Data: Material manuals.
- B. Maintenance Data: Include maintenance procedures, recommended maintenance materials, a suggested schedule for cleaning, stain removal methods, and polishes and waxes.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not install wood flooring until wet construction work is completed.
- B. Do not install flooring until moisture content of concrete floor has stabilized at 12 percent maximum and ambient air at installation space is not less than 65 degrees F.
- C. Provide heat, light, and ventilation prior to installation.
- D. Maintain room temperature and relative humidity in accordance with adhesive manufacturer's instructions for a period of two days prior to delivery of materials, during, and after installation.

PART 2 PRODUCTS

2.1 WOOD FLOORING

- A. Manufactures and Products: Provide Strand Woven Carbonized Bamboo as manufactured by Green Choice Flooring International, or approved comparable product.
 - 1. Color/Finish: Nutmeg.

2.2 ACCESSORIES

- A. Secondary Subflooring: APA C-C plugged, Group 2, Exterior type, square edges; sanded fire retardant treated as specified in Section 06 05 73.
 - 1. FSC Certified for Base Bid 1.
 - 2. Product to be urea-formaldehyde free.
- B. Slip Sheet: Felt Rosin paper as continuous underlayment in nailed flooring applications.
- C. Nails: Type recommended by flooring manufacturer.
- D. Primers and Adhesives: Water resistant type, recommended by flooring manufacturer for substrate.
 - 1. Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
- E. Edge Strip: Stainless steel angle or Tee to suit application conditions

2.3 FINISHES

- A. Manufacturer's standard finishes for selected products.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that floor framing is smooth and flat to plus or minus 1/4 inch in 10 feet.

- B. Verify that required floor mounted utilities are in proper location.

3.2 INSTALLATION - GENERAL

- A. Prior to applying or installing each material, broom clean substrate and ensure surface is free of oil, grease, dust, and foreign substances.
- B. Prepare concrete and plywood sub-floors to receive wood flooring in accordance with manufacturer's instructions.
- C. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- D. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- E. Vacuum clean substrates.
- F. Apply primer when required by flooring manufacturer.

3.3 INSTALLATION - NAILED FLOORING

- A. Place slip sheet over installation area, fastened as recommended by flooring manufacturer.
- B. Nail flooring in accordance with manufacturer's instructions.
- C. Lay flooring parallel to length of room areas, set joints flush and tight. Verify alignment as work progresses.
- D. Arrange flooring with end matched grain set flush and tight.

3.4 INSTALLATION - ADHERED FLOORING

- A. Adhesives:
 - 1. Spread only enough adhesive to permit installation of materials before initial set.
 - 2. Remove excess adhesive extruded through floor surface as work progresses.
- B. Install wood flooring in accordance with manufacturer's instructions.
 - 1. Set wood flooring in place, press with heavy roller to attain full adhesion.
 - 2. Lay flooring in patterns indicated on Drawings. Verify alignment as work progresses.
 - 3. Arrange flooring with end matched grain set flush and tight.
 - 4. Install divider strips at locations indicated on Drawings.
 - 5. Install edge strips at unprotected or exposed edges, and where flooring terminates.
 - 6. Install with manufacturer's recommended expansion space at fixed walls and other interruptions.

3.5 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.

- B. Clean and polish floor surfaces in accordance with manufacturer's instructions.

3.6 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Prohibit traffic on floor finish for 48 hours after installation.

END OF SECTION

SECTION 09 64 00
WOOD FLOORING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Prefinished hardwood flooring, nailed on wood subfloor over slip sheet.
 - 2. Prefinished hardwood flooring adhered to concrete substrates.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings:
 - 1. Indicate floor joint pattern, grain direction, and termination details.
 - 2. Indicate provisions for expansion and contraction, base, and base corner details.
- C. Product Data: Provide data for resilient blocks, floor materials, and floor finish care.
- D. Samples: Submit two samples 12 x 12 inch in size illustrating floor finish, color, and sheen.

1.3 QUALITY ASSURANCE

- A. Work: In accordance with the following:
 - 1. Lumber Grading Agency: Certified by ALSC.
 - 2. Plywood Grading Agency: APA or other code approved quality control agency.

1.4 MOCKUP

- A. Section 01 40 00 - Quality Requirements: Requirements for mockup.
- B. Construct mockup, 10 x 10 feet, which includes accessories and finish.
- C. Locate where directed.
- D. Accepted mockup may remain as part of the Work.

1.5 MAINTENANCE DATA

- A. Section 01 78 53 - Operation and Maintenance Data: Material manuals.
- B. Maintenance Data: Include maintenance procedures, recommended maintenance materials, a suggested schedule for cleaning, stain removal methods, and polishes and waxes.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not install wood flooring until wet construction work is completed.
- B. Do not install flooring until moisture content of concrete floor has stabilized at 12 percent maximum and ambient air at installation space is not less than 65 degrees F.
- C. Provide heat, light, and ventilation prior to installation.
- D. Maintain room temperature and relative humidity in accordance with adhesive manufacturer's instructions for a period of two days prior to delivery of materials, during, and after installation.

PART 2 PRODUCTS

2.1 WOOD FLOORING

- A. Manufactures and Products: As indicated in Finish Schedule.

2.2 ACCESSORIES

- A. Secondary Subflooring: APA C-C plugged, Group 2, Exterior type, square edges; sanded fire retardant treated as specified in Section 06 05 73.
 - 1. FSC Certified for Base Bid 1.
 - 2. Product to be urea-formaldehyde free.
- B. Slip Sheet: Felt Rosin paper as continuous underlayment in nailed flooring applications.
- C. Nails: Type recommended by flooring manufacturer.
- D. Primers and Adhesives: Water resistant type, recommended by flooring manufacturer for substrate.
 - 1. Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
- E. Acoustic Underlayment: Refer to Section 061629.
- F. Edge Strip: Stainless steel angle or Tee to suit application conditions

2.3 FINISHES

- A. Manufacturer's standard finishes for selected products.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that floor framing is smooth and flat to plus or minus 1/4 inch in 10 feet.

- B. Verify that required floor mounted utilities are in proper location.

3.2 INSTALLATION - GENERAL

- A. Prior to applying or installing each material, broom clean substrate and ensure surface is free of oil, grease, dust, and foreign substances.
- B. Prepare concrete and plywood sub-floors to receive wood flooring in accordance with manufacturer's instructions.
- C. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- D. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- E. Vacuum clean substrates.
- F. Apply primer when required by flooring manufacturer.

3.3 INSTALLATION - NAILED FLOORING

- A. Place slip sheet over installation area, fastened as recommended by flooring manufacturer.
- B. Nail flooring in accordance with manufacturer's instructions.
- C. Lay flooring parallel to length of room areas, set joints flush and tight. Verify alignment as work progresses.
- D. Arrange flooring with end matched grain set flush and tight.

3.4 INSTALLATION - ADHERED FLOORING

- A. Adhesives:
 - 1. Spread only enough adhesive to permit installation of materials before initial set.
 - 2. Remove excess adhesive extruded through floor surface as work progresses.
- B. Install acoustic underlayment in accordance with Acoustic Underlayment Manufacturer's installation instructions.
- C. Install wood flooring in accordance with manufacturer's instructions.
 - 1. Set wood flooring in place, press with heavy roller to attain full adhesion.
 - 2. Lay flooring in patterns indicated on Drawings. Verify alignment as work progresses.
 - 3. Arrange flooring with end matched grain set flush and tight.
 - 4. Install divider strips at locations indicated on Drawings.
 - 5. Install edge strips at unprotected or exposed edges, and where flooring terminates.
 - 6. Install with manufacturer's recommended expansion space at fixed walls and other interruptions.

3.5 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean and polish floor surfaces in accordance with manufacturer's instructions.

3.6 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Prohibit traffic on floor finish for 48 hours after installation.

END OF SECTION

SECTION 09 68 13

TILE CARPETING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes carpet tile;
 - 1. Fully adhered.
 - 2. Installed in recessed entrance floor mats.
 - 3. Carpet accessories.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate layout of joints, direction of carpet pile, and location of edge moldings.
- C. Product Data: Submit data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- D. Samples:
 - 1. Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
 - 2. Submit two, 12 inch long samples of:
 - a. Edge strip
- E. Manufacturer's Installation Instructions: Submit special procedures, and perimeter conditions requiring special attention.

1.3 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.4 QUALITY ASSURANCE

- A. Surface Burning Characteristics:
 - 1. Floor Finishes: Comply with one of the following:
 - a. Class I, minimum 0.45 watts/sq cm when tested in accordance with NFPA 253.
 - b. CPSC 16 CFR 1630.

1.5 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 experience.

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. Store materials in area of installation for 48 hours prior to installation.

1.8 EXTRA MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Supply one full carton of carpet tiles of each color and pattern selected.

PART 2 PRODUCTS

2.1 CARPET TILE

- A. Manufacturers:
 - 1. Collins & Aikman Floor Coverings.
 - 2. Interface Flooring Systems, Inc.
 - 3. Mannington Commercial Carpet.
 - 4. Milliken Carpet.
 - 5. Substitutions: Section 01 60 00 - Product Requirements.

2.2 COMPONENTS

- A. Carpet Tile Type: Tufted, manufactured in one color dye lot:
 - 1. Tile Size: 18 x 18 inch, nominal.
 - 2. Thickness: Minimum 0.11 inch.
 - 3. Color: As selected.
 - 4. Pattern: As selected.
 - 5. Carpet: Maximum volatile organic compound content in accordance with CRI Green Label Plus Testing Program.

2.3 ACCESSORIES

- A. Sub-Floor Filler: Type recommended by flooring material manufacturer.
- B. Moldings and Edge Strips: color as selected
 - 1. Rubber.
- C. Contact Adhesive: Recommended by carpet manufacturer.
 - 1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify floor surfaces are smooth and flat and are ready to receive work.

3.2 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.
- B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- C. Clean substrate.

3.3 INSTALLATION

- A. Install carpet tile in accordance with CRI 104.
- B. Do not mix carpet from different cartons unless from same dye lot.
- C. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- D. Install carpet tile in square pattern, with pile direction aligned as indicated on shop drawings.
- E. Locate change of color or pattern between rooms under door centerline.
- F. Fully adhere carpet tile to substrate.
- G. Trim carpet tile neatly at walls and around interruptions.
- H. Complete installation of edge strips, concealing exposed edges.

3.4 INSTALLATION AT ENTRANCE FLOOR MATS

- A. Install carpet tiles into entrance floor mats per carpet and entrance mat manufacturer's instructions.
 - 1. Refer to Section 12 48 13.

3.5 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Remove excess adhesive from floor, base, and wall surfaces without damage.
- C. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 90 00
PAINTING AND COATING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and field application of paints and other coatings.
- B. Refer to Section 014335 for Mockup requirements affecting work of this section.
- C. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this section.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Submit scale drawings illustrating traffic markings and colors to be used.
- C. Product Data: Submit data on all finishing products and coatings.
- D. Samples:
 - 1. Submit two paper chip samples, 3 x 3 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.
 - 2. Submit two painted samples, illustrating selected colors and textures for each color and system selected with specified coats cascaded. Submit on tempered hardboard, 6 x 6 inch in size.
- E. Manufacturer's Installation Instructions: Submit special surface preparation procedures, and substrate conditions requiring special attention.

1.4 OPERATION AND MAINTENANCE DATA

- A. Section 01 78 53 - Operation and Maintenance Data: Material manual submittals.
- B. Operation and Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

1. Manufacturing Location: Within 500 miles of Project site for final assembly of components into Products.
- B. Applicator: Company specializing in performing the work of this section with minimum three years documented experience.

1.6 PRE-INSTALLATION MEETING

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing Work of this section.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- C. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- D. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- C. Do not apply exterior coatings during rain or snow when relative humidity is outside the humidity ranges, or moisture content of surfaces exceed those required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E. Minimum Application Temperature for Varnish and Stain Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.
- F. Provide lighting level of 80 ft candle measured mid-height at substrate surface.

1.9 SEQUENCING

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

- B. Sequence application to the following:
 - 1. Do not apply finish coats until paintable sealant is applied.
 - 2. Back prime wood trim before installation of trim.

1.10 EXTRA MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for extra materials.
- B. Supply 1 gallon of each color, type, and surface texture; store where directed.
- C. Label each container with color, type, texture, room locations, in addition to the manufacturer's label.

PART 2 PRODUCTS

2.1 PAINTS AND COATINGS

- A. Manufacturers:
 - 1. M. A. Bruder & Sons.
 - 2. Sherwin-Williams.
 - 3. Benjamin Moore.
 - 4. Finnaren & Haley Paints.
 - 5. Tnemec.
 - 6. PPG/Porter Paints
 - 7. Substitutions: Section 01 60 00 - Product Requirements.

2.2 COMPONENTS

- A. Coatings: Ready mixed, except field catalyzed coatings. Prepare coatings:
 - 1. To a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
 - 2. For good flow and brushing properties.
 - 3. Capable of drying or curing free of streaks or sags.
 - 4. Flat and Non-Flat Paints: Maximum volatile organic compound content in accordance with GS-11.
 - 5. Anti-Corrosive Paints: Maximum volatile organic compound content in accordance with GC-03.
 - 6. Clear Wood Finishes: Maximum volatile organic compound content in accordance with SCAQMD Rule 1113.
- B. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified; commercial quality.
 - 1. Clear Wood Finishes: Maximum volatile organic compound content in accordance with SCAQMD Rule 1113.
- C. Patching Materials: Latex filler.
- D. Fastener Head Cover Materials: Latex filler.

2.3 FINISHES

- A. Refer to schedule at end of section for surface finish schedule.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify that surfaces and substrate conditions are ready to receive Work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. Test shop applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Plaster and Gypsum Wallboard: 12 percent.
 - 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
 - 3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
 - 4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
 - 5. Concrete Floors: 8 percent.

3.2 PREPARATION

- A. Surface Appurtenances: Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- B. Surfaces: Correct defects and clean surfaces which affect work of this section.
- C. Marks: Seal with shellac those which may bleed through surface finishes.
- D. Impervious Surfaces: Remove mildew by scrubbing with solution of tetra-sodium or tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- E. Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.
- F. Concrete Floors: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- G. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

- H. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- I. Concrete and Concrete Masonry Unit Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- J. Plaster Surfaces: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
- K. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand, power tool, wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.
- L. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
- M. 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.
- N. 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.
- O. 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 paintable caulking compound after prime coat has been applied.
- P. Exterior Wood 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 has been applied.
- Q. Wood Doors Scheduled for Painting: Seal wood door top and bottom edge surfaces with clear sealer or tinted primer.
- R. Metal Doors Scheduled for Painting: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

- A. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- B. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless specified otherwise.

- C. Sand wood and metal surfaces lightly between coats to achieve required finish.
- D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- E. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- F. Prime concealed surfaces of woodwork with primer paint.
- G. Prime concealed surfaces of interior wood surfaces scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with thinner.

3.4 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect and test questionable coated areas.

3.5 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Collect waste material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.6 SCHEDULE - EXTERIOR SURFACES - LATEX

- A. Shop Primed Ferrous Metal - Gloss Acrylic Enamel:
 - 1. MAB Paints:
 - a. Finish: Two coats Rust-O-Lastic Gloss Acrylic Finish 043, 3.0 mils dry film thickness each coat.
 - 2. Sherwin-Williams:
 - a. Finish: Two coats DTM Acrylic Gloss B66, 3.0 mils dry film thickness each coat.
 - 3. Benjamin Moore:
 - a. Finish: Two coats DTM M-28 Acrylic Gloss, 2.0 mils dry film thickness each coat.
 - 4. F&H:
 - a. Finish: Two coats Acrylic Gloss Polyurethane 2.0 mils dry film thickness each coat.
 - 5. PPG/Porter Paints:
 - a. Finish: Two coats 90-374 Pitt-Tech DTM Acrylic Gloss, 2 - 3 mils dry film thickness each coat.

- B. Ferrous Metal - Gloss Acrylic Enamel:
 - 1. MAB Paints:
 - a. Primer: One coat Rust-O-Lastic Hydro Prime II Primer 073, 3.0 mils dry film thickness.
 - b. Finish: Two coats Rust-O-Lastic Gloss Acrylic Finish 043, 3.0 mils dry film thickness each coat.
 - 2. Sherwin-Williams:
 - a. Primer: One coat DTM Acrylic B66 Primer/Finish Paint, 3.0 mils dry film thickness.
 - b. Finish: Finish: Two coats DTM Acrylic Gloss B66, 3.0 mils dry film thickness each coat.
 - 3. Benjamin Moore:
 - a. Primer: One coat M-28 Acrylic Metal Primer; 2.0 mils dry film thickness.
 - b. Finish: Two coats M-28 Acrylic Gloss Enamel; 2.0 mils dry film thickness each coat.
 - 4. F&H:
 - a. Primer: One coat High Performance Acrylic Polyurethane Primer, 2.0 mils dry film thickness.
 - b. Finish: Finish: Two coats Acrylic Gloss Polyurethane 2.0 mils dry film thickness each coat.
 - 5. PPG/Porter Paints:
 - a. Primer: One coat 90-712 Pitt-Tech DTM Acrylic Primer/Finish, 2 - 3 mils dry film thickness.
 - b. Finish: Finish: Two coats Pitt-Tech DTM Acrylic Gloss, 2 - 3 mils dry film thickness each coat.

- C. Galvanized Metals - Gloss Acrylic Enamel: Pretreat as required by manufacturer.
 - 1. MAB Paints:
 - a. Primer: One coat Rust-O-Lastic Hydro-Prime II 073, 3.0 mils dry film thickness.

- b. Finish: Two coats Rust-O-Lastic Gloss Acrylic Finish 043, 3.0 mils dry film thickness each coat.
 2. Sherwin-Williams:
 - a. Primer: One coat DTM Acrylic B66 Primer/Finish Paint, 3.0 mils dry film thickness.
 - b. Finish: Two coats DTM Acrylic Gloss B66, 3.0 mils dry film thickness each coat.
 3. Benjamin Moore:
 - a. Primer: One coat M-28 Acrylic Metal Primer; 2.0 mils dry film thickness
 - b. Finish: Two coats M-28 Acrylic Gloss Enamel; 2.0 mils dry film thickness each coat.
 4. F&H:
 - a. Primer: One coat High Performance Acrylic Polyurethane Primer, 2.0 mils dry film thickness.
 - b. Finish: Finish: Two coats Acrylic Gloss Polyurethane 2.0 mils dry film thickness each coat.
 5. PPG/Porter Paints:
 - a. Primer: One coat 90-712 Pitt-Tech DTM Acrylic Primer/Finish, 2 - 3 mils dry film thickness.
 - b. Finish: Finish: Two coats 90-374 Pitt-Tech DTM Acrylic Gloss, 2 - 3 mils dry film thickness each coat.
 - D. Wood, Plastic, and Composite Siding - Flat Acrylic: For factory primed composite siding, primer may be omitted.
 1. MAB Paints:
 - a. Primer: One coat Sea Shore Latex Primer, 1.7 mils dry film thickness.
 - b. Finish: Two coats Sea Shore Acrylic Latex House Paint 061 Line, 1.5 mils dry film thickness each coat.
 2. Sherwin-Williams:
 - a. Composite Siding Primer: One coat Loxon Exterior Masonry Acrylic Primer, 3.1 mils dry film thickness.
 - b. Wood Primer: One coat A-100 Exterior Wood Primer; B42, 1.4 mils dry film thickness.
 - c. Finish: Two coats A-100 Exterior Latex Flat House & Trim, 1.5 mils dry film thickness each coat.
 3. Benjamin Moore:
 - a. Primer: One coat Moorcraft Super Spec Latex Exterior Primer 169; 1.3 mils dry film thickness.
 - b. Finish: Two coats Moorcraft Super Spec Flat Latex House and Trim Paint 171; 1.2 mils dry film thickness each coat.
 4. PPG/Porter Paints:
 - a. Primer: One coat PP335 Acri-Pro 100 Acrylic Primer, 1 mil dry film thickness.
 - b. Finish: Finish: Two coats PP519 Acri-Shield Flat Acrylic, 1.5 mils dry film thickness each coat.
 - E. Wood, Plastic, and Composite Siding - Semi-Gloss Acrylic: For factory primed composite siding, primer may be omitted.
 1. MAB Paints:
 - a. Primer: One coat Sea Shore Latex Primer, 1.7 mils dry film thickness.

- b. Finish: Two coats Sea Shore Acrylic Trim Enamel 024 Line, 1.5 mils dry film thickness each coat.
 2. Sherwin-Williams:
 - a. Composite Siding Primer: One coat A-100 Exterior Latex Wood Primer (B42 W41); 1.4 mils dry film thickness.
 - b. Wood Primer: One coat A-100 Exterior Wood Primer; B42; 1.4 mils dry film thickness.
 - c. Finish: Two coats A-100 Gloss Latex House & Trim, 1.5 mils dry film thickness each coat.
 3. Benjamin Moore:
 - a. Primer: One coat Moorcraft Super Spec Latex Exterior Primer 169; 1.3 mils dry film thickness.
 - b. Finish: Two coats Moorcraft Super Spec Latex House and Trim Paint 170; 1.1 mils dry film thickness each coat.
 4. PPG/Porter Paints:
 - a. Primer: One coat PP335 Acri-Pro 100 Acrylic Primer, 1 mil dry film thickness.
 - b. Finish: Finish: Two coats PP619 Acri-Shield Gloss Acrylic, 1.5 mils dry film thickness each coat.
 - c. thickness each coat.
- F. Wood and Plastic, New - High Gloss Latex Enamel:
 1. MAB Paints:
 - a. Primer: One coat Sea Shore Latex Primer 056, 2.2 mils dry film thickness.
 - b. Finish: Two coats Rust-O-Lastic Acrylic DTM 043, 2.0 mils dry film thickness each coat.
 2. Sherwin-Williams:
 - a. Primer: One coat A-100 Latex Wood Primer, 2.2 mils dry film thickness.
 - b. PVC Plastic Primer: One coat PrepRite Bonding Primer (B51W50); 4.0 mils dry film thickness.
 - c. Finish: Two coats DTM Acrylic B66-100, 2.0 mils dry film thickness each coat.
 3. Benjamin Moore:
 - a. Primer: One coat Fresh Start Exterior Primer 023; 1.8 mils dry film thickness.
 - b. Finish: Two coats DTM Acrylic M28; 2.0 mils dry film thickness each coat.
 4. PPG/Porter Paints:
 - a. Primer: One coat Seal Grip 17-921Acrylic Primer, 1.5 dry film thickness
 - b. Finish: Two coats 90-374 Pitt-Tech DTM Acrylic Gloss, 2 - 3 mils dry film thickness each coat.
- G. Gypsum Board, Siding - Flat Acrylic:
 1. Sherwin-Williams:
 - a. Primer: One coat A-100 Exterior Latex Wood Primer (B42 W41); 1.4 mils dry film thickness.
 - b. Finish: Two coats A-100 Exterior Latex Flat, 1.4 mils dry film thickness each coat.
 2. MAB Paints:
 - a. Primer: One coat Sea Shore Latex Primer, 1.7 mils dry film thickness.
 - b. Finish: Two coats Sea Shore Acrylic Latex House Paint 061 Line, 1.4 mils dry film thickness each coat.
 3. Benjamin Moore:

- a. Primer: One coat Moorcraft Super Spec Latex Exterior Primer 169; 1.3 mils dry film thickness.
 - b. Finish: Two coats Moorcraft Super Spec 100% Acrylic Exterior Flat 180; 1.3 mils dry film thickness each coat.
 4. PPG/Porter Paints:
 - a. Primer: One coat PP335 Acri-Pro 100 Acrylic Primer, 1 mil dry film thickness.
 - b. Finish: Finish: Two coats PP519 Acri-Shield Flat Acrylic, 1.5 mils dry film thickness each coat.
- H. Concrete and Concrete Masonry Units - Semi-Gloss Acrylic:
1. MAB Paints:
 - a. Filler: One coat Block Kote 2000 064-140 or Block Kote 1000 064-145.
 - b. Finish: Two coats Sea Shore Acrylic Trim Enamel 024 Line, 1.5 mils dry film thickness each coat.
 2. Sherwin-Williams:
 - a. Filler: One coat Prep Rite Interior/Exterior Block Filler (B25 W25).
 - b. Finish: Two coats A-100 Gloss Latex House & Trim, 1.5 mils dry film thickness each coat.
 3. Benjamin Moore: Concrete
 - a. Primer: One coat Acrylic Masonry Sealer 066; dry film thickness as recommended by manufacturer.
 - b. Finish: Two coats Super Spec Latex House and Trim Paint 170; 1.1 mils dry film thickness each coat.
 4. Benjamin Moore: Concrete Masonry Units
 - a. Primer: One coat Super Craft Latex Block Filler 285; 8.1 mils dry film thickness.
 - b. Finish: Two coats Super Spec Latex House and Trim Paint 170; 1.1 mils dry film thickness each coat.
 5. PPG/Porter Paints:
 - a. Primer: One coat 6-15 Speedhide Acrylic Masonry Block Filler, 5 - 14 mils dry film thickness.
 - b. Finish: Finish: Two coats PP649 Acri-Shield Semi-Gloss Acrylic, 1.5 mils dry film thickness each coat.
- I. Gypsum Board, Cement Plaster - Satin Acrylic:
1. Sherwin-Williams:
 - a. Primer: One coat A-100 Exterior 100% Acrylic Latex Wood Primer, 1.7 mils dry film thickness.
 - b. Finish: Two coats A-100 Exterior Latex Satin, 1.3 mils dry film thickness each coat.
 2. MAB Paints:
 - a. Primer: One coat Sea Shore Latex Primer, 1.7 mils dry film thickness.
 - b. Finish: Two coats Sea Shore Acrylic Satin House Paint 060 Line, 1.2 mils dry film thickness each coat.
 3. Benjamin Moore:
 - a. Primer: One coat Super Spec Latex Exterior Primer 169; 1.3 mils dry film thickness.
 - b. Finish: Two coats Super Spec Low Luster House Paint 185; 1.0 mils dry film thickness each coat.
 4. PPG/Porter Paints:

- a. Primer: One coat 6-15 Speedhide Acrylic Masonry Block Filler, 5 - 14 mils dry film thickness.
 - b. Finish: Finish: Two coats PP739 Acri-Shield Satin Acrylic, 1.5 mils dry film thickness each coat.
- J. Gypsum Board, Cement Plaster - Semi-Gloss Acrylic:
- 1. Sherwin-Williams:
 - a. Primer: One coat A-100 Exterior 100% Acrylic Latex Wood Primer, 1.7 mils dry film thickness.
 - b. Finish: Two coats A-100 Gloss Latex House & Trim, 1.5 mils dry film thickness each coat.
 - 2. MAB Paints:
 - a. Primer: One coat Sea Shore Latex Primer, 1.7 mils dry film thickness.
 - b. Finish: Two coats Sea Shore Acrylic Trim Enamel 024 Line, 1.5 mils dry film thickness each coat.
 - 3. Benjamin Moore:
 - a. Primer: One coat Super Spec Latex Exterior Primer 169; 1.3 mils dry film thickness.
 - b. Finish: Two coats Super Spec Latex House and Trim Paint 170; 1.1 mils dry film thickness each coat.
 - 4. PPG/Porter Paints:
 - a. Primer: One coat PP335 Acri-Pro 100 Acrylic Primer, 1 mil dry film thickness.
 - b. Finish: Finish: Two coats PP649 Acri-Shield Semi-Gloss Acrylic, 1.5 mils dry film thickness each coat.
- K. Concrete - Elastomeric fine texture:
- 1. MAB Paints:
 - a. Finish: Two coats Acra-Lastic 014 Line, 6.0-8.0 mils dry film thickness each coat.
 - 2. Sherwin-Williams:
 - a. Primer: One coat Loxon Exterior Acrylic Masonry Primer A24, 3.1 mils dry film thickness.
 - b. Finish: Two coats Con-Flex XL Textured High Build Coating, A5-800 Series; 9-11 mils dry film thickness each coat.
 - 3. Benjamin Moore:
 - a. Primer: One coat Acrylic Masonry Sealer 066; dry film thickness as recommended by manufacturer.
 - b. Finish: Two coats Moorlastic Acrylic Elastomeric Waterproof Coating 056; 3.9 mils dry film thickness each coat.
 - 4. PPG/Porter Paints:
 - a. Primer: One coat 4-2 Perma-Crete High Build Acrylic Primer, 2.6 – 3.2 mils dry film thickness.
 - b. Finish: Finish: Two coats 4-110 Perma-Crete Pitt-Flex Elastomeric Smooth Texture, 5.4 – 7.2 mils dry film thickness each coat.

3.7 SCHEDULE - EXTERIOR SURFACES - HIGH PERFORMANCE

- A. Shop Primed Ferrous Metal - Gloss Urethane:
 - 1. MAB Paints:

- a. Bond Coat: One coat PlyMastic 650 Epoxy, 065 line, 3 to 6 mils dry film thickness.
 - b. Finish: Two coats Ply-Thane 890 HS Coating 020, 3 - 4 mils dry film thickness per coat.
 2. Sherwin-Williams:
 - a. Bond Coat: One coat MacroPoxy 646, 2 - 5 mils dry film thickness.
 - b. Finish: Two coats Hi-Solids Polyurethane B65, 3 - 4 mils dry film thickness per coat.
 3. Benjamin Moore:
 - a. Primer: One coat Epoxy Mastic 45/46 Primer; 2.0 mils dry film thickness.
 - b. Finish; Two coats M 74/75 Aliphatic Acrylic Urethane; 2.0 mils dry film thickness each coat.
 4. PPG/Porter Paints:
 - a. Bond Coat: One coat 95-245 Pitt-Guard Rapid Coat D-T-R Epoxy Coating, 4 - 7 mils dry film thickness.
 - b. Finish: Two coats 95-812 Series Pitthane Ultra Gloss Urethane Enamel, 2 - 3 mils dry film thickness per coat.
- B. Ferrous Metals - Gloss Urethane:
1. MAB Paints:
 - a. Primer: One coat Ply-Mastic 650 Epoxy Primer, 4 - 6 mils dry film thickness.
 - b. Finish: Two coats Ply-Thane 890 HS Coating 020, 3 - 4 mils dry film thickness.
 2. Sherwin-Williams:
 - a. Primer: One coat Recoatable Epoxy Primer, 4 - 6 mils dry film thickness.
 - b. Finish: Two coats Hi-Solids Polyurethane B65, 3 - 4 mils dry film thickness per coat.
 3. Benjamin Moore:
 - a. Primer: One coat DM 33/34 Polyamide Epoxy Metal Primer; 2.0 mils dry film thickness.
 - b. Finish: Two coats M 74/75 Aliphatic Acrylic Urethane; 2.0 mils dry film thickness each coat.
 4. Tnemec:
 - a. Primer: One coat Typoxy Series 27; 4 - 6 mils dry film thickness.
 - b. Finish: Two coats Endura-Shield Series 73; 3 - 4 mils dry film thickness per coat.
 5. PPG/Porter Paints:
 - a. Primer: One coat 95-245 Pitt-Guard Rapid Coat D-T-R Epoxy Coating, 4 - 7 mils dry film thickness.
 - b. Finish: Two coats 95-812 Pitthane Ultra Gloss Urethane Enamel, 2 - 3 mils dry film thickness per coat.
- C. Galvanized Metals - Gloss Urethane:
1. MAB Paints:
 - a. Primer: One coat Ply-Mastic Epoxy Primer, 4 - 6 mils dry film thickness.
 - b. Finish: Two coats Ply-Thane 890 HS Coating 020, 3 - 4 mils dry film thickness per coat.
 2. Sherwin-Williams:
 - a. Primer: One coat Macropoxy HS primer,(B58), 3.0-6.0 mils dry film thickness.
 - b. Finish: Two coats Hi Solids Polyurethane B65, 3.0-4.0 mils dry film thickness per coat.

3. Benjamin Moore:
 - a. Primer: One coat DM 33/34 Polyamide Epoxy Metal Primer; 2.0 mils dry film thickness.
 - b. Finish: Two coats M 74/75 Aliphatic Acrylic Urethane; 2.0 mils dry film thickness each coat.
4. Tnemec:
 - a. Primer: One coat Typoxy Series 27; 4 - 6 mils dry film thickness.
 - b. Finish: Two coats Endura-Shield Series 73; 3 - 4 mils dry film thickness per coat.
5. PPG/Porter Paints:
 - a. Primer: One coat 95-245 Pitt-Guard Rapid Coat D-T-R Epoxy Coating, 4 - 7 mils dry film thickness.
 - b. Finish: Two coats 95-812 Pitthane Ultra Gloss Urethane Enamel, 2 - 3 mils dry film thickness per coat.

3.8 SCHEDULE - INTERIOR SURFACES - LATEX, LOW VOC

- A. Concrete Masonry Units – Semi-Gloss Finish
 1. Sherwin Williams:
 - a. Filler Coat: PrepRite Interior/Exterior Block Filler B25W25.
 - b. Finish: Two coats ProMar 200 Zero VOC Semi-Gloss B31W0265.
 2. Benjamin Moore:
 - a. Filler Coat: MoorCraft Int/Ext Block Filler 285.
 - b. Finish: Two Coats Pristine Latex Semi-Gloss 214.
 3. PPG/Porter Paints:
 - a. Filler Coat: Speedhide Block Filler 6-15
 - b. Finish: Two coats Pure Performance Semi-Gloss 9-500
- B. Plaster and Gypsum Board: Flat Finish:
 1. Sherwin Williams:
 - a. Primer: One coat ProGreen 200 Interior Latex Primer, B28W600 Series. Finish: Two coats ProMar 200 Zero VOC Flat B30W0265.
 2. Benjamin Moore:
 - a. Primer: One coat Pristine Eco Spec Latex Primer Sealer 231.
 - b. Finish: Two Coats Pristine Eco Spec Latex Flat 219.
 3. PPG/Porter Paints:
 - a. Primer: One coat Pure Performance Primer 9-900
 - b. Finish: Two coats Pure Performance Flat 9-100
- C. Plaster and Gypsum Board: Eggshell Finish:
 1. Sherwin Williams:
 - a. Primer: One coat ProGreen 200 Interior Latex Primer, B28W600 Series. Finish: Two coats ProMar 200 Zero VOC Eggshell B20W0265.
 2. Benjamin Moore:
 - a. Primer: One coat Pristine Eco Spec Latex Primer Sealer 231.
 - b. Finish: Two Coats Pristine Eco Spec Latex Eggshell 223.
 3. PPG/Porter Paints:
 - a. Primer: One coat Pure Performance Primer 9-900
 - b. Finish: Two coats Pure Performance Eggshell 9-300

- D. Plaster and Gypsum Board: Semi-Gloss Finish:
 - 1. Sherwin Williams:
 - a. Primer: One coat ProGreen 200 Interior Latex Primer, B28W600 Series. Finish: Two coats ProMar 200 Zero VOC Semi-Gloss B31W0265.
 - 2. Benjamin Moore:
 - a. Primer: One coat Pristine Eco Spec Latex Primer Sealer 231.
 - b. Finish: Two Coats Pristine Eco Spec Latex Semi-Gloss 224.
 - 3. PPG/Porter Paints:
 - a. Primer: One coat Pure Performance Primer 9-900
 - b. Finish: Two coats Pure Performance Semi-Gloss 9-500

- E. Wood: Semi-Gloss Finish:
 - 1. Sherwin Williams:
 - a. Primer: One coat Premium Wall & Wood Primer, B28W8111. Finish: Two coats ProMar 200 Zero VOC Semi-Gloss B31W0265.
 - 2. Benjamin Moore:
 - a. Primer: One coat Pristine Eco Spec Latex Primer Sealer 231.
 - b. Finish: Two Coats Pristine Eco Spec Latex Semi-Gloss 224.
 - 3. PPG/Porter Paints:
 - a. Primer: One coat Pure Performance Primer 9-900
 - b. Finish: Two coats Pure Performance Semi-Gloss 9-500

- F. Ferrous Metal: Semi-Gloss Finish:
 - 1. Sherwin Williams:
 - a. Primer: One coat ProIndustrial Pro-Cryl Universal Primer.
 - b. Finish: Two coats ProIndustrial Zero VOC Acrylic semi-Gloss B66-600 series.
 - 2. Sherwin Williams:
 - a. Primer: One coat DTM Primer.
 - b. Finish: Two coats ProMar 200 Zero VOC semi-Gloss B66-600 series.
 - 3. Benjamin Moore:
 - a. Primer: One coat IronClad Latex Low Lustre Metal and Wood Enamel 363.
 - b. Finish: Two Coats Pristine Eco Spec Latex Semi-Gloss 224.
 - 4. PPG/Porter Paints:
 - a. Primer: One coat Pitt-Tech DTM Acrylic Primer 90-712
 - b. Finish: Two coats Pure Performance Semi-Gloss 9-500

END OF SECTION

SECTION 10 14 13
INTERIOR SIGNAGE

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior room signs identifying each permanent common room or space.
 - 2. Interior informational signs.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate sign sizes and designs including complete text; show signs with text to scale. Show construction, materials, finishes, mounting details, and ballast locations.
- C. Samples Signs: Submit two 12 x 12 inch size samples of each type face sheet illustrating style, texture, color, graphic image, message, cutouts and translucent lens attachment.
- D. Samples Sign Frames and Trim: Submit two 12 inch long samples of each type extruded frame and trim illustrating finish, texture, and color.

1.3 REGULATORY REQUIREMENTS

- A. Conform to ANSI A117.1 and applicable code for provisions for the physically handicapped.

PART 2 PRODUCTS

2.1 INTERIOR ROOM SIGNS

- A. Manufacturers:
 - 1. Apco Graphics Inc.
 - 2. Vital Signs.
 - 3. Stanco Signs.
 - 4. ASI Architectural Sign Solutions.
 - 5. Substitutions: Section 01 60 00 - Product Requirements.
- B. Signs: Plastic with photo-mechanically engraved text and Braille; 8 x 8 inch, 1/2 inch radius corners; 1 inch high slip-in, removable name plate.
- C. Lettering: Color and position as selected; Helvetica style, characters raised 1/32 inch.
 - 1. Room numbers and room names 5/8 inch high upper case text, 1 inch high numerals.

- 2. Room names 1/2 inch high upper and lower case.
- D. Backplate Color: As selected.
- E. Braille: Provide Grade 2 Braille translation of printed text.
- F. Pictograms: Provide pictograms for stair entry doors.
- G. Provide room or unit numbers and room names at each entrance to each room as shown on the Drawings.
- H. Tape Adhesive: Double sided tape, permanent adhesive.

2.2 INTERIOR INFORMATIONAL SIGNS

- A. Manufacturers:
 - 1. Apco Graphics Inc.
 - 2. Mohawk Sign Systems, 300 Series.
 - 3. 20/90 Sign Systems.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Signs: Plastic subsurface printed on 1/16 inch thick clear matte acrylic and laminated to 1/8 inch thick acrylic backplate; 8 wide x height required for message, 1/2 inch radius corners.
- C. Lettering: Color and position as selected; Helvetica style, minimum 5/8 inch high upper case text.
- D. Backplate Color: As selected.
- E. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Beginning of installation means installer accepts existing surfaces.

3.2 INSTALLATION

- A. Install signs in accordance with manufacturer's instructions.
- B. Install signs after interior surfaces are finished.
- C. Locate signs as indicated on Drawings in accordance with accessibility requirements.
- D. Clean and polish signs when installation is completed.

3.3 INSTALLATION - ROOM AND INFORMATIONAL SIGNS

- A. Mount room signs with adhesive tape.
- B. Locate room identification signs on wall surfaces adjacent to strike side of door, level, 5 feet above finished floor to center line of sign and 3 inches from door jamb trim.
- C. Locate informational signs on wall surfaces, level, 5 feet above finished floor to center line of sign at location scheduled.

3.4 ROOM NAME AND IDENTIFICATION SIGN SCHEDULE

- A. Toilet Room Signs: Pictogram, accessibility symbol, text, and Braille for “Men” and “Women.”
 - 1. Install at each public toilet room door.
- B. Stair Entry Signs: Pictogram, text, and Braille for “Exit Stair.”
 - 1. Install in corridor at each stair tower entry door.
- C. Elevator Signs: Pictogram, text, and Braille for “Elevator.”
 - 1. Install in corridor at each elevator call station.
- D. Elevator Jamb Floor Level Signs: Text, and Braille for floor number.
 - 1. Install on each elevator jamb at each elevator lobby.
- E. Offices Identification Signs: Text, and Braille for Room Name and Room Number at each permanent room. Include slip in plate with name of office occupant.
- F. Other Room Identification Signs: Text, and Braille for Room Name and Room Number at each permanent room.

3.5 INFORMATIONAL SIGN SCHEDULE:

- A. Accessible Entrance Signs: Pictogram and the following text “Barrier Free Entrance” with directions to nearest accessible entrance.
 - 1. Install at each accessible entrance when all entrances are not accessible.
- B. Directions to Accessible Entrance Signs: Pictogram and the following text “For barrier free entrance use..” with directions to nearest accessible entrance.
 - 1. Install at each non accessible entrance.
- C. Use Stair Signs: Pictogram and the following text “In case of fire, do not use elevator. Use stairs.”
 - 1. Install at each elevator lobby adjacent to elevator hall call station.

- D. Stair Landing Signs: Text for “You are on level X, Y to Exit.” Where X is the floor number for the current landing and Y is the number of floors remaining to reach the exit discharge to grade.
 - 1. Install inside stair towers at each floor landing.

END OF SECTION

SECTION 10 28 00

TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Toilet and bath, shower, washroom accessories.
 - 2. Grab bars.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.
- C. Samples: Submit two samples of each component illustrating color and finish.

1.3 QUALITY ASSURANCE

- A. Flame Resistant Fabric: Passes when tested in accordance with NFPA 701, Test 1 or Test 2.

1.4 REGULATORY REQUIREMENTS

- A. Conform to ICC A117.1 and applicable code for provisions for the physically handicapped.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Manufacturers: Provide Grohe Atrio products and other products indicated in Schedule on Drawings as Basis of Design.
 - 1. Bobrick Washroom Equipment, Inc.
 - 2. Bradley Corporation.
 - 3. American Specialties Inc.
 - 4. A&J Washroom Accessories.
 - 5. Broan.
 - 6. Franklin Brass Manufacturing Co.
 - 7. Basco.
 - 8. Truebro Inc.
 - 9. Brocar Products, Inc.
 - 10. Substitutions: Section 01 60 00 - Product Requirements.

- B. Sheet Steel: ASTM A1008/A1008M; CS - Commercial Steel, Types B.
- C. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666; Type 304.
- D. Adhesive: Waterproof, type recommended by accessory manufacturer.
 - 1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
- E. Fasteners, Screws, and Bolts: Hot dip galvanized steel, tamper-proof.
- F. Adhesive: Two component epoxy or Contact, waterproof.
 - 1. Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

2.2 FABRICATION

- A. Form surfaces flat without distortion. Weld and grind joints smooth.
- B. Shop assemble components and package with anchors and fittings.
- C. Back paint components to prevent electrolysis.
- D. Provide steel anchor plates, adapters, and anchor components for installation.
- E. Hot dip galvanize exposed and painted ferrous metal and fastening devices.

2.3 SHOP FINISHES

- A. Anchors: Galvanize to 1.25 oz/sq yd (380 g/sq m).
- B. Chrome/Nickel Plating: ASTM B456, Type SC 2; satin finish.
- C. Stainless Steel: No. 4 satin luster finish.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Verify exact location of accessories for installation.
- B. Deliver inserts and rough-in frames to site. Provide templates and rough-in measurements as required.

3.2 INSTALLATION

- A. Install fixtures, accessories and items in accordance with manufacturers' instructions.
- B. Install plumb and level, securely and rigidly anchored to substrate.

END OF SECTION

SECTION 10 28 17
SHOWER ENCLOSURES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Shower doors.
 - 2. Glass shower enclosures.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Shop Drawings: Indicate shower enclosure and door layout.
- B. Product Data: Submit data describing materials and construction including hardware and attachments.
- C. Samples: Submit one sample, minimum 12 by 12 inch size indicating glass, door hinge, door stop, perimeter framing, and attachments. Include sample of each type of hardware. Samples will be returned for incorporation into the Work.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Manufacturers:
 - 1. C. R. Laurence Co., Inc.
 - 2. American Shower Door.
 - 3. Substitutions: Section 01600 - Product Requirements.
- B. Channel Frame: Brass base metal, polished finish.
- C. Glazing: Fully tempered clear, low iron glass conforming to CPSC Standard 16 CFC 1201, 3/8 inch thick.
- D. Door Hardware: Finish to match channel frame.
 - 1. Strike: Clear plastic water seal, full length of door.
 - 2. Hinge: Top and bottom, clamp on patch type with built-in stop and latching mechanism.
 - 3. Pull Handles: Solid brass, U-shape handle, 8 inch centers.
 - 4. Towel Bars attached to doors, not permitted.

- E. Fasteners: Brass to match channel frame where exposed, stainless steel or brass where concealed.
- F. Perimeter Sealant: Silicone; ASTM C920; single component, solvent curing, non-sagging, nonstaining, fungus resistant, nonbleeding; color as selected; manufactured by:
 - 1. General Electric; SCS 1702
 - 2. Dow Corning-786
 - 3. Pecora; 898 Silicone Sanitary Sealant.
 - 4. Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Verify substrates are ready to receive shower doors and enclosures.
- B. Verify blocking is provided in wall construction to support doors and enclosures.

3.2 INSTALLATION

- A. Install shower doors and enclosures in accordance with manufacturer's instructions.
- B. Attach shower doors to wall framing or solid blocking.
- C. Adjust door for proper operation and alignment.
- D. Seal joints at wall materials in accordance with sealant manufacturer's instructions.

END OF SECTION

SECTION 10 55 13
MAIL DELIVERY BOXES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Individual mail boxes with hinged and locked doors, front loading.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate locations, construction and anchorage details, dimensions.
- C. Product Data: Provide data for components.
- D. Samples: Submit two full unit samples.
- E. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- F. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.3 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.1 MAIL BOXES

- A. Manufacturers - Single, Front Loading Mailboxes:
 - 1. Nuova Letter Box, as supplied by Chasso Acquisition, LLC.
 - 2. Substitutions: [Section 01 60 00 - Product Requirements] [Not Permitted].
- B. Components:
 - 1. Stainless steel frame.
 - 2. Box Door: Stainless steel with manufacturer's standard finish, as selected.
 - 3. Concealed hinge.
 - 4. Top loading slot.
 - 5. Manufacturer's standard lock cylinder and two keys.

6. Size: 16-1/2 by 16-1/2 inches by 4 inches deep.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that mounting locations are ready to receive work.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions and U.S. Postal Service regulations and manufacturer's instructions.
- B. Install and secure boxes, plumb and level, in position.
- C. Verify that slots and doors operate smoothly.

END OF SECTION

SECTION 10 57 00

WARDROBE AND CLOSET SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Wire closet shelving.
 - 2. Tubular steel closet shelving.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate shelving layout and supports required.
- C. Product Data: Provide manufacturers technical literature on closet racks and installation instructions.
- D. Samples: Submit two samples 24 inch long illustrating shelving finish, color, and sheen.
- E. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.

1.3 QUALITY ASSURANCE

- A. Accessibility Requirements: Conform to ICC A117.1.

1.4 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate the Work with placement of support framing and blocking in walls.

PART 2 PRODUCTS

2.1 CLOSET SHELVING - WIRE

- A. Manufacturers:
 - 1. Closet Maid Corporation.
 - 2. Schulte Corporation.
 - 3. Substitutions: Section 01 60 00 - Product Requirements.

- B. Linen Utility Closet Shelving: Shelf with turned down front edge, vinyl coated steel wire spaced 1 inch on center, 16 inches wide, length indicated, 3 shelves total.
- C. Mounting Hardware: Manufacturer's standard components.

2.2 CLOSET SHELVING - TUBULAR STEEL

- A. Manufacturers:
 - 1. Raymond Engineering Inc. Rigid Rak; Series 350 Tubular Steel Wall Racks.
 - 2. Substitutions: Section 01 60 00 - Product Requirements.
- B. Closet Shelving: Shelf and integral rod type, chrome plated steel, square tubing end brackets with 3/4 inch diameter shelf rails, and 1 inch diameter clothes rod suitable to accept coat hangers, 12 inches wide, length indicated.
- C. Mounting Hardware: Manufacturer's standard components.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify installation of blocking to provide solid support and attachment for closet shelving.

3.2 INSTALLATION - WIRE SHELVING

- A. Install closet shelving in accordance with manufacturer's instructions.
- B. Install closet shelving with screws into studs or solid blocking. Use of toggle bolts, molly bolts, fiber or plastic plugs is not acceptable.
- C. Install shelves full length of closets, as indicated.
- D. Install mounting brackets maximum spacing 32 inches on center to align with studs.
- E. Install wall clips maximum spacing 12 inches on center.
- F. Cap cut ends of wire.

3.3 INSTALLATION - TUBULAR STEEL SHELVING

- A. Install closet shelving in accordance with manufacturer's instructions.
- B. Install closet shelving with screws into studs or solid blocking. Use of toggle bolts, molly bolts, fiber or plastic plugs is not acceptable.
- C. Install shelves full length of closets, as indicated.

END OF SECTION

SECTION 10 82 13

TREILLAGE

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Trellis panels and accessories.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 PERFORMANCE REQUIREMENTS

- A. Wind Loads: Design and size components to withstand dead loads and live loads caused by positive and negative wind loads acting normal to plane of equipment enclosure, including building corners.
 - 1. As calculated in accordance with ASCE 7 - Calculation of Wind Loads, as measured in accordance with ASTM E330; Exposure A and basic wind speed of 80 mph.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate treillage layout plan and elevations, panel sizes, clearance dimensions, tolerances, interweave materials and details, frames, connection and mounting hardware, and fasteners. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.
- C. Product Data: Submit data describing design characteristics, materials and finishes.
- D. Samples: Submit three samples 6 x 6 inch in size illustrating finish and color of surfaces.
- E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
 - 1. Manufacturing Location: Within 500 miles of Project site for final assembly of components into Products.

1.5 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.6 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate the Work with installation of poured in place concrete walls.
 - 1. Provide anchors to be embedded in poured in place concrete.
- C. Coordinate the Work with installation of wood fencing.

1.7 WARRANTY

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

PART 2 PRODUCTS

2.1 TRELLIS PANELS AND ACCESSORIES

- A. Manufacturers: GreenScreen panels by greenscreen, distributed by Materials For Design, 215.290.1177.
 - 1. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Self supporting tubular aluminum structural framing with fixed blade aluminum wall louvers.

2.2 PANELS

- A. Rigid, three dimensional welded wire grid fabricated of 14 gauge galvanized steel wire, per ASTM A641.
- B. Face Grid: Wire welded at each intersection forming a 2 x 2 inch grid at both front and back of panel.
- C. Trusses: Bent wire trusses spaced at 2 inches on center, welded to front and back face grids at each contact point.
- D. Panel Thickness: 3 inches unless otherwise indicated on Drawings.
- E. Length and Width: As indicated on Drawings..

2.3 TRIMS

- A. Manufacturer's standard trim pieces as indicated on Drawings.
 - 1. 20 gauge, galvanized steel per ASTM A879.
 - 2. Channel Trim: Thickness of panel x 1/2 inch legs.
 - 3. Angle Trim: 1/2 inch x 1/2 inch legs.

2.4 POSTS

- A. Provide manufacturer's standard 3 inch width fence posts where indicated on Drawings.

2.5 ACCESSORIES

- A. Fasteners and Anchors: Stainless steel type.
 - 1. For attachment to structure fasteners with minimum pullout resistance of 550 lb.
- B. Clips and Straps: Provide manufacturer's standard types of clips and straps suitable for mounting conditions.
 - 1. Galvanized steel per ASTM A879.
- C. Plastic Spacers: Provide manufacturer's standard polyethylene washers.
- D. Welding Materials: AWS D1.1; type required for materials being welded.
- E. Sealants: As specified in Section 07 90 00.

2.6 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site. Fabricate to allow site assembly with bolted connections.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
- 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. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.7 FACTORY FINISHING

- A. Manufacturer's standard zinc rich epoxy powder coat, topcoated with polyester based powder coat.
 - 1. Color as selected by Architect.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

- B. Verify prepared substrate is ready to receive Work and framing anchor locations are as indicated on shop drawings.

3.2 PREPARATION

- A. Supply steel items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.

3.3 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Install panels level and plumb.
- D. After erection, touch up damaged shop finishes.

3.4 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation From Plumb: 1/4 inch per story or for every 12 ft in height whichever is greater, non-cumulative.
- C. Maximum Offset From True Alignment: 1/4 inch.
- D. Maximum Out-of-Position: 1/4 inch.

3.5 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Clean surfaces and components.

END OF SECTION

SECTION 11 31 00
RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Installation of Owner supplied kitchen and laundry appliances.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Provide data and power requirements for appliances and accessories.
- C. Shop Drawings: Indicate profiles, sizes, required clearances, utility rough-in sizes and locations.
- D. Submit appliance manufacturer's installation instructions.
- E. Source Quality Control Submittals: Indicate results of factory tests and inspections.
- F. Field Quality Control Submittals: Indicate results of Contractor furnished tests and inspections.
- G. Qualification Statements:
 - 1. Submit manufacturer, installer, and licensed professional experience qualifications.
 - 2. Submit manufacturer's approval of installer.

1.3 OPERATION AND MAINTENANCE DATA

- A. Section 01 78 53 - Operation and Maintenance Data: Equipment manual submittals.
- B. Operating and Maintenance Instructions: Include appliance manufacturer's standard instructions.

1.4 QUALITY ASSURANCE

- A. Appliances: Conform to applicable code for UL approvals.

PART 2 PRODUCTS

2.1 SUSTAINABILITY CHARACTERISTICS

- A. Provide Energy Star compliant appliances wherever possible.

2.2 STANDARD UNIT APPLIANCES

- A. Provide installation for Owner supplied appliances as indicated on appliance schedule, unless otherwise indicated.

2.3 ACCESSORIES

- A. Washing Machine Pan: One piece with drain, formed high-density polypropylene, 2.5 inches deep, sized as required for type of washing machine selected.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- C. Verify that utility services and that electrical power matches appliance requirements.

3.2 INSTALLATION

- A. Install equipment in accordance with manufacturer's instructions.
- B. Set and adjust equipment level and plumb.
- C. Connect appliances to utilities and make units operational.
- D. Adjust appliances for smooth operation under loaded conditions.

END OF SECTION

SECTION 12 20 00
WINDOW TREATMENTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Roll-up blinds.
 - 2. Operating hardware.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SYSTEM DESCRIPTION

- A. Roll-up blinds, installed at window openings; manual control to raise or lower by cord attached to stiffened lower blind edge.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate opening sizes, tolerances required, method of attachment, clearances, and operation.
- C. Product Data: Submit data indicating physical and dimensional characteristics, operating features, and available colors and patterns.
- D. Samples: Submit two samples, 12 inches long illustrating shade materials, finish, and color. Include samples of cord, rod, and chain accessories.
- E. Manufacturer's Installation Instructions: Submit special procedures, perimeter conditions requiring special attention.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.5 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.6 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

- B. Coordinate the Work with window installation and placement of concealed blocking to support blinds.

PART 2 PRODUCTS

2.1 VERTICAL ROLL-UP BLIND

- A. Manufacturers: Basis of Design products as supplied by The Shade Store.
 - 1. Luton Shading Systems.
 - 2. Mechoshade.
 - 3. Substitutions: Section 01 60 00 - Product Requirements.
- B. Manual Operator: Stainless steel ball chain operator with clutch to hold shade in any position; manufacturer's standard roller tube sized for opening.
- C. Transparency: Levels, 3, 5, and 10 as indicated or selected.
- D. Facia Panel: Aluminum with fabric brush, baked enamel finish, color as selected.
- E. Hem Bar: Extruded aluminum, sewn-in at bottom edge of fabric.
- F. Fabric: Flame resistant, opaque PVC coated fiberglass, Vimco No-Lite, 0 percent openness, color as selected.
- G. Attachment Hardware: Type recommended by blind manufacturer.

2.2 ROLL-UP BLIND

- A. Sheeting: Vinyl treated cloth.
- B. Roller Mechanism: Internally fitted with hardware for blind operation.
- C. Pull Cord: Braided nylon.
- D. Attachment Hardware: Type recommended by blind manufacturer.

2.3 FABRICATION

- A. Fabricate blinds to fit within openings with uniform edge clearance of 1/4 inch.
- B. At openings requiring multiple blind units, provide separate blind assemblies with space of 1/4 inch between assemblies, occurring at window mullion centers.

2.4 FINISHES - ROLL-UP BLINDS

- A. Blind Sheeting: color as selected.
- B. Cord and Accessories: Color as selected to coordinate with blind color.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify that openings are ready to receive the work.
- C. Ensure structural blocking and supports are correctly placed.

3.2 INSTALLATION

- A. Install blinds.
- B. Secure in place with flush countersunk fasteners.
- C. Place intermediate head supports as recommended by manufacturer.
- D. Provide clearance between window sash and blind for operation of sash and sash hardware.
- E. Isolate metal components from masonry and concrete to prevent galvanic action.

3.3 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation of Gap at Window Opening Perimeter: 1/4 inch.
- C. Maximum Offset From Level: 1/8 inch.

3.4 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for starting and adjusting.
- B. Adjust blinds for smooth operation.

3.5 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Clean blind surfaces just prior to occupancy.

END OF SECTION

SECTION 12 35 30

RESIDENTIAL CASEWORK

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Prefabricated kitchen and bath cabinet units and counter tops.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate casework locations, scale plans, elevations, cutouts and clearances required.
- C. Product Data: Provide data on component profiles, sizes, assembly methods, and schedule of finishes.
- D. Samples: Submit two panels, 6 x 6 inch in size illustrating cabinet and counter top finish.

1.3 QUALITY ASSURANCE

- A. Perform Work in accordance with HUD Service Use criteria and KCMA (Kitchen Cabinet Manufacturers Association) - Certification Program.
- B. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
 - 1. Manufacturing Location: Within 500 miles of Project site for final assembly of components into Products.

PART 2 PRODUCTS

2.1 CASEWORK

- A. Manufacturers: Provide Ikea and Fresca Livello products as Basis of Design or approved comparable products.
 - 1. Aristokraft
 - 2. Merillat Industries, Inc.
 - 3. Armstrong World Industries.
 - 4. Yorktowne Cabinets.
 - 5. Evans Cabinet Co.
 - 6. Substitutions: Section 01 60 00 - Product Requirements.

2.2 WOOD CABINET COMPONENTS

- A. Particleboard Core Plywood: ANSI/HPMA HP hardwood and decorative Plywood, Good Grade (1) or better. Used at plastic laminated doors and drawer fronts only.
- B. Solid Wood: Clear, dry, sound, and free of defects and knots selected from First Grade lumber as defined by NHLA, uniform color for natural finish.

2.3 WOOD CABINET FABRICATION

- A. Wall and base cabinets and face frames same construction and appearance.
- B. Brace cabinets as required to produce sturdy and rigid construction.
- C. Toe space as shown on drawings.
- D. Face Style: As selected.
- E. End Panels: Finished to match faces, 1/2 inch thick minimum. Base cabinet end panels shall stop 3-1/2 inches above floor, supported by solid treated lumber.
- F. Backs: Plywood - 1/4 inch thick, exterior glue, grain painted.
- G. Shelves: Plywood - Manufacturer's standard construction, edge banded.
- H. Drawers and Door Fronts:
 - 1. Kitchen Cabinets: A-2 grade interior hardwood plywood 3/4 inch thick, back beveled with edges filled and sanded; recessed center panel as detailed
 - 2. Vanity Cabinets: Plastic laminate GP 28 on 5/8 inch thick particleboard; recessed center panel as detailed.
- I. Drawer Construction: Sides: Grade "C" solid lumber 1/2 inch x 3-1/4 inch french dovetailed into drawer head. Back: Grade "C" solid lumber 3/4 inch thick rabbeted into sides. Bottom: Softwood or hardwood plywood 1/4 inch thick rabbeted into sides, front and back, floating. Supports solid wood 3/4 inch thick. Fabricate with exposed fronts fastened to subfronts with mounting screws from interior body. Fabricate with subfronts and backs rabbeted into sides and secured with glue and mechanical fasteners.
- J. Base Bottom: Manufacturer's standard panel.
- K. Wall Cabinet Tops and Bottoms: Manufacturer's standard panelck.
- L. Hanging Rails: Solid lumber 1 x 4 continuous.
- M. Corner Blocks and Cleats: Wood braces of S4S, C-Grade kiln dried lumber, 3/4 inch x 1-3/4 inch thick x full length front to back. Corner posts attached to vertical corners, fabricated with notches to provide adjustability and retainment of interior storage devices.
- N. Frame rails and stiles with glued mortise and tendon joints. Stiles and top and bottom rails dadoed to receive ends.

- O. Back, Top and Bottom Rails 3/4 inch x 3 inch solid wood, interlocking with end panels and rabbeted to receive top and bottom panels. Back rails secured under pressure with glue and with mechanical fasteners.
- P. Ends connected to stiles with pressure glued tongue and plow joint and concealed mechanical fasteners; dadoed minimum 1/4 inch deep to receive shelves, bottoms, tops and backs.

2.4 COUNTER TOPS AND PASS-THRU TOPS

- A. Quartz counter tops at bar and other locations as indicated. Refer to Section 06 61 16 Solid Surfacing Fabrications.

2.5 HARDWARE

- A. Hardware: Manufacturer's standard, unless otherwise indicated.
- B. Hinges: Adjustable, self-closing wrap around, 180 degree opening.
- C. Drawer Guides: Dual steel side mounted drawer guides with ball bearing rollers, similar to K & V 1300.

2.6 FACTORY WOOD FINISHING

- A. Exposed Surfaces: Factory finished, wood species as selected by Architect.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Verify adequacy of backing and location of mechanical and electrical outlets.
- B. Provide supplementary support framing.

3.2 INSTALLATION

- A. Set and secure casework in place rigid, plumb, and level; in accordance with manufacturer's instructions and details on drawings.
- B. Provide cutouts for plumbing fixtures, appliances, and other fixtures and fittings.
- C. Use fixture attachments at concealed locations for wall mounted components.
- D. Use concealed joint fasteners to align and secure adjoining cabinet units and counter tops.

- E. Carefully scribe casework which is against other building materials, leaving gaps of 1/32 inch maximum. Use filler strips not additional overlay trim for this purpose.
- F. Secure cabinets to floor using appropriate anchorage.
- G. Adjust moving or operating parts to function smoothly and correctly.

END OF SECTION

SECTION 12 48 13

ENTRANCE FLOOR MATS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Link mats.
 - 2. Recessed frames.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate dimensions.
- C. Product Data:
 - 1. Submit data indicating mat characteristics and component dimensions.
 - 2. Submit data indicating recessed frame characteristics, component dimensions, and details.
- D. Samples: Submit two samples, 12 by 12 inches in size illustrating pattern, color, finish, and edging.

1.3 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Maintenance Data: Include cleaning instructions and stain removal procedures.

1.4 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

PART 2 PRODUCTS

2.1 FLOOR MATS (Interlocking Multiple Tread - Carpet Inserts)

- A. Manufacturers:
 - 1. C/S Group; Pedigrid G1 with LB Series Frame.
 - 2. Reese Enterprises, Inc.; Perfec Grate; Tread # 470 with Frame 420L.
 - 3. Arden Architectural Specialties, Inc.; G-100 with Type F-1 frame.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.

- B. Interlocking Multiple Tread Grille: Rails and keylocks 6063-T52 aluminum, mill finish.
- C. Carpet: Color fast, solution dyed 100 percent nylon, fusion bonded to a rigid two-ply backing to prevent fraying and supplied in continuous spliced-free lengths with antimicrobial additive and factory treated with Scotchgard to reduce soiling, color as selected.
- D. Recessed Frame: Mill finish aluminum, recessed frame sized to accommodate Grille, with capabilities of being fastened into the concrete.

2.2 FABRICATION

- A. Construct recessed mat frames square, tight joints at corners, rigid. Coat surfaces with protective coating where in contact with cementitious materials.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify that floor opening for mats are ready to receive work.

3.2 PREPARATION

- A. Verify size of floor recess before fabricating mats.
- B. Vacuum clean floor recess.

3.3 INSTALLATION

- A. Install mat frames to achieve flush plane with finished floor surface.

3.4 INSTALLATION TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Gap Formed at Recessed Frame From Mat Size: 1/4 inch.

3.5 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for starting and adjusting.
- B. Adjust floor mats and frames to prevent tripping hazard.

END OF SECTION

SECTION 12 93 13

BICYCLE RACKS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Bicycle racks for exterior use.
 - 2. Bicycle racks for interior use.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

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

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

PART 2 PRODUCTS

2.1 BICYCLE RACKS - EXTERIOR

- A. Products: Subject to compliance with requirements, provide Hoop Rack by Dero Bike Racks or approved comparable product.
- B. Components: Rail mounted hoop racks.
 - 1. Hoop: 1-1/2 inch diameter steel pipe, schedule 40.
 - a. Finish: Hot dipped galvanized, G60 minimum.
 - 2. Rails: U shaped galvanized rail stock.
 - a. Thickness: 3/16 inch.
 - b. Size: 3 inches x 1.4 inches.
- C. Accessories:
 - 1. Fasteners, brackets, and other hardware required for complete installation as recommended by manufacturer for application.
 - a. Tamper resistant fasteners.

2.2 BICYCLE RACKS - INTERIOR

- A. Products: Subject to compliance with requirements, provide Bike File by Dero Bike Racks or approved comparable product.

- B. Wall mounted trolley assembly with bicycle hangers.
 - 1. 9 hangers per 8 feet of trolley assembly.
 - 2. Trolley Track: 12 gauge galvanized steel.
 - 3. Trolley Assembly: Manufacturer's standard stainless steel.
 - 4. Bicycle Hanger Arms: Cast or bent steel hanger rods, manufacturer's standard finish.
- C. Accessories:
 - 1. Mounting brackets, end caps, supports, nuts, bolts, washers, angles, braces, and other components required for complete installation.
 - 2. with requirements for untreated materials.

2.3 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- E. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.4 GALVANIZED-STEEL FINISHES

- A. Galvanized finish left exposed unless otherwise noted on Drawings.

2.5 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run directional finishes with long dimension of each piece.
 - 2. Directional Satin Finish: No 4.
 - 3. Dull Satin Finish: No. 6.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, positioned, and anchored at locations indicated on Drawings.

END OF SECTION

SECTION 12 93 13

BICYCLE RACKS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Bicycle racks for exterior use.
 - 2. Bicycle racks for interior use.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SUBMITTALS

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

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

PART 2 PRODUCTS

2.1 BICYCLE RACKS - INTERIOR

- A. Products: Subject to compliance with requirements, provide Bike File by Dero Bike Racks or approved comparable product.
- B. Wall mounted trolley assembly with bicycle hangers.
 - 1. 9 hangers per 8 feet of trolley assembly.
 - 2. Trolley Track: 12 gauge galvanized steel.
 - 3. Trolley Assembly: Manufacturer's standard stainless steel.
 - 4. Bicycle Hanger Arms: Cast or bent steel hanger rods, manufacturer's standard finish.
- C. Accessories:
 - 1. Mounting brackets, end caps, supports, nuts, bolts, washers, angles, braces, and other components required for complete installation.
 - 2. with requirements for untreated materials.

2.2 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- E. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.3 GALVANIZED-STEEL FINISHES

- A. Galvanized finish left exposed unless otherwise noted on Drawings.

2.4 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run directional finishes with long dimension of each piece.
 - 2. Directional Satin Finish: No. 4.
 - 3. Dull Satin Finish: No. 6.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, positioned, and anchored at locations indicated on Drawings.

END OF SECTION

Carpenter Square Townhouses

Project Number: 12-03-01A

MECHANICAL SPECIFICATION LIST

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SECTION 15050

BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 APPLICATION OF THIS SECTION

- A. This Section applies to all other Sections in Division 15, as the work is applicable.

1.02 SECTION INCLUDES

- A. Drawing intent.
- B. Arrangement of work.
- C. Coordination.
- D. Pipe, valves and accessories.
- E. Pipe installation procedures.
- F. Field painting.
- G. Electrical equipment and wiring.
- H. Pipe sleeves, seals and escutcheons.
- I. Counterflashing.

1.03 RELATED SECTIONS

- A. Section 15050 - Earthwork for Mechanical Construction.
- B. Division 7 - Firestopping around Penetrations through Fire Rated Construction.
- C. Division 7 - Base Flashings and Premolded Pipe Seals.
- D. Division 7 - Joint Sealer around Penetrations through Non-Fire Rated Construction.
- E. Section 15890 - Sleeves for Ductwork.

1.04 DRAWING INTENT

- A. Drawings are diagrammatic and indicate general arrangements, approximate sizes and relative locations of principal equipment and materials. Provide offsets as required for coordinated installation. Provide minor equipment, details, materials and methods not shown but standard, referenced and specified, to complete the work.

1.05 ARRANGEMENT OF WORK

- A. Conceal mechanical construction running through finished spaces within walls or chases. At suspended ceilings, conceal Work above ceiling unless indicated otherwise.
- B. In finished spaces with or without ceilings, coordinate with other trades so as to be in conformance with reflected ceiling plans.
- C. In finished spaces without ceilings, run piping and ductwork parallel with building lines.
- D. Where physical interferences cannot be resolved readily, prepare composite drawings at a scale of not less than 1/4 inch = 1'-0", clearly showing Work of this Division in relation to Work of other trades. Obtain written approval by A/E of proposed changes. Distribute drawings to other trades affected. Correct conflicts at no additional cost.
- E. Subject to approval by A/E and without extra cost, make modifications in layout as required to prevent conflict with other trades for proper execution of the Work.
- F. Do not install piping, ducts or equipment foreign to electrical equipment in electrical rooms and closets. Do not install piping and ducts over, around, in front of, in back of or below electrical controls, panels, switches, terminals, boxes or similar electrical equipment in any area of building. Drip pans are not permitted under any circumstances around electrical equipment.
- G. Position mechanical work for easy unobstructed operation of the building.
- H. Check equipment layouts with shop drawings of other trades to determine roughing-in requirements. Do not scale drawings for exact locations. Produce a neat arrangement of work, and to overcome local interferences to best advantage of the project.
- I. Do not install aluminum or copper products where they will be encased in concrete.

1.06 COORDINATION

- A. In general, arrange work so access doors will not be required. Where devices requiring access must be concealed in finished Construction, coordinate with other Trades and provide schedule showing size and location of each door.
- B. Prepare dimensioned drawings showing size and location of equipment foundations and pads.

PART 2 - PRODUCTS

2.01 PIPE, VALVES AND ACCESSORIES

- A. Restrictions:
 - 1. Do not use gaskets or packings containing asbestos.
 - 2. Do not use fittings or flanges manufactured in Asia.

3. When two or more valves of the same type are used in the same service, furnish all valves of this type from the same manufacturer.

B. Manufacturers - General:

1. Except as restricted above, and where pipe system products are specified by reference standard only, any manufacturers product conforming to the specified standard may be used.
2. For pipe system products where manufacturers' systems and model numbers are specified, comparable systems and products by the following manufacturers may be used. Provide figure number comparison chart for specified and substituted valves.

C. Valve Manufacturers:

1. Gas Cocks: DeZurik, Grinnell, Walworth, Rockwell-Nordstrom.
2. Refrigerant Check and Shutoff Valves: Henry Valve Co., Alco, Flo-Con, Sporlan, Ranco.

D. Accessory Manufacturers:

1. Gaskets: Manville, Anchor, Flexitallic, DuPont.
2. Isolation Flanges and Unions: Electric Pipe Line, Epco Sales, Harco Technologies Corp., B & K Industries, Tube Turns Technologies, Inc.
3. Joint Sealing Tape: 3M, Crane Packing, Permatex, Dupont.

E. Substitutions: None permitted.

2.02 FIELD PAINTING MATERIALS

- A. Follow Division 9 as applicable.

2.03 ELECTRICAL EQUIPMENT AND WIRING

- A. Motors: Follow Section 15170.

B. Motor Starting Equipment:

1. Unless otherwise specified, motor control centers, single and three phase starters and disconnect switches are specified under Section 16440.
2. Provide disconnect switches, magnetic motor starters and combination disconnect switches and starters which are an integral part of packaged equipment specified in Division 15. Comply with material requirements of Section 16440.

C. Wiring and Conduit:

1. Follow Division 16.
2. Unless otherwise specified, power wiring from the power source to motor starting equipment (including variable frequency drive packages) and from that equipment to motors including final connections is specified under Sections 16111 and 16120.

3. Classify line (120 volt) and low (below 120 volt) voltage wiring from control panels to control(ed) devices as control wiring.
 4. Factory install power wiring from control(ed) devices, motors and equipment to factory mounted starting equipment specified under this Division. Wherever possible, factory install control wiring.
- D. Control Panels:
1. ATC Control Panels: Follow Section 15950.
 2. Other Panels: NEMA 1 general purpose enclosure when designated for interior locations; NEMA 3R weather resistant enclosure when designated for exterior location or when otherwise exposed to moisture.
 3. Accessories:
 - a. Internal Circuit Protection for each motor, control circuit, electric heater and other circuits requiring protection.
 - b. Control Transformers: Where required to operate at 120 Vac maximum.
 - c. Terminal Strips: Mounted within enclosure arranged for conduit entry.
 4. Factory mount and wire devices required for equipment control.
 5. Wire control panels so that only one switched field power connection is required.
- E. Identification: Follow Section 15190.
- F. Electrical Characteristics: Verify that electrical characteristics of equipment furnished under this Division are in conformance with electrical services shown or specified.
- G. Design Modifications:
1. Follow Division 1 for provisions on substitutions.
 2. When proposed products differ from design standard in size, characteristics or capacity, inform A/E and all concerned parties in writing of such proposed changes, listing related items of work affected by change.
- 2.04 PIPE SLEEVES - ABOVE GRADE
- A. Wall Sleeves: Steel pipe or 18 gauge galvanized steel; full dimension of wall.
 - B. Floor and Roof Sleeves: Steel pipe with welded-on collar to position top of sleeve 2 inches above floor slab, and 8 inches above roof deck, make bottom of sleeve flush with underside of roof or floor deck.
 - C. Size (ID): 1/2 inch to 3/4 inch larger than penetrating element, including pipe insulation where specified in Section 15250.
- 2.05 PIPE SLEEVE/SEAL ASSEMBLY - BELOW GRADE FOUNDATION WALLS AND FLOORS
- A. Manufacturers:

1. Thunderline Link Seal.
 2. O.Z./Gedney.
 3. Substitutions: None permitted.
- B. Description: Mechanical type, multiple interlocking synthetic rubber expandable links. Include seal manufacturer's metal sleeve for matching assembly.
- C. Size (ID): As recommended by manufacturer to accommodate penetrating element.

2.06 ESCUTCHEONS

- A. One piece, set screw type, chrome plated steel and cast brass. See Part 3 for locations.

2.07 EXCAVATION AND BACKFILL

- A. All excavation is unclassified. The Contractor shall inspect the site and make allowance in his bid for soil to be excavated since no compensation will be given where rock is encountered.
- B. The Contractor, unless otherwise noted on the drawings, shall do all excavations for trenches, foundations, and pits of whatever kind necessary for the installation of this work. Bottom of trenches shall have the proper uniform grade wherever possible, unless otherwise directed.
- C. Trenches are to be excavated to the widths, lines and grades indicated on the drawings and/or specified in the appropriate sections of these specifications. Trenches for piping are to be excavated to a minimum width of one (1) foot plus the outside diameter of the pipe. The trench shall be excavated in a manner such that the pipe will be located in the center of the trench with the trench bottom having the proper uniform grade in the direction of flow. Trenches shall be deep enough to provide a minimum of four (4) feet fill over the piping except as may be otherwise indicated on the drawings.
- D. In earth excavation, trenches shall be carried to invert of pipe. If rock is encountered, carry trench to a point six inches below pipe invert. No pipe shall be bedded directly upon rock but shall be cushioned by a six inch layer of selected crushed stone or grave.
- E. The Contractor shall do any shoring, bracing, etc., necessary to maintain the banks of his excavation, shall make good any damage done to property of adjoining premises or work of other contractors due to his failure to properly shore his excavation. The Contractor shall do all pumping required to keep his excavations free of water including rental of pumps, temporary power and labor.
- F. All excavations shall be left open until work has been inspected and approved by the Owner's Representative. Sufficient time shall be allowed after notice is given that work is ready for inspection for making all examinations and tests. Under no circumstances shall excavated material be left, even temporarily, where it will interfere with the building or other Contractor's operations.
- G. Excavations which pass under or within eighteen (18) inches of columns or wall foundations shall backfilled up to the level of the columns or wall foundations with

concrete mixed in proportions to one part cement, three parts sand and five parts coarse aggregate. Excavations shall not undermine foundations at a slope of 1:1 or greater.

- H. All earth backfilling shall be made in layers not to exceed six (6) inches and each layer shall be thoroughly tamped into place before the next layer is placed. Backfilling shall be clean earth, free stone, pieces of concrete, rubbish, and other foreign materials. Material frozen in lumps or material softer than the adjoining soil shall not be used in backfilling. The Contractor shall distribute on the premises as directed, all earth remaining after the backfilling.
- I. Any rock encountered shall be removed without blasting.
- J. The Contractor will do all patching of bituminous surfaces, concrete walks, driveways, streets, etc., necessary to complete his work. All patching shall match the existing surfaces. Patching shall be done by personnel skilled in their trades.
- K. Provide adequate temporary crossovers for pedestrian and vehicular traffic including guard rails, lamps, flags, as directed; remove same when necessity for such protection ceases.

PART 3 - EXECUTION

3.01 PIPE INSTALLATION PROCEDURES

- A. Clean piping materials before installation to remove grease, loose dirt, mill scale and other foreign matter.
- B. Unless shown otherwise, route piping in the most direct manner, parallel to building lines.
- C. Close open ends of piping and equipment when it is not actually being worked on, with flange cover, cap or plug to prevent entry of foreign material during construction.
- D. Accurately align, support and connect piping without forcing.
- E. Make allowances for expansion and contraction in piping systems to avoid strain to joints, hangers or equipment.
- F. Group piping wherever practical at common elevations.
- G. Space piping to maintain at least 2 inch clearance from any other object, including movement due to temperature changes. When piping is insulated, maintain 2 inch clearance between insulation and adjacent insulated piping, walls or other objects.
- H. Install piping free of traps and with sufficient slope so that systems may be drained to one or several points. In event that it is impossible to drain to a common point due to structural obstructions and finished ceiling heights, provide additional drain valves required to completely drain piping systems. Verify location of drain valve, with A/E before installation.

- I. Locate piping to maintain access to and clearance around equipment. Locate piping systems to maintain 7'-0" clear headroom in areas where piping is exposed to view. Do not obstruct coil pulls, filter removals, access doors or the Work of other Sections.
- J. Locate piping valve train connections for maximum serviceability. Arrange equipment piping connections so that maintenance may be performed with minimum impact to connected piping system.
- K. Provide accessible flanges and union connections on supply and return connections of equipment, valves and other items which must be disconnected or removed for maintenance. Where unions are furnished as an integral part of equipment, additional unions are not required.
- L. Do not use all-thread (close) nipples, swaged nipples, or bushing reducers.
- M. Provide access to valves when not exposed.
- N. Provide piping support system in accordance with Section 15140.
- O. Where pipe support members are welded to structural building framing exposed to the atmosphere, scrape, brush clean, and apply one coat of zinc rich primer to finished welds.

3.02 JOINTS AND CONNECTIONS

A. Threaded Connections:

- 1. Ream pipe end, to remove burrs.
- 2. Use only standard taper threads, ANSI B2.1. Make threads full, sharp, clean, and free of fins and burrs.
- 3. Use Teflon joint sealing tape. Apply to male threads only. Conceal threads on chrome plated pipe.
- 4. Do not use close or short nipples of a size where the length of unthreaded pipe is less than the width of a pipe wrench.
- 5. Thredolets, T-Drill (Plumbing Piping System, Only) or similar code approved fittings may be used for branch connections.
- 6. Slip joints are permitted only in Sanitary Drainage systems on fixture side of traps.
- 7. Threaded flanges shall be factory machined per ANSI B16.5 in pressure rating conforming to piping system.

B. Plastic Pipe Connections:

- 1. For PVC piping, do not use adhesives, cements or sealers which have deteriorated or which will not spread smoothly.
- 2. Join polyvinyl chloride (PVC) piping by solvent cementing in accordance with ANST/ASME B31.3.

C. Threaded and Bonded Bell and Spigot Connections:

1. Make tapered end field joints using tapering tool furnished by manufacturer.
2. Assemble piping system without adhesive, to verify measurements prior to bonding.
3. Construct (bond) joints in accordance with manufacturer's recommendations using joint wrenches furnished by manufacturer. Below 70 degrees F, use "heat assist methods" to shorten cure time.
4. Maintain minimum acceptable burial depths as required by authority having jurisdiction.

D. Connections of Dissimilar Metallic Materials:

1. Isolate connections between dissimilar metallic materials where galvanic or electrolytic action may occur. Use dielectric fittings that provide a complete isolation of each end, using materials suitable for design pressure, temperature and fluid contained.
2. Isolate non-ferrous piping passing through openings in structural steel with non-conductive material permanently attached to the pipe.

3.03 FIELD PAINTING

- A. Except as specified below, field painting required for mechanical construction is specified under Division 9.
- B. Furnish ferrous materials with a factory-applied prime coat unless other means of protection from rust are provided. Where materials are not factory primed, field prime prior to installation.
- C. Repair damaged factory applied finished surfaces to match original surface. Completely refinish surfaces if repairs are not acceptable.

3.04 ELECTRICAL EQUIPMENT AND WIRING

- A. Install the work in accordance with applicable provisions of Division 16.
- B. Unless otherwise specified, install wire in conduit.
- C. Install control wiring for products under this Division except as specified in Section 15950.
- D. Where equipment is furnished without factory mounted control panels or motor starting equipment, install necessary integral control and power wiring to terminal junction or control boxes at one location for connection of field wiring.

3.05 PIPE SLEEVES, SEALS AND ESCUTCHEONS

- A. Sleeves: Furnish sleeves to other Sections as appropriate for installation. Sleeves in concrete shall be spaced a minimum of 4 inches apart.
- B. Seals: install mechanical seals around pipe passing through foundation walls, in such manner to ensure watertight installation.

C. Escutcheons: Install plates tight to wall or ceiling as follows:

1. Finished Spaces: chrome plated.
2. Unfinished Spaces: Cast brass.
3. Concealed Spaces: None required.

3.06 COUNTERFLASHING

A. When roof mounted work is not furnished with integral counterflashing, provide metal counterflashing formed as a rain hood, overlapping base flashing by 4 inches. Seal hood with clamping ring and sealant. See Division 7 for materials and methods.

END OF SECTION

SECTION 15140

SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Pipe and equipment support systems.
- B. Inserts.

1.02 RELATED SECTIONS

- A. Section 15890 - Ductwork Supports.

1.03 DEFINITIONS

- A. Supports: Attachments, hangers, rests, inserts, couplings, anchors, saddles, guides, channels, nuts, bolts, plates, rods, supplemental steel and other miscellaneous components required to support the work.
- B. Hot Systems - (A-1): Content of pipeline at or above 120 degrees F temperature.
- C. Ambient Systems - (B): Content of pipeline which is not heated or cooled and will remain at a temperature range between 60 degrees F to 119 degrees F.
- D. Cold Systems - (C-1): Content of pipeline at or below 59 degrees F temperature.
- E. Plastic Pipe: Thermoset or thermoplastic, rigid or semi-rigid PVC, ABS, DWV, CPVC, FRP, PP and others.

1.04 SUBMITTALS

- A. Shop Drawings: Submit for custom fabricated supports "**only**". Show sizes, weights, dimensions, materials and connecting methods used for support system. Indicate hanger and support framing and attachment methods.
- B. List of exceptions to specifications on a line-by-line basis. Include proposed materials, methods, and cost difference where substitutions are allowed.

1.05 QUALITY ASSURANCE

- A. Comply with ANSI/ASME B31 - Pressure Piping Code.
- B. Comply with MSS SP-58, SP-69, SP-89 - Manufacturers Standardization Society Standard Practices for Application, Design, Fabrication and Installation of Hangers and Supports.

PART 2 - PRODUCTS

2.01 PROTECTIVE COATINGS AND FINISHES

- A. Support and Anchor Material: Compatible with materials being supported. Protect against corrosion, abrasion and electrolytic action in accordance with MSS SIP-58 and SP-89.
- B. Use copper plated hangers and supports for bare copper piping. Use plastic covers on supports used for un-insulated plastic pipe.
- C. Where design, material, tolerances or post-factory assembly requirements prevent use of metallic factory coatings, apply multiple field coatings of zinc chromate primer.

2.02 PIPE HANGERS, SUPPORTS AND ATTACHMENTS

- A. Manufacturers: Any manufacturer conforming to specified standards. Grinnell Figure numbers are shown for reference only.
- B. Type 1: Adjustable clevis hanger, carbon steel. Figure 260.
- C. Type 6: Adjustable swivel ring, split ring type. Malleable iron or carbon steel. Figure 104.
- D. Type 8: Extension pipe or riser clamp, carbon steel. Figure 261.
- E. Type 10: Adjustable swivel ring, band type, carbon steel. Figure 70.
- F. Type 28 and 29: Forged steel beam clamp with eye nut. Figure 292].
- G. Type 31: Light welded carbon steel bracket. Attach pipe with scheduled hanger or support. Figure 194.
- H. Type 32: Medium welded carbon steel bracket. Attach pipe with scheduled hanger or support. Figure 195.
- I. Type 33: Heavy welded carbon steel bracket. Attach pipe with scheduled hanger or support. Figure 199.
- J. Type 38: Adjustable pipe saddle support, cast iron. Provide locknut nipple, floor flange, and concrete pier or steel support. Figure 264.
- K. Type 39: Pipe covering protection saddle. Curved carbon steel plate up to 24 inch and alloy steel for larger sizes. Minimum 12 inch in length. Figures 160 through 165.
- L. Type 40: Insulation protection shield. Carbon steel, galvanized, minimum 12 inch in length. Shields used with rollers shall be increased one nominal gauge thickness. Figure 277.
- M. Type 41: Single Pipe roll. Cast iron roll and sockets, steel roll rod. Figure 171.

- N. Type 43: Adjustable roller hanger. Cast iron roll, carbon steel yoke, roll rod and hex nuts. Figure 181.
- O. Type 44: Pipe roll, complete. Cast iron roll and stand. Figure 271.
- P. Type 45: Pipe roll and plate, complete. Cast iron roll and plate.
- Q. Type 46: Adjustable pipe roll and base. Cast iron base plate, stand and roll. Provide floor flange and concrete pier or steel support for floor support. Figure 274.
- R. Rigid Pipe Hangers (Anchors): In accordance with ASTM F708.
- S. Guides: Carbon steel spider type. Figures 255 and 256.
- T. Trapeze Hangers: Steel channels (Unistrut) and scheduled individual hanger, roll or clamp support.
- U. Un-Insulated Tubing Support 1/2 Inches and Smaller: Tube straps or one hole clamps.
- V. Shields for Vertical Copper Pipe Risers: Sheet lead.
- W. Hanger Rods: Steel, cadmium plated, threaded both ends, threaded one end, or continuously threaded.

2.03 INSERTS AND ATTACHMENTS

- A. Select inserts and attachment, to suit loading conditions in accordance with manufacturer's recommendations.
- B. Inserts for Placement in Concrete Formwork: Malleable iron, wedge or universal case with nut, galvanized finish. Size inserts to suit threaded hanger rods.

PART 3 - EXECUTION

3.01 INSERTS AND ATTACHMENTS

- A. Furnish inserts for placement in concrete slabs and beam formwork and masonry. Provide template, drawing or other instruction as required for correct location.
- B. Where concrete slabs form finished ceiling, make inserts flush with underside slab surface.

3.02 PIPE HANGERS AND SUPPORTS

- A. Support piping systems in accordance with applicable (referenced) standards. Space plastic piping in accordance with manufacturer's recommendations. Independently support concentrated weights such as valves, strainers, heavy fittings and where direction changes occur.

- B. Provide pipe system supports immediately adjacent to connected equipment. Do not support system valve trains and pipe risers on pumps, heat exchangers or other similar equipment.
- C. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent surfaces.
- D. Place a hanger within 12 inches of each horizontal elbow.
- E. Use hangers with 1 1/2 inch minimum vertical adjustment.
- F. Support horizontal cast iron pipe adjacent to each hub or clamp (for no-hub piping), with 5 foot maximum spacing between hangers.
- G. Where cast iron pipe is suspended in excess of 18 inches by means of non-rigid hangers, brace the pipe against horizontal movement.
- H. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub or clamp (for no-hub piping).
- I. Where several pipes can be installed in parallel and at same elevation, custom designed trapeze hangers may be used. Incorporate rollers, shields, saddles, lateral support limit devices, and similar apparatus in the trapeze hanger design.
- J. Support riser piping independently of connected horizontal piping.
- K. Do not use sprinkler and standpipe system supports for non-sprinkler and standpipe system components.

3.03 PIPE HANGER, SUPPORT AND ATTACHMENT SCHEDULE

A. Piping System Type: Hot, A-1

<u>ITEM PIPE SYSTEM</u>	<u>ATTACHMENT TYPE INSULATED</u>
Hangers	Type 1 up to 2 Inch; 41,43 with saddle for larger
Pipe Roll Supports	44,46 with saddle
Wall Supports	31,32,33
Floor Supports	46 with saddle
Vertical Supports	8
Protection Shield or Saddle	39

B. Piping System Type: Ambient B

<u>ITEM PIPE SYSTEM</u>	<u>ATTACHMENT TYPE INSULATED</u>	<u>BARE</u>
Hangers	1,10 with shield	1,6,10

Pipe Roll Supports	44,45,56 with shield	44,45,46
Wall Supports	31,32,33	Cast Iron Hook- up to 3 inch; 31, 32, 33 all sizes
Floor Supports	38 with shield	38
Vertical Supports	8	8
Protection Shield or Saddle	40	None

C. Piping System Type: Cold, C-1

<u>ITEM PIPE SYSTEM</u>	<u>ATTACHMENT TYPE INSULATED</u>
Hangers	1,10 with shield
Pipe Roll Support	44,45,46 with shield
Wall Supports	31,32,33
Floor Supports	38 with shield
Vertical Supports	8
Protection Shield or Saddle	40

END OF SECTION

SECTION 15170
MOTORS AND DRIVES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Motors, Drives and Protective Guards.

1.02 DELIVERY, STORAGE AND HANDLING

- A. Protect motors from weather and moisture by maintaining factory covers and suitable weatherproof covering. For extended outdoor storage, remove motors from equipment and store separately.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Motors:

1. General Electric.
2. Lincoln.
3. Magnetek.
4. Marathon.
5. Reliance.
6. Baldor.
7. Substitutions: None permitted.

B. Belt Drives:

1. T.B. Woods.
2. Browning.
3. Eaton.
4. Substitutions: Follow Division 1.

2.02 MOTOR DESIGN CRITERIA

- A. Unless otherwise noted, design motors for normal starting torque and current in accordance with NEMA Standards using a service factor of 1.15 at constant speeds.

- B. Design and guarantee motors to operate continuously at full load at 40 degrees C ambient with Class "B" insulation.
- C. For equipment located outdoors or exposed to weather, provide totally enclosed fan-cooled (TEFC) or totally enclosed air over (TEAO) motors, unless indicated otherwise.
- D. Motors located in air handling unit air stream shall be TEFC type.
- E. Motors 1 HP and larger, shall be high efficiency type.
- F. All motors shall be constant speed, squirrel cage induction type.
- G. Motors and drives shall not produce sound levels exceeding OSHA standards.
- H. Use NEMA Procedure IEEE 112, Test Method B, to determine motor efficiencies.
- I. Motors supplied with equipment shall be selected by the equipment manufacturer for the intended service.

2.03 MOTOR ELECTRICAL CHARACTERISTICS

- A. Motors Smaller than 1/2 hp: 115 volts, 1 phase, 60 Hz, unless shown otherwise.
- B. Motors 1/2 hp and Larger: 208 volts, 3 phase, 60 Hz, unless shown otherwise.

2.04 DRIVES

- A. Provide V-belt motor drives (use only Type A, B, C or D matched sets) unless otherwise specified. Minimum Drive Efficiency: 95 percent.
 - 1. Select drives for 150 percent of specified motor nameplate horsepower ratings.
 - 2. Provide V-belts of premium quality endless cord impregnated rubber trapezoidal cross-section.
 - 3. Provide companion type driven sheaves selected with design rpm at the midpoint of the adjustment range.
 - 4. Provide adjustable screw device for belt tensioning.
- B. Provide variable or fixed-pitch motor sheaves for fans and other belt-driven equipment requiring balancing. Provide replacement fixed-pitch (only) sheaves when required by Balancing Agency. Provide replacement pulleys and belts when installed sheaves are not capable of producing design flow rates.

2.05 GUARDS

- A. Provide guards on belts, pulleys, chains, gears, couplings, projecting setscrews, keys and other rotating parts. Construct guards in accordance with OSHA.
- B. Guards shall be easily removable and shall completely enclose the subject items.

- C. Construct guards of 16 gauge galvanized flattened expanded sheet steel with openings approximately 3/4 x 1-5/8 inches. Weld or bolt sheet to 1-1/4 x 1-1/4 x 1/8 inch galvanized angle iron frame. Bolt frame to vibration base using 1-1/4 x 1-1/4 x 1/8 inch galvanized angle iron mounting supports.
- D. Provide 4 inch diameter hole reinforced with metal band; centered at motor and drive shaft. Attach a 6 inch rotating coverplate to reinforcing band to allow access to shafts and permit tachometer reading with guards in place.
- E. Where grease fittings are enclosed by guards, provide extensions to an accessible location outside of guard.

2.06 SOURCE QUALITY CONTROL

- A. Statically and dynamically balance motors and test run at factory.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Except as specified otherwise, power wiring including conduit, cable and final connections, is specified under Sections 16111 and 16120.
- B. Do not operate motors until the following items are established:
 - 1. Voltage available on each phase in accordance with nameplate rating.
 - 2. Full load voltage reading not less than nameplate rating.
 - 3. Full load amperage reading not in excess of nameplate rating.
 - 4. Direction of driven equipment is proper.
- C. Maintain and lubricate motors and drives until final acceptance.

END OF SECTION

SECTION 15200

ROOF CURBS AND SUPPORTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Factory fabricated roof curbs and supports.

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Furnish roof curbs and supports to roofing section in Division 7 for installation.

PART 2 - PRODUCTS

2.01 DESIGN STANDARD MANUFACTURER:

- A. Manufacturers or Model Numbers listed are the design standards, substitutions subject to Division 1 are:
 - 1. Roof Equipment Manufacturer specified in other Sections.
 - 2. S & L Manufacturing Company.
 - 3. Roof Products & Systems Corporation.
 - 4. Houston Roof Curbs.
 - 5. Other Substitutions: None permitted.

2.02 MATERIALS

- A. Dimensionally coordinate curbs and supports with building structure and equipment to be supported.
- B. Curbs and Supports: Except where specified otherwise; 12 inch high, 18 gauge galvanized steel sides, treated wood nailers, fully mitered corners with welded seams and rigid glass fiber insulation.
- C. Roof Curbs:
 - 1. Type C: use with pipe or duct penetrations; integral baseplate, 2 inch thick insulation, acrylic clad ABS plastic cover, boots and stainless steel clamps. Pate Company Model PCA.
- D. Roof Duct and Equipment Supports:
 - 1. Use with ducts, utility sets and equipment not exceeding 36 inches in width; integral baseplate and counterflashing. Pate Company Model ES.

2. Where ducts and equipment exceed 36 inches in width; Pate Company Model ES supports in height to provide minimum 24 inches clearance between underside of equipment or insulated duct and finished roof surface.
- E. Roof Pipe Curb:
1. Pipe curb assembly shall consist of heavy gauge galvanized steel roof curb, unitized construction, with integral base plate, 1 ½" insulation and 2 X 2 treated wood nailer. Pate Company Model PCC.
 2. Unit shall be furnished with acrylic clad thermoplastic cover, fastening screws, graduated step boots with stainless steel clamps.

PART 3 - EXECUTION

- A. (Not Used).

END OF SECTION

SECTION 15250

MECHANICAL INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Piping, ductwork and equipment insulation.
- B. Accessories.

1.02 SUBMITTALS

- A. Product Data: Describe each insulation type.
- B. Schedule: Show each type of insulation, location and thickness.
- C. List of exceptions to specifications on a line-by-line basis. Include proposed materials, methods, and cost difference where substitutions are allowed.

1.03 QUALIFICATIONS

- A. Applicator: Company specializing in insulation application with three years minimum experience.

PART 2 - PRODUCTS

2.01 DESIGN STANDARD MANUFACTURERS: Manufacturers or model numbers listed are the design standards. The following substitutions are permitted. Acceptable manufacturers are listed below.

- A. Insulation:
 - 1. Owens-Corning.
 - 2. Manville.
 - 3. Knauf.
 - 4. CertainTeed.
 - 5. Rubatex.
 - 6. Pabco.
 - 7. Promat.
 - 8. Thermal Ceramics.
 - 9. Armacell.

10. Other Substitutions: None permitted.

2.02 MATERIALS - GENERAL REQUIREMENTS

- A. Except for Type F insulation, use materials with maximum flame spread/fuel contributed/smoke developed rating of 25/50/50 in accordance with ASTM E84.
- B. Use insulation rated for temperatures encountered.

2.03 INSULATION

- A. Type A: Glass fiber; ANSI/ASTM C547; 'k' value of 0.24 at 75 degrees F; noncombustible. Manville micro-Lok AP-T Plus with vapor barrier.
- B. Type F: Flexible elastomeric foam; ANSI/ASTM C534; 'k' value of 0.28 at 75 degrees F, with smooth exterior surface. Armacell-Armaflex 1.5" thick.
- C. Type W: Flexible glass fiber wrap; ANSI/ASTM C553; non-compressed 'k' value of 0.26 at 75 degrees F with foil scrim; Kraft vapor barrier facing. Manville Microlite Type 150 Faced Duct Wrap.

2.04 PIPING ACCESSORIES

- A. Aluminum Jackets and Bands: ASTM B209; 0.016 inch thick jacket, smooth finish with 3/4 inch wide bands.
- B. PVC Jackets: One piece, 20 mil thick, premolded type, UV protected; Zeston 2000 with Perma-Weld jacket adhesive.
- C. PVC Valve and Fitting Covers: Zeston.
- D. Tape: Vapor barrier, pressure sensitive.
- E. Adhesive: Vapor barrier, compatible with insulation.

2.05 DUCTWORK ACCESSORIES

- A. Adhesive: Waterproof fire-retardant type.
- B. Glass Fiber Lagging Adhesive: Fire resistive.
- C. Impale Anchors: Galvanized steel, 12 gauge, self-adhesive pad.
- D. Duct Tape: UL rated flame retardant, self-sealing, foil scrim kraft laminate, vapor barrier, 3 inch wide.

PART 3 - EXECUTION

3.01 GENERAL

- A. Install insulation after piping and ductwork has been pressure tested and approved.
- B. Clean surfaces for adhesives. Install materials on clean, and dry surfaces.
- C. Seal joints, seams and penetrations of insulation to maintain vapor barrier.

3.02 PIPING INSULATION

- A. Do not insulate chrome plated piping.
- B. Continue insulation with vapor barrier through pipe supports, hangers and sleeves.
- C. Where piping is exposed to view in finished spaces, position and cover seams in least visible locations.
- D. Insulate joints, fittings, valves, flanges, flexible connections, expansion joints and other devices with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive. Install insulation on valves, flanges and expansion joints so that it can be easily removed and replaced without damage. Do not insulate unions, strainers, flexible connectors or check valves.
- E. Where glass fiber insulation is applied to piping subject to condensation; seal longitudinal laps of jackets with adhesive, and wrap butt joints with 2 inch wide tape.
- F. Where pre-molded PVC fitting covers are used; apply multiple layers of insulation until cover is tightly packed. Hot piping covers may be initially secured with stainless steel serrated tacks. Seal seam edges of cold piping covers with adhesive. Secure hot and cold piping covers by taping ends to adjacent insulation.
- G. Neatly finish insulation at supports, protrusions and interruptions.
- H. Insulation (Type F) Application:
 - 1. Install with joints tightly butted. Stagger joints where multi-layer application is required. Secure inner layer with stainless steel tie wire, 12 inches OC. Secure outer layer with stainless steel bands, 12 inches OC. Fill joints with insulating cement.
 - 2. Finish: Apply a heavy coat of insulating cement over entire surface. Apply multiple 1/16 inch thick layers of lagging adhesive over the dry cement with one layer of glass cloth embedded between the layers. Overlap the glass cloth edges at least 1 inch. Thin the finish layer to achieve a smooth finish.
- I. Jackets, Indoors: Insulate piping with vapor barrier jackets, factory or field applied.
- J. Jackets, Outdoors: Insulate piping with vapor barrier jackets. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 DUCTWORK INSULATION

- A. Where dampers have elevated regulators and access doors have outer flanges, install insulation between duct and regulator or flange.
- B. Insulation (Type W) Application:
 - 1. Lap insulation a minimum of 3 inches.
 - 2. Install insulation to ductwork with adhesive. In addition to adhesive, secure insulation to underside of horizontal ductwork and all vertical ductwork with mechanical fasteners 12 inches OC when duct dimension is 18 inches or larger. Where spacing around ductwork will not permit installation of mechanical fasteners, use 100 percent adhesive coverage.
 - 3. Stop and point insulation around access doors and damper operators to allow operation without disturbing insulation.
 - 4. Seal jacket joints, penetrations by mechanical fasteners and other vapor barrier penetrations with tape.

3.04 PIPING INSULATION SCHEDULE

INSULATION THICKNESS (INCHES) FOR PIPE SIZES

Piping System Types	Fluid Temp. Range °F	Type	1 and smaller	1.5 – 2.0	2.5 – 4.0	5.0 & 6.0	8.0 and larger
Cooling Systems							
Refrigerant	Below 45	A	1.0	1.0	1.5	2.0	2.0
Plumbing Systems							
Domestic Cold Water	Any	A	1.0	1.0	1.0	2.0	2.0
Domestic Hot Water and Recirculating	130 & below	A	1.0	1.0	1.0	2.0	2.0
	131-160	A	1.0	1.0	1.0	2.0	2.5
Incoming Water Service	Any	A	1.0	1.0	1.0	2.0	2.0

3.05 DUCTWORK INSULATION SCHEDULE

Equipment	Type	Thickness (inches)
Air Handling Unit Supply Air Ductwork	W	2" (R-7)
Outdoor Air Ductwork (1)	W	2" (R-7)

END OF SECTION

SECTION 15330
SPRINKLER SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Design and installation of the following systems extending outside the building with final connection to site water main.
 - 1. Wet pipe sprinkler system.

1.02 RELATED SECTIONS

- A. Section 15050 - Excavation and Backfill for Underground Piping.
- B. Section 15050 - Pipe and Valve Installation Procedures.

1.03 SUBMITTALS

- A. All submittals shall bear approval from State or Local Fire Marshall prior to A/E review. Make all submittals at one time. Partial submissions will not be accepted.
- B. Shop Drawings: As a minimum, show the following:
 - 1. Piping drawings.
 - 2. Location and rating of sprinkler heads.
 - 3. Risers, drops and offsets required to avoid interference with other construction.
 - 4. Sprinklers shall be referred to on drawings, submittals, and other documentation, by the sprinkler identification or model number as specifically published in the appropriate agency listing or approval. Trade names or other abbreviated designations shall not be allowed.
 - 5. Source of water supply and design pressure.
 - 6. Underground point of connection to water supply, details and locations of anchoring and joint reinforcing.
 - 7. Provision for flushing, draining and testing, including locations and sizes of drains, vents and flow test stations.

1.04 INFORMATIONAL SUBMITTALS

- A. Submittals require no responsive action by A/E.
- B. Proposed flushing and testing procedures.
- C. Statement of Supplier/Installer qualifications.

- D. Certificates: Certify that field tests have been performed and that Work meets or exceeds specified requirements.
- E. Start-up report.
- F. Project Record Documents.
- G. Operation and Maintenance Data.
- H. Hydraulic calculations, signed and sealed by a Professional Engineer registered in the State of Pennsylvania

1.05 QUALIFICATIONS

- A. Supplier/Installer: Company specializing in sprinkler systems specified with five years experience.
- B. Materials:
 - 1. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
 - 2. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.

1.06 REGULATORY REQUIREMENTS

- A. Comply with:
 - 1. International Building Code.
 - 2. NFPA 13R: Standard for Installation of Sprinkler Systems.
 - 3. NFPA 70: National Electric code.
 - 4. FM Approval Guide and Loss Prevention Data.
 - 5. (Owner's Insurance Carrier) Requirements.
 - 6. UL 199: Automatic Sprinklers for Fire Protection Service.
 - 7. UL Fire Protection equipment List.
 - 8. Local Water Company Requirements.

1.07 MAINTENANCE MATERIAL

- A. Provide spare sprinkler heads of each type and temperature rating used. Comply with NFPA 13R as to number required.
- B. Provide one special sprinkler wrench for each type of sprinkler head.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Design Standard Manufacturers: Manufacturers or model numbers listed are the design standards, substitutions are permitted subject to Division 1, except where specified otherwise.

2.02 MATERIALS - GENERAL REQUIREMENTS

- A. Products: See individual product specifications for those requiring UL listing.
- B. Definitions: As established by NFPA for materials used for fire protection systems.

2.03 UNDERGROUND FIRE PROTECTION PIPE SYSTEM

- A. Pipe: Ductile iron pressure pipe; AWWA C151/ANSI A21.51.
- B. Lining: Cement-mortar; AWWA C104/ANSI A21.4.
- C. Joints:
 - 1. Mechanical or push-on type; AWWA C111/ANSI A21.11.
- D. Fittings: Ductile iron; AWWA C110/ANSI A21.10.

2.04 ABOVEGROUND FIRE PROTECTION SYSTEM

- A. Sprinkler System:
 - 1. Pipe:
 - a. 5 Inches and Smaller: Light wall, Schedule 10 seamless steel, black; ASTM A135 or CPVC.
 - 2. Joints: welded or grooved (rolled only) or CPVC.
 - 3. Fittings: Steel, welded ends, or ductile or malleable iron mechanical joint; ASTM A536/ASTM A47 or CPVC.
 - 4. Couplings (Victaulic) 8 Inch and Smaller: Ductile iron housing, ASTM A536, Grade EPDM gasket. Victaulic Style 005 Firelock rigid coupling for fire protection services or CPVC.
- B. Gate Valves:
 - 1. 2 Inches and Smaller: 175 psi, OS&Y bronze, threaded ends, Nibco T-104-0 or CPVC.
 - 2. 2-1/2 Inches and Larger: 175 psi, IBBM, OS&Y flanged ends, Nibco P-607-0.
- C. Check Valves:

1. 2 Inches and Smaller: Class 125, 200 w.w.p, bronze swing disc, threaded ends, Nibco KT-403-W or CPVC.

2.05 PIPE SUPPORTS AND ANCHORS

- A. NFPA and FM approved.

2.06 PIPE SLEEVES AND SEALS

- A. As specified in Section 15050.

2.07 ALARM PRESSURE SWITCHES

- A. UL listed, pressure switch for initiating a sprinkler flow alarm per NFPA 72 in conjunction with alarm check valves and dry-pipe or pre-action sprinkler systems.
- B. DPDT alarm contacts rated 24 vdc at 1A minimum, adjustable to operate from 0 to 20 psi.
- C. Furnish with SPDT tamper contacts rated 24 vdc at vdc minimum, actuated by removal of cover.
- D. Potter Electric Co. Model PS1O-2.

2.08 WATERFLOW DETECTOR

- A. UL listed, saddle mounted paddle type for detecting and initiating a sprinkler flow alarm per NFPA 72 in wet-pipe sprinkler systems.
- B. DPDT alarm contacts rated 24 vdc at 1A minimum, actuated by a pneumatic retard mechanism adjustable from 0 to 70 seconds.
- C. Furnish with SPDT tamper contacts rated 24 vdc at 1A, minimum, actuated by removal of cover.
- D. Potter Electric Co. Model VSR.

2.09 SPRINKLER HEADS

- A. UL listed and FM approved: Type as shown.
- B. Sprinklers shall be glass bulb type, with hex shaped wrench boss integrally cast into the sprinkler body to reduce the risk of damage during installation.
 1. Wrenches shall be provided by the sprinkler manufacturer that directly engage the hex-shaped wrench boss integrally cast in the sprinkler body. Victaulic FireLock Series.
- C. Use sprinkler heads having 1/2 inch orifice with "K" factor between 5.3 and 5.8 unless shown otherwise.
- D. Temperature Rating: 155 degrees F, except where heads are subject to abnormal heating conditions and of sufficient rating to prevent accidental discharge when no fire is present.

- E. Head Guards: Type suitable for sprinkler head used.
- F. Escutcheons and guards shall be listed, supplied, and approved for use with the sprinkler by the sprinkler manufacturer.

2.10 SPRINKLER HEAD CABINETS

- A. Surface mounted cabinets for storing spare heads and wrenches, mount in mechanical closet.
- B. Cabinet and Door; 22 gauge minimum sheet steel with concealed hinge and recessed handle.
- C. Finish: Prime coat and baked enamel in color selected.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install the work in accordance with Article "Quality Assurance" of this Section.
- B. Install sprinkler guards at locations where sprinkler heads may be subject to mechanical injury, or where required by authority having jurisdiction.
- C. Do not install sprinklers that have been dropped, damaged, or show a visible loss of fluid. Never install sprinklers with cracked bulbs.
- D. Sprinkler bulb protector shall be removed by hand after installation. Do not use tools or any other device(s) to remove the protector that could damage the bulb in any way.
- E. Protect concealed sprinkler head cover plates where ceilings will receive field paint finish.
- F. Sprinkler piping load shall include an additional 250 pound load applied at point of hanging as required by NFPA.
- G. Install sprinkler piping so that water can be drained back through the mains. Where this is not possible, provide valves with hose connections at low points to permit drainage. Extend drains to spill-over floor drains, sumps, mop receptors or as indicated.
- H. Use ball type valves for main riser drain, auxiliary drains and inspectors test connections.
- I. Underground piping - Special Requirements:
 - 1. Install tie rods with couplings, nuts, bolts, washers and clops at changes in direction.
 - 2. After installation of tie rods and accessories and before backfilling is started, clean tie rods and accessories, and apply 2 coats of asphaltic coating.
 - 3. Install concrete thrust blocks at changes in direction and as required by NFPA.

- J. Install detector check valve assembly and accessories in compliance with local water company requirements.
- K. Install water flow detector on topside of horizontal pipe or on vertical pipe. Install minimum 6 inches from fitting or 24 inches from a valve.

3.02 FLUSHING

- A. Flush underground mains and lead-in connections to system risers in accordance with acceptable procedure, before connections are made to sprinkler piping.
- B. Install drainage plugs, taps and valves where required to conduct flushing operation.
- C. Arrange for disposal of flushing water to avoid damage to Owner's property. Obtain owner approval of drain locations.
- D. Repair damage caused by leaks, flooding or draining during flushing.
- E. Give A/E two weeks written advance notification of date and time flushing will be conducted.

3.03 FIELD TESTING

- A. General Requirements:
 - 1. Test new wet and standpipe systems, and new underground fire main in accordance with NFPA 13R.
 - 2. Measure hydrostatic pressure at low point of individual system, zone or main being tested.
 - 3. Should leaks occur during testing, stop test, repair leaks, and repeat entire test from beginning.
 - 4. Repair damage caused by leaks, flooding or draining during testing.
 - 5. Obtain Written approval of sprinkler, system installation from Local Fire Marshall and submit copy to owner and A/E.
 - 6. Complete and forward Installer's NFPA Material and Test Certificate to Local Fire Marshall, owner and A/E.
- B. For New Wet Systems:
 - 1. Hydrostatically test new wet sprinkler systems at not less than 100 psi for two hours, or at 50 psi for two hours above maximum static pressure where maximum static pressure is greater than 150 psi. No leakage is permissible.
- C. For New Underground Fire Main:
 - 1. Hydrostatically test new underground fire main piping at not less than 100 psi for two hours, or at 50 psi for two hours above maximum static pressure when maximum static pressure is greater than 150 psi.

2. Measure amount of leakage in piping at specified test pressure by pumping from a calibrated container, amount of leakage at joints shall not exceed two quarts per hour per 100 gaskets or joints, regardless of pipe diameter.

3.04 SYSTEM START-UP

- A. Provide services of manufacturer's representative for a minimum of 2 hours.

END OF SECTION

SECTION 15411
PLUMBING SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Incoming water service supplying water to domestic water distribution system.
- B. Domestic use water system to plumbing fixtures, specialties and equipment; food service equipment.
- C. Sanitary waste and vent system from plumbing fixtures, food service equipment, and general use floor drains.
- D. Natural gas distribution system to mechanical equipment and food service equipment.

1.02 RELATED SECTIONS

- A. Section 15050 - Excavation and Backfilling for Utility Trenches.
- B. Division 7 - Joint Sealers.
- C. Division 10 - Toilet Accessories.
- D. Division 11 - Furnishing and Installation of Sinks and Drains with Tailpieces in Food Service Equipment.
- E. Section 15050 - Pipe and Valve Installation Procedures.
- F. Section 15140 - Supports and Anchors.
- G. Section 15250 - Piping Insulation.
- H. Section 15421 - Plumbing Pipe Schedules, Testing and Cleaning.
- I. Section 15431 - Plumbing Specialties.
- J. Section 15435 - Drains and Cleanouts.
- K. Section 15441 - Plumbing Fixtures and Trim.
- L. Section 15455 - Water Heaters.
- M. Section 15950 - Automatic Temperature Control and Instrumentation.
- N. Section 16010 - Equipment Wiring Systems.

O. Section 16440 - Magnetic Motor Starters.

1.03 SUBMITTALS

A. Make all submittals at one time. Partial submittals will not be reviewed.

B. List of exceptions to specifications on a line-by-line basis. Include proposed materials, methods, and cost difference where substitutions are allowed.

1.04 REGULATORY REQUIREMENTS

A. Comply with:

1. ANSI/ASME Boiler and Pressure Vessel Code.
2. ASHRAE Standards 90.1 - 2007.
3. International Building Code.
4. International Plumbing Code.
5. Hydraulic Institute Standards for Centrifugal, Rotary and Reciprocating Pumps.
6. National Sanitation Foundation.
7. National Standard Plumbing Code.
8. NFPA 54 - National Fuel Gas Code.
9. NSF – 61 drinking water system components.
10. Philadelphia Gas Work.
11. State of Pennsylvania Department of Environmental Protection.

PART 2 - PRODUCTS

2.01 INCOMING WATER SERVICE, DOMESTIC USE, WATER SYSTEM

A. Below Grade:

1. 2 Inches and Smaller: Schedule P-5.3.

B. Above Grade:

1. 2 Inches and Smaller: Schedule P-5.1.

2.02 SANITARY WASTE SYSTEM

A. Gravity Piping:

1. Below Grade: Schedule P-6.4.
2. Above Grade:
 - a. Waste and Vent: Schedule P-6.4.

b. Indirect Waste:

- 1) 2 Inches and Smaller: Schedule P-5.2.

2.03 STORM WATER SYSTEM

A. Gravity Piping:

1. Below Grade: Schedule P-6.4.
2. Above Grade: Schedule P-6.4.

2.04 NATURAL GAS SYSTEM

- A. Below Grade: Schedule P-3.1.
- B. Above Grade: Schedule P-3.1.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install systems in accordance with reviewed submittals and referenced standards.
- B. Use chrome Plated material for exposed non-insulated piping in kitchen area.
- C. Install branch shut-off valves to allow construction to proceed with a minimum amount of drain-down time for existing System(s).
- D. Insulate piping in accordance with Section 15250.

3.02 INCOMING WATER SERVICE, DOMESTIC USE WATER SYSTEM [S]

- A. Water meter will be furnished by Philadelphia Water Department. Schedule and coordinate delivery.
- B. Install water meter assembly complete with reduced pressure backflow preventer and their accessories.
- C. Protect domestic water distribution system[s] against backflow and siphonage both natural and induced.
- D. Install backflow preventers as specified in Section 15431 to isolate equipment connected to domestic water system[s] which can pollute or contaminate water distribution systems or any part thereof, due to reversal of flow, pressure drop, pressure loss or induced vacuum.

3.03 STORM WATER, AND SANITARY WASTE SYSTEMS

- A. Prior to installation of underground piping, remove large stones or other hard matter, which could damage pipe or prevent consistent backfilling or compaction. Place pipe on compacted subgrade.
- B. Lay pipe to slope gradients shown and specified, with maximum variation from true slope of 1/8 inch in 10 feet.
- C. Install vertical lines plumb.
- D. Install horizontal lines 4 inches and larger with a minimum uniform pitch of 1/8 inch per foot unless shown otherwise. Install piping 3 inches and smaller with a minimum uniform pitch of 1/4 inch per foot unless shown otherwise. Make changes in pipe sizes with reducers or increasers.
- E. Connect horizontal lines with vertical stacks using 45 degree "Y" branches, 60 degree "Y" branches, combination "Y" and one-eighth bend branches, and sanitary tees or other acceptable fittings of equivalent sweep. Short sweeps may be used in soil and waste lines where flow direction changes from horizontal to vertical.
- F. Connect horizontal lines with other horizontal lines using 45 degree "Y", branches, combination "Y" and one-eighth bend branches, or other fittings of equivalent sweep.
- G. Connect vertical lines with horizontal lines using 45 degree "Y" branches, combination "Y" and one-eighth bend branches, or other fittings of equivalent sweep.
- H. Extend vent pipes through roof. Do not locate vents within 10 feet of windows or air intakes. Base flashing is specified under roofing specifications. Counterflashing is specified under Section 15050.
- I. Underground Soil Piping: 3 inch I D minimum.
- J. Underground Waste Piping: 3 inch I D minimum.
- K. Provide cleanouts at beginning of each run, at each change of direction and at intervals in piping such that maximum spacing between cleanouts is 50 feet for pipe of 4 inch diameter and smaller, and 100 feet for piping over 4 inch diameter.
- L. Mechanical couplings (grooved type) and fittings may be used in lieu of lead and oakum joints for interior rain water conductors when not located above hard ceilings, in sealed shafts or in other inaccessible areas.

3.04 NATURAL GAS SYSTEM

- A. Slope gas piping not less than 1/4 inch per 15 feet, to prevent liquid traps. Apply joint compounds to threaded connections sparingly, on male end only.
- B. Extend branch piping from top or sides of horizontal lines, not from bottom.
- C. Provide 6 inch long capped drip pockets of same size as pipe at low points of system.

- D. Unless shown otherwise, install a full size cock and union in the following locations:
 - 1. On each lateral as close to gas main as possible.
 - 2. At each gas consuming equipment item.
- E. Do not install valves in above-ceiling spaces, unless shown otherwise.
- F. Provide gas pressure regulators in service lines to food service, and mechanical equipment.
- G. Provide an independent vent to building exterior from each gas pressure regulator, as required by the National Fuel Gas Code.
- H. See drawings for size, location and arrangement of gas pressure regulators.
- I. Gas piping installed below building slabs must be installed in an approved conduit and the ends sealed. The conduit system must be vented to the roof.

END OF SECTION

SECTION 15421

PLUMBING PIPE SCHEDULES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Piping system components, materials and limitations.
- B. Testing and Cleaning.

1.02 RELATED SECTIONS

- A. Section 15411 - Application of Pipe Schedules to Various Plumbing Systems.

1.03 SUBMITTALS

- A. Product Data: Submit schedule identifying each product; sizes, materials and capacities.
- B. List of exceptions to specifications on a line-by-line basis. Include proposed materials, methods, and cost difference where substitutions are allowed.

1.04 INFORMATIONAL SUBMITTALS

- A. Certifications:
 - 1. Certify that field tests have been performed and that work meets or exceeds specified requirements.
 - 2. Water Sterilization Certification.
- B. Field Test Reports.
- C. Operation and Maintenance Data: Include assembly views, lubrication instructions and replacement parts list.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Store valves in shipping containers with labeling in place.
- B. Protect pipe threads from damage with plastic caps.

PART 2 - PRODUCTS

2.01 PIPE SYSTEMS MATERIALS

- A. See piping schedule pages 3 to 11 at the end of this Section.

PART 3 - EXECUTION

3.01 PIPING INSTALLATION AND CONNECTIONS

- A. Follow Sections 15050 and 15411.

3.02 FIELD TESTING

- A. Notify A/E 2 weeks in advance of date and time that testing will be conducted.
- B. Test systems before covering or concealment.
- C. Flush piping systems before testing.
- D. Should leaks occur during testing, stop test, repair leaks, and repeat entire test from beginning.
- E. Repair damage caused by leaks, flooding or draining.
- F. Separately test above and below grade drainage systems.
- G. Issue certification of successful test for each system.
- H. Unless otherwise required by local authorities having jurisdiction, follow testing procedures scheduled.

3.03 PIPING SYSTEMS CLEANING

- A. Follow cleaning procedures scheduled.

3.04 TABLE OF CONTENTS FOR PIPING SCHEDULES

<u>SCHEDULE</u>	<u>SERVICE</u>
P-3.1	Natural Gas (low pressure; less than 1 psi).
P-5.1	Domestic Use Water (above grade 2 inches and smaller)
P-5.2	Sanitary Indirect Waste
P-5.3	Domestic Water (below grade 2 inches and smaller)
P-6.4	Sanitary Waste
	Storm Water
P-8.1	Testing, Cleaning, Sanitizing
P-8.2	Sterilizing
P-8.4	Testing and Cleaning
P-8.7	Testing and Cleaning

SCHEDULE P-3.1

- A. Service: Natural gas (low pressure; less than 1 psi).
- B. Maximum Design:
 - 1. Pressure: 125 psig.
 - 2. Temperature: 200 degrees F.
- C. Pipe, Aboveground: Schedule 40, electric resistance welded or seamless steel, black; ASTM A53, Grade B.
- D. Pipe, Underground: Schedule 40, welded or seamless steel, black; ASTM A53, Grade B and mill wrapped, ANSI B36.10.
- E. Joints, Aboveground
 - 1. 2 Inches and Smaller: Thread or socket welded.
 - 2. 3 Inch and 4 Inch: Socket welded.
- F. Joints, Underground:
 - 1. 4 Inches and Smaller: Socket welded.
- G. Fittings, Aboveground:
 - 1. 2 Inches and Smaller: Class 150 Malleable iron, threaded ends; ANSI B16.3 or Class 3000 forged steel, socket weld ANSI B16.11 and ASTM A105.
 - 2. 3 Inch and 4 Inch: Class 3000 forged steel, socket weld, flanged at valve and equipment connections: ANSI B16.9.
- H. Fittings, Underground:
 - 1. 4 Inches and Smaller: Class 3000 forged steel, socket weld, flanged at valve and equipment connections: ANSI B16.11 and ASTM A105.
- I. Valves: 4 Inches and Smaller: UL listed Class 125, iron body, non-lubricated plug valve with threaded or flanged ends, DeZurik Figure 425.
- J. Strainers: 2 Inches and Larger: Class 125, cast iron body, flanged, Y pattern with 0.0055 inch stainless steel perforated screen, Spirax/Sarco Model 125.
- K. Encasement, all below grade piping: Polyethylene jacket or double layer half-lapped 10 mil polyethylene tape; ANSI/AWWA C105.
- L. Test and Clean: Follow Schedule P-8.7.

END OF SCHEDULE

SCHEDULE P-5.1

- A. Service:
 - 1. Domestic use water (above grade 2 inches and smaller).
- B. Maximum Design:
 - 1. Pressure: 150 psig.
 - 2. Temperature: 150 degrees F.
- C. Pipe: Type L hard drawn seamless copper tubing, ASTM B88.
- D. Joints: Soldered with grade HB lead free solder (lead content not more than 0.1 percent); ASTM B32, ANSI/AWS A5.8; J. W. Harris, Bridgit.
- E. Fittings: Wrought copper, soldered ends; ANSI B16.22
- F. Flanges: 150 psi, cast bronze; ANSI B16.1B.
- G. Ball Valves: 2 Inches and Smaller: (600 psi WOG, two piece brass body, soldered connections, chrome plated ball, TFE seats and packing, FS WW-V-35, Nibco Figure S-FP-600N.
- H. Check Valves:
 - 1. 2 Inches and Smaller: Class 125, 200 psi, brass, swing check, renewable brass disc, soldered connections.
- I. Test, Clean and Sanitize: Follow Schedule P-8.1.

END OF SCHEDULE

SCHEDULE P-5.2

- A. Service:
 - 1. Sanitary indirect waste.
- B. Maximum Design:
 - 1. Pressure: Gravity vented.
 - 2. Temperature: 140 degrees F.
- C. Pipe: 2 Inches and Smaller: Type DWV copper drainage tubing; ASTM B306.
- D. Joints: Soldered with grade HB lead-free solder (lead content not more than 0.1 percent); ASTM B32, ANSI/AWS A5.8; J. W. Harris, Bridgit.
- E. Fittings: Cast bronze, drainage; ANSI B16.23.
- F. Test and Clean: Follow Schedule P-8.4.

END OF SCHEDULE

SCHEDULE P-5.3

- A. Service:
 - 1. Domestic water (below grade 2 inches and smaller).
- B. Maximum Design:
 - 1. Pressure: 150 psig.
 - 2. Temperature: 150 degrees F.
- C. Pipe: Type K soft annealed seamless copper tubing, ASTM B88.
- D. Joints: Soldered with grade HB lead free solder (lead content not more than 0.1 percent); ASTM B32, ANSI/AWS A5.8; J. W. Harris, Bridgit.
- E. Fittings: Wrought copper, soldered ends; ANSI B16.22.
- F. Ball Valves: 600 psi WOG, two piece brass body, soldered connections, chrome plated ball, TFE seats and packing, FS WW-V-35, Nibco Figure S-FP-600N.
- G. Check Valves: Class 125, 200 psi, brass, swing check, renewable brass disc, soldered connections.
- H. Test, Clean and Sanitize: Follow Schedule P-8.1.

END OF SCHEDULE

SCHEDULE P-6.4

- A. Service:
 - 1. Sanitary waste.
 - 2. Storm water.
- B. Maximum Design:
 - 1. Pressure: Gravity vented.
 - 2. Temperature: 140 degrees F.
- C. Pipe: 6 Inches and smaller; plain ends, Schedule 40 polyvinyl chloride (PVC) plastic DWV pipe; ASTM D2665, D1784.
- D. Joints: Socket type, solvent welded; ASTM D2564.
- E. Fittings: Socket type, DWV pipe patterns; ASTM D2665, D3311, D1784.
- F. Test and Clean: Follow Schedule P-8.4.

END OF SCHEDULE

SCHEDULE P-8.1

- A. Testing: Schedules P-5.1, P-5.3.
- B. Cleaning:
 - 1. Flush internals of system with water of sufficient velocity and quantity that will dislodge sediment or dirt.
 - 2. Remove flow indicators and flow measuring devices before flushing. Replace after cleaning is completed.
 - 3. System may be tested in sections. Remove blanks, caps or plugs. Remake joints used in section testing and record information.
- C. Hydrostatic Test:
 - 1. Remove pipe system devices not designed to withstand specified test pressure.
 - 2. After flushing fill system with water, venting off entrapped air at high points of the system.
 - 3. Apply hydrostatic pressure to one and one-half times design pressure or 150 psig, whichever is greater. Test pressure for Schedules shall not exceed maximum design pressure.
 - 4. Hold test pressure for 4 hours. A/E will inspect to determine visible leaks or significant pressure variations. (Temperature variations must be considered.)
 - 5. When hydrostatic test is approved, drain water to storm sewer.
 - 6. Dismantle, clean and reinstall drain valves and strainers.
 - 7. Tabulate and submit test results.
 - 8. Reinstall pipe system devices.
- D. Repair of Leaks:
 - 1. Mechanical or Threaded Joints:
 - a. Tighten joints using discretion.
 - b. Take joints apart and replace defective material.
 - 2. Soldered Joints: Take joint apart, clean both tube and fitting and remake joint.
- E. Plastic Joints: Take joints apart and replace with new material.
- F. Retest after repairs.
- G. Sanitizing: Schedule P-5.1, P-5.3: See Schedule P-8.2.

END OF SCHEDULE

SCHEDULE P-8.2

- A. Sterilizing: Schedules P-5.1, P-5.3.
1. Provide plumbing connections and power for pumping chlorine into the system.
 2. Verify quality of water supply used for sanitizing prior to proceeding.
 3. Unless otherwise required by local authorities having jurisdiction, sterilize new water lines in accordance with the following procedure:
 - a. Through a 3/4 inch hose connection in the water main entering the building, pump sufficient sodium hypochlorite to produce a free available chlorine residual of not less than 200 ppm throughout the system.
 - b. Proceed upstream from point of chlorine application, opening all faucets and taps until chlorine is detected. Close faucets and taps when chlorine is evident.
 - c. When chlorinated water has been brought to every faucet and taps, retain water in the system for at least 3 hours.
 - d. At end of the retention period, open all faucets and taps, and thoroughly flush until chlorine residual is less than 1.0 ppm.
 - e. Take water samples tested conform to applicable regulations, submit certification of successful completion.
 4. If any samples tested indicate the presence of coliform organisms, repeat the entire sterilization procedure.

END OF SCHEDULE

SCHEDULE P-8.4

- A. Testing: Schedules P-5.2, P-6.4.
- B. Cleaning: Flush internals of system with water of sufficient velocity to dislodge sediment and dirt.
- C. Hydrostatic Test:
 - 1. Test Pressure: 10 feet of water.
 - 2. Hold test pressure for 30 minutes without visible leak or significant pressure or level variations. Temperature fluctuations must be considered. A/E will inspect joints.
- D. Each vertical stack, with its branch waste and vent pipes, may be tested separately by plugging openings at base of Stack.
- E. Final Air Test (Unless Waived): After all plumbing fixtures have been set, and traps filled with water, test connections to prove gastight and watertight, as follows:
 - 1. Fill traps with water. Introduce thick pungent smoke, produced by smoke machine(s), into entire system. When smoke appears at stack openings on roof, close vents and maintain pressure equivalent to 1 inch water column throughout inspection.
 - 2. If authority-having jurisdiction finds that a smoke test is impractical, a peppermint test is acceptable.
- F. Tabulate and submit test results.

END OF SCHEDULE

SCHEDULE P-8.7

- A. Testing: Schedules P-3.1.
- B. Cleaning:
 - 1. Purge internals of system with clean dry compressed air of sufficient quantity that will dislodge sediment or dirt.
 - 2. Remove flow indicators and flow measuring devices before flushing. Replace after cleaning is completed.
- C. Standing Pressure Test:
 - 1. Test gas piping with air to a pressure of 3 psig of 1.5 times the operating pressure, whichever is greater.
 - 2. Maintain this pressure, without pumping, for one hour. There shall be no loss of pressure.
 - 3. Tabulate and submit test results.
- D. Repair of Leaks:
 - 1. Mechanical or Threaded Joints:
 - a. Tighten joints using discretion.
 - b. Take joints apart and replace defective material.
 - 2. Welded Joints:
 - a. Remove defective weld metal by chipping, grinding or flame gouging. Reweld following new work procedure in accordance with ANSI B31.3.
 - b. Do not repair by adding weld metal to the defective area.
 - 3. Retest after repairs.

END OF SCHEDULE

END OF SECTION

SECTION 15431
PLUMBING SPECIALTIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Wall hydrants (exterior).
- B. Back flow preventers (reduced pressure type).
- C. Double check valve assembly.
- D. Trap primers.
- E. Washing machine connections.
- F. Natural gas pressure regulators.
- G. Relief valves.

1.02 SUBMITTALS

- A. Product Data: Describe each product specified.
- B. List of exceptions to specifications on a line-by-line basis. Include proposed materials, methods, and cost difference where substitutions are allowed.

1.03 REGULATORY REQUIREMENTS

- A. Follow Section 15411.

PART 2 - PRODUCTS

2.01 DESIGN STANDARD MANUFACTURER:

- A. Model numbers listed are design standards. Substitutions where permitted are subject to Division 1.

2.02 WALL HYDRANTS (EXTERIOR)

- A. Manufacturers:
 - 1. Jay R. Smith Model 5509 QT.
 - 2. Zurn.

3. Wade.
 4. Substitutions: None permitted.
- B. Non-freeze type, 3/4 inch hose connection, universal inlet connection, bronze casing, satin nickel bronze face with lockable box. Include adjustable wall clamp and integral breaker.

2.03 BACKFLOW PREVENTERS (REDUCED PRESSURE TYPE)

A. Manufacturers:

1. Watts Regulator Company, Series, 909.
 2. Conbraco Industries, Inc.
 3. Wilkins.
 4. Cla-Val Co.
 5. Substitutions: None permitted.
- B. 3/4 Inch to 2 Inches: Bronze body, tight-seating rubber check valve and relief valve assemblies, bronze body ball valve test cocks and strainer, bronze ball shut-off valves.
- C. 3 Inches to 10 Inches: FDA approved epoxy coated, cast iron check valve bodies with bronze seats, cast iron relief valve with stainless steel trim, bronze body ball valve test cocks and epoxy coated cast iron strainer, resilient wedge gate valve shut-off valves.
- D. Conform to ASSE Standard 1013 for reduced pressure principal backflow preventers.
- E. Conform to NSF – 61 drinking water system components.

2.04 TRAP PRIMERS

A. Manufacturers:

1. Single Trap Primers - Cast bronze with 1/2 inch NPT female connections. Jay R. Smith Figure 2699.
 2. Multiple Trap Primers - With distribution units. Precision Plumbing Product Company Model P-1 or P-2.
 3. Substitutions: None permitted.
- B. Standards: ASSE Standard 1018.

2.05 WASHING MACHINE CONNECTIONS

A. Manufacturers:

1. Symmons Industries, Model W-602.
2. Guy Gray, Model WB-200.
3. Oatey.

4. Substitutions: None permitted.
 - B. Wall box assembly containing water supply and drain connections and single control valve with lever handle.
- 2.06 NATURAL (GAS PRESSURE REGULATORS)
- A. Manufacturers:
 1. American Meter Company, Series 3000.
 2. Schlumberger Industries.
 3. Fisher Controls Company.
 4. Substitutions: None permitted.
 - B. Cast iron pipe section with screwed ends, aluminum diaphragm chamber, Buna-N diaphragm, seats and discs.
- 2.07 RELIEF VALVES
- A. Manufacturers:
 1. Bell and Gossett, Models 790 and 1170.
 2. Watts, Series 174A.
 3. Kunkle, Model 919.
 4. Substitutions: None permitted.
 - B. Bronze body, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labeled.

PART 3 - EXECUTION

3.01 WALL HYDRANTS

- A. Locations shown are approximate. Exact mounting heights and locations will be as directed.
- B. Install wall hydrants flush with wall.

3.02 BACKFLOW PREVENTERS

- A. Install DWV copper drain line, full size, from backflow preventer relief to nearest drain.
- B. Install reduced pressure type backflow preventer at hose end and nozzle outlets.

END OF SECTION

SECTION 15435

DRAINS AND CLEANOUTS

PART 1 - GENERAL

1.01 SUBMITTALS

- A. Product Data: Provide a description and dimensioned drawing indicating materials of construction and finishes of each product specified.
- B. List of exceptions to specifications on a line-by-line basis. Include proposed materials, methods, and cost difference where substitutions are allowed.

1.02 REGULATORY REQUIREMENTS

- A. Follow Section 15411.

1.03 QUALITY ASSURANCE

- A. Floor Drains: ANSI A112.21.1M-1980.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Design Standard Manufacturer: JAY R. SMITH. Substitutions subject to Division 1 are:
 - 1. Wade.
 - 2. Zurn.
 - 3. Josam.
 - 4. Watts Drainage.
 - 5. Other Substitutions: None permitted.
- B. All drains shall be by one manufacturer.
- C. Provide drain outlets compatible with pipe material.

2.02 DRAINS

- A. Drain FD-1: Cast iron body and flashing collar with sediment bucket with nickel bronze top; Series 2010-B.

2.03 CLEANOUTS

- A. Unfinished Floor Areas:

1. In Storm and Sanitary Waste Piping: Cast iron body with flange and inside caulk outlet, adjustable housing with round cast; iron scoriated tractor top; Series 4240.
- B. Finished Floor Areas: Follow Section 09000 for floor finishes.
 1. In Storm and Sanitary Waste Piping: Cast iron body with flange and inside caulk outlet, adjustable housing with round secured satin nickel bronze scoriated top; Series 4240.
 2. Provide cleanout markers in carpeted areas.
- C. Walls:
 1. In Storm and Sanitary Waste Piping:
 - a. Hub Openings: Cast iron ferrule with tapered threaded bronze plug. Plug tapped for center screw. Stainless steel access cover with hardware where required. Series 4422.
 - b. No-Hub Cleanouts: Taper threaded bronze plug with center screw tapping. Stainless steel access cover with hardware where required. Series 4472.
 2. Access cover shall not exceed 6 inches in diameter.
 3. At Exterior Areas: Heavy duty Duracoat cast iron, body with double flanged housing and scoriated cast iron cover with lifting device secured with countersunk screws. Series 4250.
- D. To Grade:
 1. In Storm and Sanitary Waste Piping; Heavy duty cast iron body with double flanged housing and scoriated cast iron cover with lifting device secured with countersink screws; Series 4250.

2.04 ACCESSORIES

- A. Flashing: 6 pound sheet lead.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Follow Section 01400 for Quality Control of Installation.
- B. Flashing: At floor drains and floor cleanouts above ground level, install flashing to 12 inches beyond outside diameter of drain or cleanout.

3.02 DRAINS

- A. Provide separate traps for drains not furnished with integral traps, except, do not provide traps for roof drains.

3.03 CLEANOUTS AND ACCESS COVERS

- A. Install full size cleanouts up to 4 inches in diameter at changes in direction on horizontal drainage lines, and at intervals not greater than 50 feet on straight runs.
- B. Install access covers at cleanouts in partitions and walls.

END OF SECTION

SECTION 15441

PLUMBING FIXTURES AND TRIM

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Water closets.
- B. Lavatories.
- C. Showers.
- D. Sinks.
- E. Laundry trays.
- F. Service sinks.

1.02 RELATED SECTIONS

- A. Section 15411 - Plumbing Systems.

1.03 SUBMITTALS

- A. Product Data: Describe fixtures, sizes, rough-in dimensions, utility sizes, trim and finishes. Make all submittals at one time. Partial submissions will not be reviewed.
- B. List of exceptions to specifications on a line-by-line basis. Include proposed materials, methods, and cost difference where substitutions are allowed.

1.04 INFORMATIONAL SUBMITTALS

- A. Operation and Maintenance Data: Include data for fixture trim with exploded views and replacement parts lists.
- B. Manufacturer's Installation Instructions.

1.05 REGULATORY REQUIREMENTS

- A. Follow Section 15411.

PART 2 - PRODUCTS

2.01 DESIGN STANDARD MANUFACTURERS:

- A. Manufacturers or model numbers listed are the design standards. Substitutions subject to Division 1 are:
- B. Fixtures (Vitreous Ware): American Standard, Kohler, Eljer.
- C. Fixtures (Stainless Steel): Just, Elkay.
- D. Seats: Olsonite, Bemis, Beneke, Church.
- E. MOP Receptors: Fiat, Stern/Williams, Florestone.
- F. Trim: Speakman, Chicago, American Standard, T&S Brass and Bronze Works.
- G. Supply and Traps: McGuire, American Standard, Chicago, Eljer.
- H. Shower Heads and Mixing Valves: Powers, Symmons, Speakman.
- I. Conditions: Furnish fixtures and trim by same manufacturer for each product specified throughout.

2.02 GENERAL REQUIREMENTS

- A. Fixture Color: White, except as shown or specified otherwise.
- B. Vitreous Ware: Best quality, non-absorbent ware. Warped or imperfect fixtures will not be accepted.
- C. Glazing on Metal: Thoroughly fused and united to body without discoloration, chips, flaws or craze. Glaze all surfaces except those coming in contact with walls, floor or other fixtures.
- D. Fixture Trim: Cast brass faucet bodies. Polished chrome finish on fixture trim and exposed piping.
- E. Fixture Traps: Wall type with integral cleanout plugs. Comply with specified plumbing code.
- F. Accessories: Furnish fixtures with specialties, trim and required support brackets. Factory paint support brackets.

2.03 WATER CLOSET (WC-1)

- A. Water Closet: Vitreous china, back outlet, wall hung. American Standard Afwall Aquameter 2257.103.
- B. Seat: White, open front, less cover, Olsonite 95.
- C. Flush Valve: Sloan Royal 111.
- D. Carrier: J.R. Smith Series 200 or 400.

2.04 LAVATORY (LAV-1)

- A. Lavatory: Vitreous china, under counter. American Standard Ovalyn 0470.013.
- B. Faucet: Chrome plated, single handle, 4 inch centerset. Delta 501.
- C. Supply: 1/2 x 3/8 inch angle, chrome plated, flexible, [loose key]. McGuire 2165 [LK].
- D. Drain: Open grid strainer 1-1/4 inch tailpiece, chrome plated P-trap. McGuire 155A.
- E. Trap: 1-1/4 x 1-1/2 inch, chrome plated. McGuire 8902.

2.05 SHOWER (SH-1)

- A. Shower Valve: Concealed anti-scald balanced pressure, integral volume control, adjustable temperature limit stop, separate check stops. Speakman 1432 AF-SCS-3.
- B. Shower Head: Chrome plated, 2.5 GPM brass ball swivel joint, spray adjusting T-handle. Speakman S-2253 AF.
- C. Shower Arm: Chrome plated brass 7 inch shower arm and wall flange. Speakman 2500.

2.06 SHOWER (SH-2) ADA

- A. Shower Valve: Concealed anti-scald balanced pressure, integral volume control, adjustable temperature limit stop, separate check stops. Speakman SM-3060.
- B. Shower receptor: Fiat ADAW-3636.
- C. Hand Held Shower: 2.5 GPM, fully adjustable. Speakman VS-100-AF.
- D. Shower Head: Chrome plated, 2.5 GPM, brass ball swivel joint, spray adjusting T-handle. Speakman S-2253AF.
- E. Shower Arm: Chrome plated 7 inch shower arm and wall flange. Speakman 2500.
- F. Transfer Valve: Chrome plated, brass lever handle. Speakman S-1182.
- G. Supply Elbow: Chrome plated. Speakman VS-115.
- H. Hose: 69 inch chrome plated brass hose with liner. Speakman VS-147.
- I. Swivel Connector: Chrome plated. Speakman VS-120.
- J. Slide Bar: 24 inch chrome plated brass. Speakman VS-123.

2.07 SINK (S-1)

- A. Sink: Single compartment, countertop type 304 18 gauge stainless steel, self-rimming, sound deadened. Just SL-2225-A-GR.

- B. Faucet: 8 inch centerset, 1/8 inch swing spout, lever handles, aerator. Chicago 201-L8-E3.
- C. Supply: 1/2 x 1/2 inch angle, flexible, [loose key], chrome plated. McGuire 2167 [LK].
- D. Drain: Stainless steel crumb cup strainer with removable stainless steel basket, 1-1/2 inch chrome plated brass tailpiece. Just J-35.
- E. Trap: 1-1/2 x 1-1/2 inch chrome plated P-trap. McGuire 8912.

2.08 SINK (S-2)

- A. Sink: Double, countertop, type 304 18 gauge stainless steel, self-rimming, sound deadened. Just DL-2133-A-GR.
- B. Faucet: 8 inch centerset, 1/8 inch swing spout, lever handles, aerator. Chicago 201-L8-E3.
- C. Supply: 1/2 x 1/2 inch angle, flexible, [loose key], chrome plated. McGuire 2167 [LK].
- D. Drain: Stainless steel crumb cup strainer with removable stainless steel basket, 1-1/2 inch chrome plated brass tailpiece. Just J-35.
- E. Trap: 1-1/2 x 1-1/2 inch chrome plated P-trap. McGuire 8912.
- F. Continuous Waste: 1-1/2 inch chrome plated brass. Just J-53S.

2.09 LAUNDRY SINK (LS-1)

- A. Sink: Enameled cast iron with pedestal and wall bracket. American Standard Lake 7602.000.
- B. Faucet: Wall mount with 6 inch swivel spout, brass lever handles, aerator, soap dish. Chicago 540.
- C. Drain: Chrome plated brass with rubber stopper, 2 inch chrome tailpiece. McGuire 1266A.
- D. Trap: 2 x 2 inch chrome plate P-trap. McGuire 8904.
- E. Frame: Pedestal and wall bracket. American Standard 7602.12.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.
- B. Install fixtures plumb and level.

- C. Provide piping connections to fixtures with valves and escutcheons as specified in Section 15050.
- D. Provide through bolts and 1/4 inch thick steel backing plates for securing wall hangers for wall-hung fixtures not furnished with chair carriers.
- E. Install each fixture with trap, easily removable for servicing and cleaning.
- F. Provide chrome plated supplies to fixtures with [loose key] [wheel handle] stops, reducers and escutcheons.
- G. Install chrome plated parts using methods and tools which will not damage finished surfaces.
- H. Rigidly secure supplies behind wall or within wall pipe space.
- I. Verify that plumbing fixtures and trim are tight, leak-free and function properly.

3.02 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.03 SPECIAL PROTECTION

- A. Do not permit use of fixtures by construction workers.
- B. Leave factory packaging in place until final cleaning.

END OF SECTION

SECTION 15454

WATER PRESSURE BOOSTER SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Water pressure booster system.

1.02 RELATED SECTIONS

- A. Section 15411 - Plumbing Systems.

1.03 SUBMITTALS

A. Shop Drawings:

1. Complete dimensioned layout showing piping, equipment, components and accessories.
2. Include control panel layout (front view) and wiring diagrams.

B. Product Data:

1. Indicate equipment schedule number, type, capacity and power requirements.
2. Manufacturer's pump curves.

- C. List of exceptions to specifications on a line-by-line basis. Include proposed materials, methods, and cost difference where substitutions are allowed.

1.04 INFORMATIONAL SUBMITTALS

- A. Submittals require no responsive action by A/E.

- B. Manufacturer's Installation Instructions.

- C. Operation and Maintenance Data.

- D. Special Warranty: Warrant booster pumps, including motors and accessories for 2 years from Date of Substantial Completion.

1.05 REGULATORY REQUIREMENTS

- A. Follow Section 15411.

PART 2 - PRODUCTS

2.01 PRESSURE BOOSTER SYSTEM

- A. DESIGN STANDARD MANUFACTURER: Bell & Gosset. Substitutions subject to Division 1 are:
 - 1. Tiger Flow.
 - 2. Paco.
 - 3. Substitutions: None permitted.
- B. Description: Water pressure booster system with expansion tank and controller with pressure switch.
- C. Pumps shall not overload motor above its horsepower nameplate rating under any operating condition with rating based on continuous operation.
- D. Provide horizontal inline centrifugal pump.
- E. Pump Components: Including but not, limited to:
 - 1. Brass impeller.
 - 2. Brass case wear rings.
 - 3. Heavy duty iron casing.
 - 4. Mechanical seals with bronze shaft sleeves.
 - 5. Stuffing boxes designed for field interchangeability between packing and mechanical seals.
 - 6. Grease lubricated ball bearings with double row thrust bearing.
 - 7. Integral bearing support arms and heavy steel baseplates.
- F. System Components: Including but not limited to:
 - 1. Schedule 40, galvanized steel suction and discharge manifolds.
 - 2. Pressure taps in suction and discharge piping for differential pressure monitoring.
 - 3. Suction and discharge pressure gauges at pump.
 - 4. Manual shut-off valves at pump and bypass line.
 - 5. Separate high flow and low flow combination pressure reducing and non-slam check valves at pump.
 - 6. Pressure switch for starting/stopping pump operation.
 - 7. Discharge pressure limit switch with automatic reset and alarm to protect piping system from high pressure.
 - 8. Pump thermal protection for periods of no flow operation.
 - 9. High efficiency motor for each pump.
- G. Domestic Diaphragm Type Expansion Tanks:

1. Manufacturers:
 - a. Amtrol.
 - b. Taco.
 - c. Bell & Gossett.
 - d. Substitutions: None permitted.
 2. Construction: Welded steel, tested and stamped in accordance with Section 8D of ANSI/ASME Code; rated for minimum working pressure of 125 psi and 240 degrees F, with flexible diaphragm sealed into tank, and steel legs or saddles.
 3. Accessories: Pressure gauge and air-charging fitting, tank drain, in-line air purger, precharge to 35 PSIG.
- H. Control Panel Components: Including but not limited to:
1. NEMA 1 construction, steel, with industrial grade enamel paint.
 2. Main disconnect. Interlocked with door of control panel.
 3. Fused disconnect switches.
 4. Magnetic across-the-line starter for each pump.
- I. Sequence of Operation: Pump shall be sequenced with a backup pressure sequencing system.
- J. Capacity as shown.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Follow Division 1 for Quality Control of Installation.

3.02 DEMONSTRATION AND INSTRUCTIONS

- A. Provide 2 hours for start-up, demonstration and instruction of system operation

END OF SECTION

SECTION 15455
WATER HEATERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Gas fired tankless water heater.

1.02 RELATED SECTIONS

- A. Section 15411 - Plumbing Systems.

1.03 SUBMITTALS

- A. Make all submittals at one time. Partial submittals will not be reviewed.
- B. Shop Drawings: Complete dimensioned layout showing piping, equipment, components and accessories.
- C. Product Data: Indicate equipment schedule number, type, capacity and power requirements.
- D. List of exceptions to specifications on a line-by-line basis. Include proposed materials, methods, and cost difference where substitutions are allowed.

1.04 INFORMATIONAL SUBMITTALS

- A. Submittals require no responsive action by A/E.
- B. Manufacturer's Installation Instructions.
- C. National Board Registration Certificate for Hot Water Heaters.
- D. Operation and Maintenance Data. Include data for all specified products.

1.05 REGULATORY REQUIREMENTS

- A. Follow Section 15411.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Heaters shall meet requirements of Local and State codes.

- B. Factory assemble, wire and test heaters and associated components so only field piping and wiring connections are required.

2.02 Tankless WATER HEATER

- A. Design standard Manufacturer: Takagi. Substitutions subject to Division 1 are:
 - 1. Other Substitutions: Follow Division 1.
- B. General Description: The flash water heater shall be a copper coil integral fin and tube construction with quick release brass or bronze water ways.
 - 1. Heater shall be factory assembled and tested.
 - 2. Heater shall be vented with 4 inch stainless steel Category III vent pipe, not to exceed 50 feet.
 - 3. Provide intake air kit directly vented to outside. Pipe shall be 3 inch PVC, not to exceed 50 feet.
 - 4. Heater shall be controlled by solid state circuit board monitoring incoming and outgoing temperatures with factory installed thermistors sensing and controlling flow rate to set point temperature with control both air and gas mixture inputs to maintain thermal combustion efficiency.
 - 5. Unit shall consist of ground fault interrupter, inline fusing, spark ignition and sensor system, aluminized stainless steel burners, air-fuel ration rod, Hi limit switch, modulating and proportional gas valves, freeze protection sensor and heating block and overhead cut-off fuses.
 - 6. Heater shall exceed energy efficiency requirements of ASHRAE 90lb.
- C. Capacity as shown.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install the work in accordance with regulatory requirements, and Division 1 for Quality Control of Installation.
- B. Coordinate with plumbing piping and electrical work.
- C. Install heater so that heater section can be removed for inspection and servicing without breaking domestic water connections.

3.02 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate and instruct on operation and maintenance for 2 hours.

END OF SECTION

SECTION 15511
HVAC PIPING SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Piping, valves, specialties and accessories.

1.02 RELATED SECTIONS

- A. Section 15050 - Pipe and Valve Manufacturers, Installation Requirements.
- B. Section 15140 - Supports, Anchors and Guides.

PART 2 - PRODUCTS

2.01 PIPES, VALVES AND FITTINGS FOR INDOOR AND OUTDOOR ABOVEGROUND SYSTEMS

- A. Manufacturers: See Pipe, Valves and Accessories in Section 15050.
- B. Refrigerant Piping:
 - 1. Pipe: Seamless copper tubing, Type ACR, hard drawn; ASTM B280.
 - 2. Joints: Soldered.
 - 3. Fittings: Wrought copper solder joint pressure fittings; ANSI B16.22.
 - 4. Joint Materials: Grade Sb5 solder; ASTM B32.
 - 5. Shutoff Valves: Diaphragm type, forged brass body and bonnet, positive backseating when fully open, raised seat with nylon seat disc, stainless steel spring, flared or soldered connections, UL listed. Henry Valve Company Golden Bantam.
 - 6. Check Valves: Forged brass body, Teflon seat, guided piston, stainless steel spring, accessible internal parts, operable in all positions. Rated for 300 degrees F and 500 psi. Henry Valve Company Type 1160.
- C. Condensate Drain, in supply or Return Air Plenums:
 - 1. Pipe: Hard drawn seamless copper tubing, Type L; ASTM B88.
 - 2. Joints: Soldered, Solder Grade Sb5; ASTM B32.
 - 3. Fittings: Wrought copper, soldered ends; ANSI B16.29.
- D. Condensate Drain, Outside Of Air Plenums:

1. Pipe: PVC, Schedule 40; ASTM D1785 or ASTM D2241, SDR21 or 26.
2. Joints: Solvent weld; ASTM D2855.
3. Fittings: PVC, Schedule 40; ASTM D2467.

2.02 REFRIGERANT SYSTEM VALVES AND SPECIALTIES

A. Manufacturers:

1. Henry Valve Co.
2. Alco.
3. Flo-con.
4. Sporlan.
5. Substitutions: None Permitted.

B. Liquid Indicators:

1. Double port type with copper or brass body, and flared or soldered ends.
2. Provide removable seal caps on each port for inspection of refrigerant conditions.
3. Provide full size liquid indicators in main liquid line leaving condenser.

C. Strainers:

1. Angle type with brass shell and replaceable cartridge.
2. Suitable for refrigerant and piping material utilized in the system.
3. Provide full size strainer ahead of each automatic valve. Where multiple expansion valves with integral strainers are used install single main liquid line strainer.
4. Provide shut-off valve on each side of strainer to facilitate maintenance.

D. Refrigerant Driers:

1. In-line or angle type with copper or brass shell.
2. Use replaceable desiccant drying material.
3. Provide full flow permanent refrigerant drier in low temperature systems and systems utilizing hermetic compressors.
4. Provide three-valve bypass assembly.

E. Filter-Driers:

1. Angle type, with brass shell and using combined straining and drying material.
2. Use replaceable desiccant material.
3. Acceptable in lieu of separate strainers and driers.
4. Provide three-valve bypass assembly.

F. Solenoid Valves:

1. Copper or brass body with flared or threaded ends.
2. Use replaceable coil assembly.
3. Provide a manually operated stem to permit operation in case of coil failure.
4. Provide solenoid valves in liquid line of systems operating with single pump-out or pump-down compressor control, in liquid line of single or multiple evaporator systems, and in oil bleeder lines from flooded evaporators, to stop flow of oil and refrigerant into suction line when system shuts down.

G. Expansion Valves:

1. Angle type or straight through design suitable for refrigerant utilized.
2. Brass body, internal or external equalizer, and adjustable superheat setting, complete with capillary tube and remote sensing bulb.
3. Size expansion valves to avoid being undersized at full load and excessively oversized at partial load.
4. Evaluate refrigerant pressure drop through system to determine available pressure drop across each valve.
5. Select valves for maximum load at design operating pressure [and minimum 43 degrees F of superheat].

H. Charging Valves:

1. General purpose type with brass body, flared or solder ends and removable valve core.
2. Provide valve inlet with quick coupling connection for ease of charging.
3. Provide refrigerant charging connections in liquid line between receiver shut-off valve and expansion valve.

I. Flexible Connectors:

1. Close pitch corrugated bronze hose with single layer of exterior braiding, at least 9 inches long with bronze fittings.
2. Utilize only at or near compressors where it is not physically possible to absorb vibration within piping configuration.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Follow provisions of Section 15050 regarding pipe installation procedures and other provisions.
- B. Follow Division 1 for Quality Control of Installation.

3.02 INSTALLATION, REFRIGERANT SYSTEM VALVES AND SPECIALTIES

- A. Refrigerant Driers: Mount drier vertically in liquid line adjacent to receiver with bypass assembly to permit isolation of drier for servings.
- B. Filter Driers: Install with bypass assembly to permit isolation for serving.
- C. Expansion Valves: Locate valve sensing bulb immediately after evaporator outlet on suction side.

3.03 FIELD TESTING

- A. Test installed refrigerant piping systems in accordance with ANSI/ASME B3.15.

END OF SECTION

SECTION 15671

AIR COOLED CONDENSING UNITS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Refrigerant condensing unit package, including piping, controls and accessories.

1.02 RELATED DOCUMENTS

- A. Section 15050 - Electrical Equipment and Wiring.
- B. Section 15200 - Roof Curbs and Supports.

1.03 SUBMITTALS

- A. Shop Drawings: Show schematic layout of condenser, refrigeration compressors, cooling coils, refrigerant piping and accessories required for complete system. Include complete pipe sizing data and wiring diagrams.
- B. List of exceptions to specifications on a line-by-line basis. Include proposed materials, methods, and cost difference where substitutions are allowed.

1.04 INFORMATIONAL SUBMITTALS

- A. Submittals require no responsive action by A/E.
- B. Manufacturer's Installation Instructions.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of UL.
- B. Test and rate cooling system to ARI Standard 210.

1.06 SPECIAL PROJECT WARRANTY

- A. Warranty on Motor/Compressor: Provide written warranty, signed by manufacturer, agreeing to replace/repair, within warranty period, motors/compressors with inadequate or defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required; provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. Replacement is limited to component replacement only, and does not include labor for removal and reinstallation.
- B. Warranty Period: 5 years from date of substantial completion.

1.07 MAINTENANCE SERVICE

- A. Furnish maintenance service for one year from Date of Substantial Completion. Maintenance service shall supplement warranty provisions of the General Conditions.
- B. Repeat start-up and testing operation at beginning of first cooling season.
- C. Provide cooling season start-up and winter season shutdown.
- D. Inspect and test for refrigerant leaks every 3 months.

1.08 MAINTENANCE MATERIALS

- A. Follow Division 1.
- B. Provide one complete change of lubricating oil.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. York.
- B. McQuay
- C. Carrier.
- D. Trane.
- E. Substitutions: None permitted.

2.02 AIR-COOLED CONDENSING UNITS

- A. General: Factory-assembled and tested air-cooled condensing units, consisting of casing, compressors, condensers, coils, condenser fans and motors, and unit controls. Capacities and electrical characteristics are scheduled.
- B. Unit Casings: Designed for outdoor installation and complete with weather protection for components and controls, and complete with removable panels for required access to compressors, controls, condenser fans, motors, and drives. Additional features include:
 - 1. Steel, galvanized or zinc-coated, for exposed casing surfaces, treated and finished with manufacturer's standard paint coating, exceeding 500 hour salt spray test in accordance with ASTM B117.
 - 2. Lifting lugs to facilitate rigging of units.
 - 3. Factory-installed metal grilles, for protection of condenser coil during shipping, installation, and operation.

4. Hinged and gasketed control panel door.
- C. Compressor: Reciprocating hermetic-type compressor, 1,750 RPM, designed for air-cooled condensing, complete with crankcase sight glass, crankcase heater, and backseating service access valves on suction and discharge ports. Capacity shall be controlled through cylinder unloading and hot gas bypass. Additional features include:
 1. Crankcase heater in well within crankcase.
 2. Capacity steps as scheduled, or greater number.
 3. Compressor of same manufacturer as condensing unit.
- D. Controls: Operating and safety controls shall include high and low pressure cutouts, oil pressure cutout, compressor winding thermostat cutout, 3-leg compressor overload protection, and condenser fan motors with thermal and overload cutouts. Control transformer if required shall be 115-volts. Provide magnetic contractors for compressor and condenser fan motors. Additional features include:
 1. Reset relay circuit for manual resetting of cutouts from remote thermostat location.
 2. Automatic nonrecycling pumpdown, and timing device to prevent excessive compressor cycling.
- E. Condensing Section: Condenser coil shall be seamless cooper tubing mechanically bonded to heavy-duty, configurated aluminum fins, with separate and independent refrigeration circuit for each compressor. Units shall include liquid accumulator and subcooling circuit, and backseating liquid line service access valve. Condenser coils shall be factory-tested at 450 psig, vacuum dehydrate, and filled with a holding charge of nitrogen.
- F. Condenser fans and drives: propeller-type condenser fans for vertical air discharge; either direct drive or belt drive. Additional features include:
 1. Permanent lubricated ball bearing condenser fan motors.
 2. Separate motor for each condenser fan.
 3. Constant speed condenser fan motors.
 4. Each fan assembly shall be dynamically and statically balanced.
- G. Piping Control Accessories:
 1. Provide 50 feet of precharged refrigeration piping between DX coil and condensing unit.
 2. Provide all hot gas bypass valves and piping, liquid shut off valves, angle valves, filter driers, solenoid valves, expansion valves, charging valves, sight glasses, control valve, and any additional accessories required for the control, maintenance, and operation of the condensing units and cooling coils.
- H. Controls
 1. Factory wired motor control panel containing fan motor contactors, compressor interlock and control transformer.

2. Controls: Permit operation down to 40 degrees F ambient temperature at minimum load.
3. Safety Devices:
 - a. High and low pressure switches.
 - b. Compressor overload devices.
 - c. Positive acting timer to prevent short cycling of compressor if power is interrupted and to prevent compressor from restarting for approximately 5 minutes after shutoff.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Install condensing units in accordance with manufacturers installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.
- B. Air-Cooled Condensing Units: Connect refrigerant piping to unit; maintain required access to unit.
- C. Install furnished field-mounted accessories.

3.02 TESTING

- A. Charge systems with refrigerant and oil, and test for leaks. Repair leaks and replace lost refrigerant and oil.

3.03 DEMONSTRATION

- A. Provide services of manufacturer's authorized service representative to provide start-up service and to instruct Owner's personnel in operation and maintenance of condensing units.
- B. Start-up condensing units, in accordance with manufacturer's start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

END OF SECTION

SECTION 15782
GAS FIRED FURNACES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Gas Furnace.

1.02 RELATED SECTIONS

- A. Section 15050 - Electrical Equipment and Wiring.
- B. Section 16010 - Power Wiring to Equipment.

1.03 SUBMITTALS

- A. Product Data: Show manufacturer's name, model number, physical dimensions, operating weights and wiring diagrams. Clearly identify field wiring requirements.
- B. List of exceptions to specifications on a line-by-line basis. Include proposed materials, methods, and cost difference where substitutions are allowed.

1.04 INFORMATIONAL SUBMITTALS

- A. Submittals require no responsive action by A/E.
- B. Start-Up Report.
- C. Operation and Maintenance Data.

PART 2 - PRODUCTS

2.01 GAS FIRED FURNACES

- A. Design Standard Manufacturer: York.
 - 1. Carrier.
 - 2. Trane.
- B. General: Factory assembled and tested gas fired furnace consisting of casing, heat exchangers, burners, blower fan, combustion fan, and unit controls. Capacities and electrical characteristics are scheduled.

- C. Unit Casing: Galvanized steel cabinet with baked-on enamel finish. Includes hinged blower door, filter rack, built-in-bottom drain pan, and alternate bottom or side return air connection. Heat exchanger section of cabinet lined with foil faced fiberglass insulation.
- D. Heat Exchangers: primary heat exchanger shall be heavy gauge aluminized steel, without welds. Secondary heat exchanger shall be stainless steel.
- E. Burners: Multiport, inshot burners for natural gas. Includes enclosed burner box, and hot surface ignition system.
- F. Blower Fan: Supply air blower fan shall be multi-speed, centrifugal type with direct drive motor.
- G. Combustion Fan: Direct vent sealed combustion shall include constant speed, centrifugal type fan with direct drive motor, for positive discharge of gas fumes to outdoors.
- H. Controls: Integrated system controls shall provide control of furnace limit sensors, fans, gas valve, and flame control. Controls shall include internal thermal protection and thermal cutout, vent proving pressure switch, blower door safety switch, flame sensor and switch, manual reset burner box limit, dual solenoid combination gas valve and regulator, and self-diagnostics.

2.02 PANEL FILTERS

A. Disposable Panel (FARR Model 30/30):

- 1. Type 1B: MERV 8 (30 percent efficient (ASHRAE 52)); UL Class 2; 2 inch deep; 0.08 inch w.g. at 250 FPM and 0.28 inch w.g. at 500 FPM, initial pressure drop. Changeout Pressure Drop: 0.50 inch w.g.
 - a. Pleated, cotton-synthetic with aluminum or bronze coated steel wire screen bonded to media.
 - b. Construct frame of rigid, high wet strength fiberboard with diagonal support members bonded to air sides of each pleat. Bond inside periphery of enclosure frame to filter pack.
- 2. Side Loading Filter Housing for Type 1B Filters.
 - a. Factory fabricated all welded construction, 16 gauge galvanized steel, reinforced, with extruded aluminum filter tracks.
 - b. Equip with two access doors for removal and replacement of filters.
 - c. Maximum Bypass Air Flow Rate: 1.0 percent of design flow at 3 inch w.g.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Follow Division 1 for Quality Control of Installation. Comply with requirements of Authorities having jurisdiction.

- B. Furnish and Install multiple or single gas vent piping as required by manufacturer, local code or gas company and vent to outside. Size piping to meet local code or gas company.

3.02 MANUFACTURER'S FIELD SERVICES

- A. Start and test furnace in presence of a manufacturer representative. Furnish a start-up report, including control settings, and a performance chart of the step control system.
- B. Provide assistance to manufacturer's representative during start up and testing of furnaces and associated equipment.

END OF SECTION

SECTION 15790

AIR COILS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Coils, piping and accessories.

1.02 SUBMITTALS

- A. Product Data.
- B. List of exceptions to specifications on a line-by-line basis. Include proposed materials, methods, and cost difference where substitutions are allowed.

1.03 INFORMATIONAL SUBMITTALS

- A. Manufacturer's Installation Instructions.
- B. Certificates: Submit certification of coil capacities, pressure drops and selection procedures in accordance with ARI Standard 410.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with:
 - 1. ANSI/ARI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect coil fins from crushing and bending by leaving in shipping cases until installation and by storing indoors.
- B. Protect coils from entry of dirt and debris with pipe caps or plugs.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. When coils are an integral part of equipment specified in other Sections; use those manufacturers or approved substitutions.

2.02 FABRICATION - GENERAL REQUIREMENTS

- A. Extended surface type, coils with copper tubes and plate fins of copper or aluminum. Minimum Tube Thickness for Coils: 0.035 inch.

- B. Space fins 10 per inch maximum.
- C. Maximum Fin Length: 10 feet per section.
- D. Maximum Fin Height: 42 inches.
- E. Headers: Cast iron, copper or steel. Use seamless copper or brass tubes with silver brazed joints on refrigerant coils. Use cast iron or steel on steam coils.
- F. Unless otherwise specified, construct channel frame casing, frame structure, eliminators, drip and drain pans of galvanized steel.
- G. Mount coils in a channel frame casing designed for bolting to other sections of equipment. Mount duct coils, including headers and return bends, entirely within the duct casing.
- H. Provide bolted frame structure to support and allow for individual coil removal.
- I. For unit mounted coils, provide a 6 inch minimum space on the coil discharge for temperature sensing controls.
- J. Provide cooling coils with 24 gauge moisture eliminators when air velocity exceeds 500 ft./min. Provide 20 gauge stainless steel drip pan extending 4 inches from the eliminator face.
- K. Extend cooling coil drain pans under coils, drip pans, headers and return bends.
- L. Capacity: As scheduled.

2.03 REFRIGERANT COILS

- A. Minimum Design: 300 psi. Clean, dehydrate and seal with dry nitrogen charge.
- B. Liquid Distributors: Brass or copper venturi type distributor with seamless copper distributor tubes.
- C. Configuration: Down feed with bottom suction to prevent trapping of oil.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install air coils in ducts and casing in accordance with SMACNA Standards. Follow Section 15890.
- B. Support duct mounted coils independent of ductwork and piping system. Support coil sections on channel or double angle frames and secure to casings. Arrange supports for cooling coils to avoid piercing or short circuiting drip pans. Bolt casings to other section, ductwork, or unit casings. Provide airtight seal between casings. Provide airtight seal between coil and duct or unit casings.

- C. Protect coils to prevent damage to fins and flanges. Comb out bent fins.
- D. Install coils level.
- E. Make connections to coils with unions or flanges.
- F. Except where otherwise shown, pipe cooling coil drain pans individually to floor drain with water seal trap.
- G. On refrigerant coils, provide sight glass in liquid line within 12 inches of coil.

END OF SECTION

SECTION 15850

ENERGY RECOVERY UNITS

PART 1 - GENERAL

1.01 SECTION INCLUDE

- A. Energy Recovery Ventilators (ERV).

1.02 RELATED SECTIONS

- A. Section 15050 –Electrical Equipment and Wiring.
- B. Section 16010 – Power Wiring and Conduit to Equipment.

1.03 DESIGN AND PERFORMANCE CRITERIA

- A. Energy recovery units shall be packaged units and shall transfer both heat and humidity.

1.04 SUBMITTALS

- A. Product Data: Include manufacturer, model number, physical dimensions, weights, materials, enclosure data, finishes, performance data, controls and wiring diagrams. Clearly identify field wiring requirements.
- B. List of exceptions to specifications on a line-by-line basis. Include proposed materials, methods, and cost difference where substitutions are allowed.

1.05 INFORMATIONAL SUBMITTALS

- A. Follow Section 01300. Submittal requires no responsive action by A/E.
- B. Manufacturer's Installation Instructions.
- C. Operation and Maintenance Data.

1.06 QUALITY ASSURANCE

- A. The energy recovery cores used in these products shall be third party Certified by AHRI under its Standard 1060 for Energy Recovery Ventilators. AHRI published certifications shall confirm manufacture's published performance for airflow, static pressure, temperature and total effectiveness, purge air (OACF) and exhaust air leakage (EATR). Products that are not currently AHRI Certified will not be accepted.
- B. Manufacturer shall be able to provide evidence of independent testing of the core by Underwriters Laboratory (UL), verifying a maximum flame spread index (FSI) of 25 and a maximum smoke developed index (SDI) of 50 thereby meeting NFPA 90A and NFPA 90B

requirements for materials in a compartment handling air intended for circulation through a duct system. The method of test shall be UL Standard 723.

- C. Unit shall be Listed under UL 1812 Standard for Ducted Air to Air Heat Exchangers. Some exceptions to UL Listing may apply.

1.07 PERFORMANCE

A. Energy Transfer

- 1. The ERV shall be capable of transferring both sensible and latent energy between airstreams. Latent energy transfer shall be accomplished by direct water vapor transfer from one airstream to the other, without exposing transfer media in succeeding cycles directly to the exhaust air and then to the fresh air.

B. Passive Frost Control

- 1. The ERV core shall perform without condensing or frosting under normal operating conditions (defined as outside temperatures above -10°F and inside relative humidity below 40%). Occasional more extreme conditions shall not affect the usual function, performance or durability of the core. No condensate drains will be allowed.

C. Continuous Ventilation

- 1. Unit shall have the capacity to operate continuously without the need for bypass, recirculation, pre-heaters or defrost cycles under normal operating conditions.

D. Positive Airstream Separation

- 1. Water vapor transfer shall be through molecular transport by hydroscopic resin and shall not be accomplished by "porous plate" mechanisms. Exhaust and fresh airstreams shall travel at all times in separate passages, and airstreams shall not mix.

E. Laminar Flow

- 1. Airflow through the ERV core shall be laminar over the products entire operating airflow range, avoiding deposition of particulates on the interior of the energy exchange plate material.

1.08 WARRANTY

- A. The ERV core shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of ten years from the date of purchase. The balance-of-unit shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of two years from the date of purchase.

PART 2 - PRODUCTS

2.01 ENERGY RECOVERY VENTILATORS (ERV)

A. Manufacturers:

1. Renew Aire LLC.
2. Substitutions: Approved equal.

B. Construction:

1. The energy recovery component shall be of fixed-plate cross-flow construction, with no moving parts.
2. No condensate drain pans or drains shall be allowed and unit shall be capable of operating in both winter and summer conditions without generating condensate.
3. The unit case shall be constructed of G90 galvanized, 20-gauge steel, with lapped corners and zinc plated screw fasteners.
4. Access doors shall provide easy access to blowers, ERV cores, and filters. Doors shall have an airtight compression seal using closed cell foam gaskets. Pressure taps, with captive plugs, shall be provided allowing cross-core pressure measurement allowing for accurate airflow measurement.
5. Case walls and doors shall be insulated with 1 inch, 4 pound density, foil/scrim faced, high-density fiberglass board insulation, providing a cleanable surface and eliminating the possibility of exposing the fresh air to glass fibers, and with minimum R-value of 4.3 (hr·ft²·°F/BTU).
6. The ERV cores shall be protected by a MERV-8 rated, 2" nominal, pleated, disposable filter in both airstreams.
7. Unit shall have single-point power connection and a single-point 24 VAC contactor control connection.
8. Blower motors shall be Premium Efficiency, EISA compliant for energy efficiency. The blower motors shall be totally enclosed (TEFC) and be shall be supplied with factory installed motor starters 208 volt. Direct drive models shall be EISA-compliant for energy efficiency with open drip proof design and integral thermal protection.
9. Blowers shall be quiet running, forward curve type and be either direct drive or belt drive. Units use backward incline, belt drive blower packages. Belt drive motors shall be provided with adjustable pulleys and motor mounts allowing for blower speed adjustment, proper motor shaft orientation and proper belt tensioning.
10. The unit electrical box shall include a factory installed, non-fused disconnect switch and a 24 VAC, Class II transformer/relay package.
11. The ERV shall be provided "inverter-ready" allowing for applications of inverters supplied and installed by others.

C. ACCESSORIES

1. Provide unit and duct connection orientation per drawings.
2. Provide double wall construction with 24-gauge galvanized steel liner.
3. Provide factory installed disconnect fuses.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Follow Division 1 for Quality Control of Installation.
- B. Unit Location
 - 1. Locate and orient unit to provide the shortest and most straight duct connections. Provide service clearances as indicated on the plans. Locate units distant from sound critical occupancies.
- C. Vibration Isolation
 - 1. Provide rubber or spring type isolators appropriately sized for corner weights of the specific unit.
 - 2. Provide flexible duct connections at unit duct flanges.
- D. Duct Design
 - 1. All ductwork shall be designed, constructed, supported and sealed in accordance with SMACNA HVAC Duct Construction Standards and pressure classifications.
 - 2. At a minimum all duct runs to the outdoors shall be thermally insulated at levels appropriate to the local climate. A continuous vapor barrier shall also be provided on warm surface of the insulation.
- E. Test and Balancing
 - 1. Test and Balancing may not begin until 100% of the installation is complete and fully functional.
 - 2. Follow National Comfort Institute (NCI) air test and balance procedures specific to Heat Recovery Ventilator Balancing Procedure including standard reports to the owner's representative.

END OF SECTION

SECTION 15861

FANS AND VENTILATORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Fans.

1.02 DESIGN AND PERFORMANCE CRITERIA

- A. Do not decrease motor size, increase noise level, increase tip speed by more than 10 percent, or increase inlet air velocity by more than 20 percent from specified criteria. Fans shall be capable of accommodating static pressure variations of plus or minus 10 percent.
- B. Base performance on sea level conditions.
- C. Fans shall be capable of automated turndown through the design range from maximum to minimum conditions shown without stall, surge or increased vibration for smooth trouble free operation.

1.03 SUBMITTALS

- A. Product Data:

1. Show dimensions, weights, capacities, ratings, fan performance, motor electrical characteristics, gauges and finishes of materials. Include all scheduled data.
2. Submit fan curves showing specified maximum and minimum operating points clearly plotted against total fan pressure and brake horsepower. Curves shall be multiple RPM type covering a range of plus or minus 20 percent of design operating RPM. Identify surge points.
 - a. Curves shall reflect performance of the fan including effects of the type of volume/pressure control system being applied. Example: Constant volume system with static pressure control utilizing inlet vanes and two-speed motors to maintain maximum and minimum operating points.
3. Submit sound power levels for fan inlet, outlet and casing radiation at rated capacity. Base test data on fan sizes submitted rather than estimated data based on other fan sizes.

- B. List of exceptions to specifications on a line-by-line basis. Include proposed materials, methods, and cost difference where substitutions are allowed.

1.04 INFORMATIONAL SUBMITTALS

- A. Operation and Maintenance Data: Include instructions for lubrication [filter replacement,] motor and drive replacement, spare parts lists and wiring diagrams.

1.05 QUALITY ASSURANCE

- A. Fan Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.
- B. Sound Ratings: AMCA 301; tested to AMCA 300 and bear AMCA Certified Sound Rating Seal.
- C. Fabrication: Conform to AMCA 99.
- D. Statically and dynamically balance fans at the factory.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs.
- B. Store products in clean dry place and protect motors, shafts and bearings from weather and construction dust. Handle carefully to avoid damage to components, enclosures and finish.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Where electric motor operated dampers are specified, provide spring return type damper, 120 Vac motor operators with transformer when required and relay wired to delay fan operation. Include vinyl edging with dampers.
- B. Scheduled brake horsepower does not include drive losses.
- C. Motors, Belt Drives and Guards: In accordance with Section 15170.

2.02 INLINE FANS

- A. Manufacturers:
 - 1. Greenheck Model BSQ.
 - 2. Penn/Barry.
 - 3. Cook.
 - 4. Substitutions: None permitted.
- B. Wheel and Inlet: Backward inclined centrifugal wheel in steel or aluminum construction with blades riveted to the inlet and backplate; cast steel hub bolted to backplate and keyed to shaft with set screws.
- C. Housing:

1. Minimum 20 gauge galvanized steel, adequate braced, designed to minimize turbulence with spun inlet bell and shaped cut-off.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Unless otherwise specified, install flexible connections between fan inlet and discharge ductwork. Ensure metal band of connectors are parallel with minimum one inch flex between ductwork and fan while running. Flexible connectors shall not be in tension while fan is running.
- B. Provide safety screens where inlet or outlet is exposed. Provide safety screens within ductwork where duct access doors are located at fans.
- C. Do not operate fans for any purpose until ductwork is clean, bearings lubricated and fans have been test run under observation.
- D. Where electric motor operated dampers are specified, mount transformers and relays and wire to damper operator and motor leads in accordance with provisions of Division 16.

END OF SECTION

SECTION 15890
DUCTWORK SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Low, medium and high pressure ductwork.

1.02 DEFINITIONS

- A. Duct Sizes: Inside clear dimensions. For lined ducts, maintain sizes inside lining.
- B. Low Pressure: 1/2 inch, 1 inch and 2 inch wg, positive or negative.
- C. Class 1: Non abrasive applications.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Close open ends of ductwork with temporary covers.

PART 2 - PRODUCTS

2.01 BASIC MATERIALS

- A. Steel: Galvanized sheet, lock-forming quality, G90 finish, ASTM A527. Provide A60 galvanized when duct surface will be painted.
- B. Hanger Rod: Steel, galvanized, threaded both ends, threaded one end, or continuously threaded.
- C. Duct Joint Sealant: United McGill "United Duct Sealer." No substitutions.
- D. Duct Sleeves, Sealing Collars and Seals:
 - 1. Round Duct Sleeves: Minimum 20 gauge galvanized steel.
 - 2. Square and Rectangular Duct Collars: Minimum 1-1/2 inch x 26 gauge galvanized steel flange.
 - 3. Sealers, Fire Rated Construction: See Division 7.
 - 4. Sealers, Non-Fire Rated Construction: See Division 7.
- E. Flexible Sleeves: Ventfabrics Inc. "Metaledge Ventglas". No substitutions. 9 inch wide, 30 ounce glass fabric, double coated with neoprene, flame spread rating of 25, 24 gauge galvanized. Secure with one inch wide, galvanized steel bands and 1/8 inch stove bolts 5 inches OC.

- F. Fasteners: Rivets, bolts or sheet metal screws. Fastener shall match material being fastened.

2.02 GENERAL REQUIREMENTS

- A. Drawings indicate general arrangement of work. Carefully examine Drawings and be responsible for proper fit without substantial alteration of indicated layout. Verify dimensions and routing shown with relation to existing construction and work of other trades. Verify locations and interferences prior to fabrication and erection.
- B. Unless otherwise noted, fabricate and install ductwork systems in accordance with:
 - 1. SMACNA Fire Damper and Heat Stop Guide for Air Handling Systems.
 - 2. NFPA 90A - Air Conditioning and Ventilating Systems.
- C. Rigidly brace and reinforce ducts with angles or other structural members of same material. Make internal ends of slip joints lay with flow. Make ducts straight and smooth inside, with joints neatly finished.
- D. Elbows in Rectangular Ductwork:
 - 1. Square throat elbows larger than 8 inches; double thickness turning vanes. Omit turning vanes from transfer air duct elbows.
 - 2. Securely fasten vanes to runner for quiet, vibration free operation.
 - 3. Square throat elbows 8 inches and smaller; radius elbows.
 - 4. Radius elbows; minimum centerline radius of 1-1/2 times duct width.
 - 5. In parallel flow branches with 8 inch neck and smaller; make turns out of nested fittings with radius elbows.
- E. Elbows in Round Duct:
 - 1. Elbows Centerline Radius: 1.5 times duct diameter.
 - 2. 12 Inch Diameter or Smaller Duct Size:
 - a. 15 and 30 degree elbow: 2 gore segmented.
 - b. 45 degree elbow: Manufactured two-piece stamped sweep.
 - c. 90 degree elbow: 5 gores segmented or manufactured two piece stamped sweep.
 - 3. Larger than 12 Inch Diameter Duct:
 - a. 15 and 30 degree elbow: 2 gore segmented.
 - b. 45 degree elbow: 3 gore segmented.
 - c. 90 degree elbow: 5 gore segmented.
 - 4. Welded Miter Elbow: 30 degree maximum.
- F. For smoke control system ducts, where ductwork serving one smoke zone must pass through another smoke zone, material gauges shall conform to NFPA-90A.

- G. Provide inside collars where registers or grilles are mounted flush to ductwork. Use minimum size collars required to install a controller which will produce uniform air flow over face of register or grille.
- H. Where ducts are exposed to weather, locate longitudinal seams on bottom of duct and crossbreak top to shed water.
- I. Dissimilar Metals: Make connections using fully gasketed flanges.

2.03 FABRICATION REQUIREMENTS

- A. Pressure Class: 3 inch negative to 10 inch positive.
 - 1. Duct Construction Standards: SMACNA HVAC.
 - 2. Rectangular Longitudinal Seams: Pittsburgh Lock or continuously welded.
 - 3. Round Longitudinal Seams: Lock type; RL-1 (Spiral), RL-4 (Butt Weld or Lapped and Seam Welded) or RL-5 (Groove Seam).
 - 4. Rectangular Sealed Transverse Joints: Proprietary Joint System for ducts 8 inches and larger. Pocket lock type for ducts smaller than 8 inches.
 - 5. Rectangular Welded Transverse Joints: T-21 (Welded Flange) or T-21a (Reinforced Welded Flange). Tie rods are not permitted in humidifier ducts.
 - 6. Round Sealed Transverse Joints: Proprietary Joint System, RT-1 (Beaded Sleeve), RT-6 (Swedge), or RT-5 (Beaded Crimp) up to 2 inch maximum.
 - 7. Round Welded Transverse Joints: RT-4 (Outside Sleeve) or Welded Flange.
 - 8. Round Fittings: Slip type; pleated or continuously welded stamped or segmented. Continuously welded fittings such as conical tees, 45 degree laterals or wyes should be used for continuously welded systems.
 - 9. Seal Class: A for sealed systems; not applicable for welded systems.

2.04 PROPRIETARY MECHANICAL DUCT CONNECTION SYSTEM

- A. Manufacturers:
 - 1. Lockformer "T.D.C."
 - 2. Engel "T.D.F."
 - 3. Ward Duct Connection Industries.
 - 4. Ductmate Industries, Inc. "Ductmate".
 - 5. Exxano Corporation "Nexus".
 - 6. Substitutions: None permitted.
- B. Do not use mechanical connectors on ducts heavier than 16 gauge or lighter than 26 gauge.

2.05 FLEXIBLE NON-METAL DUCTWORK

- A. DESIGN STANDARD MANUFACTURER: Manufacturers or model numbers listed are the design standards. Substitutions subject to Division 1 are:
 - 1. Flexible Technologies.
 - 2. Flexaust.
 - 3. Wagner Corp.
 - 4. Unaflex.
 - 5. Thermaflex.
 - 6. Other Substitutions: None Permitted. [Follow Division 1.]
- B. Non-Metallic, Exposed to View in Finished Areas:
 - 1. Type 1: Flexible Technologies Model Spiratube NC-1; neoprene impregnated polyester fabric, enclosed spring steel wire helix, integral liner.
 - 2. Type 2: Flexaust Model Flexadux R-2; PVC welded, reinforced spring steel wire helix, blue.
- C. Non-Metallic, Concealed and Unfinished Areas:
 - 1. Type 3: Thermaflex Insulated type M-KC and non-insulated type S-TL, UL181, Class 1, rated for 6000 fpm velocity, glass fiber cloth, coated spring steel wire helix, 1 inch thick glass fiber insulation with vapor barrier. Use insulated type where required by Section 15250.

2.06 VOLUME DAMPERS

- A. Design Standard Manufacturer: Ruskin (models as specified). Substitutions subject to Division 1 are:
 - 1. American Air Warming.
 - 2. Air Balance.
 - 3. Cesco.
 - 4. Other Substitutions: None permitted.
- B. Rigidly construct to eliminate flutter or vibration; exterior quadrant adjustment with locking nut, elevated platform for insulated ducts and sealed end bearings screwed or riveted to duct. Include open end bearings on ducts beneath elevated platforms to reduce duct leakage.
- C. Splitter dampers are not acceptable as volume dampers.
- D. Materials: As specified for ductwork unless otherwise noted.
- E. Round 4 Inch to 20 Inch: 20 gauge frame and blade. Model MDR25.
- F. Rectangular: 16 gauge frame and blade. Model MD35. Use 6 inch x 6 inch minimum.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Coordinate with concrete, masonry and gypsum wallboard trades as appropriate for through-wall duct sleeves.
- B. Install through-wall duct sleeves.

3.02 INSTALLATION

- A. Suspend ducts securely, so that under conditions of operation, there will be no vibration.
- B. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pitot tube openings where required for testing of systems.
- C. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- D. Connect ducts to fans with flexible sleeves.
- E. Connect air inlets and outlet to low pressure ducts with (5 feet maximum length) flexible ductwork. Hold in place with metal strap or clamp.
- F. Do not use flexible duct to form elbows or turns exceeding 90 degrees. Use rigid metal duct for such applications. Hang flexible ductwork on 30 inch centers with maximum sag of ½ inch per foot. Do not support ducts from ceiling system.
- G. Do not hang ductwork from metal roof deck where deck is not topped with concrete. Provide supplementary or structural steel in accordance with Division 5.
- H. During construction, provide temporary closures of metal or taped polyethylene on open ductwork, to prevent construction dust from entering ductwork system.
- I. Install mechanical duct connection systems in strict conformance with manufacturer's instructions. Overtightening of corner piece nuts and bolts may cause leakage in excess of allowable levels.

3.03 DUCTWORK APPLICATION AND MATERIAL SCHEDULE

<u>DUCTWORK SYSTEM SERVICE</u>	<u>MATERIAL (NOTES)</u>
Exposed grease exhaust Ductwork, indoors	Stainless Steel
All others	Galvanized

Notes:

- 1. Continuity welded joints, seams and connections.

2. Continuously welded joints, seams and connections on vertical ducts. For horizontal ducts: Continuously weld joints; continuously weld seams and connections on bottom and sidewall; seal seams and connections on top.
3. Slope horizontal ductwork back to grilles or equipment or provide valves drain connections at low points of system.

END OF SECTION

SECTION 15935

AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Diffusers, grilles, registers and accessories.

1.02 DESIGN AND PERFORMANCE CRITERIA

- A. Maximum Noise Level: NC 30.

1.03 SUBMITTALS

- A. Product Data: Submit data for generic types only. Schedule for individual units will not be reviewed.
- B. List of exceptions to specifications on a line-by-line basis. Include proposed materials, methods, and cost difference where substitutions are allowed.

1.04 QUALITY ASSURANCE

- A. Test and rate performance in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.

1.05 REGULATORY REQUIREMENTS

- A. Conform to ANSI/NFPA 90A.

PART 2 - PRODUCTS

2.01 DESIGN STANDARD MANUFACTURER:

- A. Manufacturers or model numbers listed are the design standards. Acceptable manufacturers are listed below:
 1. Titus.
 2. Tuttle and Bailey.
 3. Kruger.
 4. Anemostat.
 5. Price.

6. Nailer.
7. Kees, Inc.
8. Architectural Grille.
9. Substitutions: None permitted.

2.02 GENERAL REQUIREMENTS

- A. Construction Material: Provide aluminum construction as specified.
- B. Finish exposed surfaces with baked off-white epoxy enamel unless specified otherwise.
- C. Furnish frames appropriate to surrounding construction material. See Architectural Drawings.
- D. Furnish units with volume control damper in neck, adjustable through the face without removal.
- E. Furnish tools required to change deflection of air outlets or inlets to Section 15990.

2.03 TYPE CD: SQUARE CEILING DIFFUSERS

- A. Titus Model (TDV-AA): 12 inch x 12 inch or 24 inch x 24 inch, aluminum, round neck, with removable inner core.
- B. Provide inverted T-bar Type "L" frame for lay-in acoustical ceilings and Type "S" frame for gypsum board ceilings. Provide plaster frames for plaster ceilings.
- C. Provide pattern controller vane for adjustment of horizontal air pattern.
- D. Provide opposed blade volume damper adjustable from face.

2.04 TYPE DR: SUPPLY REGISTERS

- A. Titus Model 300FL: Double deflection supply registers with front blades parallel to long dimension.
- B. Aluminum construction with opposed blade damper.

2.05 TYPE WG: WALL GRILLES.

- A. Titus Model 350FL.
- B. Horizontal face bars, aluminum construction.

2.06 TYPE FG: WOOD FLOOR GRILLES

- A. Architectural Grille with slotted holes.

- B. Fabricate from oak with stained finish. Architect to select stain color.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Check location of air inlets and outlets and make adjustments in position to conform with architectural features, symmetry and lighting arrangement.
- B. Install diffusers to ductwork with airtight connections. Attach round neck diffusers to ductwork using drawbands.
- C. Provide balancing dampers on duct take-off to diffusers, grilles and registers, regardless of whether dampers are specified as part of the diffuser, grille or register assembly.
- D. Paint ductwork system componentry visible behind air outlets and inlets, with latex or alkyd flat black paint.

END OF SECTION

SECTION 15950

AUTOMATIC TEMPERATURE CONTROL

PART 1 - GENERAL

1.01 APPLICATION OF THIS SECTION

- A. Unless otherwise noted, this Section applies to all Mechanical Construction except Fire Protection and Plumbing. Coordinate with applicable Specification Sections as required.
- B. Follow Division 16 for specified provisions on electrical construction.

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Furnish automatic control dampers, to Section 15890 for installation.

1.03 RELATED SECTIONS

- A. Section 16010 - Basic Electrical Materials and Methods.
- B. Section 16111 - Conduit.
- C. Section 16120 - Wire and Cable.
- D. Section 16130 - Wiring Devices and Boxes.

1.04 SEQUENCING AND SCHEDULING

- A. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.
- B. Coordinate work under provisions of Division 1 to ensure system is complete and fully commissioned.
- C. Coordinate installation of system components with installation of mechanical systems equipment.

PART 2 - PRODUCTS

2.01 EQUIPMENT MANUFACTURERS

- A. Andover Controls.
- B. Invensys Building Systems, Inc.

- C. Honeywell Inc. (certified authorized contractor).
- D. Johnson Control.
- E. Siemens Building Technologies (Landis Division).
- F. Automated Logic Corporation (Radius Systems).
- G. Delta Controls.
- H. Substitutions: None permitted.

2.02 THERMOSTATS

- A. Programmable Thermostats (7 Day Touch Screen):
 - 1. Provide touchscreen programmable digital thermostats where shown on the plans or specified in the sequences of operation, Honeywell Commercial VisionPRO TB8220 or approved equal.
 - 2. Provide integral time clock for 7-day programming and automatic daylight savings time changeover.
 - 3. Thermostat shall maintain schedule times and temperature setpoints indefinitely and clock time and date for up to 10 years.
 - 4. Provide temperature display in °F or °C.
 - 5. Provide Proportional plus Integral (P-I) control algorithm.
 - 6. Inputs: Provide integral temperature sensor.
 - 7. Outputs:
 - a. Thermostat shall be configurable for convention or heat pump single zone systems.
 - b. Provide outputs for 2-heat/2-cool staging for conventional or 3-heat/2-cool staging for heat pumps.
 - c. Contacts shall be rated for 1 amp at 30 VAC for heating and cooling, and 0.6 amp for fan control.
 - d. Provide user selectable Fan On-Auto and Heat-Off-Cool-Auto modes.
 - e. Provide separate configurable cycle rates for heating and cooling responses.
 - f. Provide minimum-off time for compressor protection (0-5 Minutes based on installer setup).
 - 8. Schedules:
 - a. Provide two occupied and two unoccupied periods per day.
 - b. Provide individual scheduling for each day of the week.

- c. Provide gradual setpoint recovery from Unoccupied to Occupied based on a default ramping or based on the outdoor temperature sensor if provided.
- 9. Keypad Features:
 - a. Provide 4 lockout levels of keypad access.
 - 1) No access.
 - 2) Override and holiday access only:
 - 3) Override access only.
 - 4) None - complete access.
 - b. Provide Hold until feature to maintain the current setpoint for a selectable period (Maximum of 1, 2, 3 or 4 hours determined by installer setup) or until the next scheduled time period.
 - c. Provide Override feature to maintain the current setpoint until the next scheduled time period.
 - d. Provide Holiday feature to hold the system at the Unoccupied setpoint for a user selected period of 1 to 365 days.

2.03 DAMPERS

- A. Manufacturers:
 - 1. Ruskin.
 - 2. Penn Ventilator.
 - 3. Honeywell, Inc.
 - 4. Substitutions: Follow Division 1.
- B. Performance: Test in accordance with AMCA 500.
- C. Frames: Flanged, welded or riveted with corner reinforcement. Material as specified for ductwork.
- D. Blades: Minimum blade size 8 inches wide, 48 inches long, attached to maximum 1/2 inch shafts with set screws. Material as specified for ductwork. Provide opposed blades for modulating and mixing applications and parallel blades for two position applications.
- E. Blade Seals: Synthetic elastomeric or neoprene, mechanically attached, field replaceable.
- F. Jamb Seals: Stainless steel.
- G. Damper End Switch (ES): Momentary type, adjustable limit switch for monitoring motion of damper at a prescribed arc of rotation. Switch shall be hermetically sealed mercury contacts that operate by way of a trip lever. Switch shall have a SPDT contact arrangement that exceeds load requirements for voltage and current.

- H. Shaft Bearings: Oil impregnated sintered bronze or graphite impregnated nylon sleeve, with thrust washers at bearings.
- I. Linkage Bearings: Oil impregnated sintered bronze or graphite impregnated nylon.
- J. Leakage: Less than one percent based on approach velocity of 2000 fpm and 8 inch w.g.
- K. Maximum Pressure Differential: 8 inch w.g.
- L. Temperature Limits: Minus 40 to plus 200 degrees F.

2.04 DAMPER ACUTATORS

- A. Damper Actuators. General. All automatically controlled devices, unless specified otherwise elsewhere, shall be provided with actuators sized to operate their appropriate loads with sufficient reserve power to provide smooth modulating action or two-position action tight close off. Actuators shall be power failure return type where dampers are required to fail to a safe position and where specified.
- B. Actuators shall be of the push-pull or rotary type of modulating, three point floating, or two position control as required by the application. The actuator shall use an overload proof synchronous motor or an electric motor with end switches to de-energize the motor at the end of the stroke limits. Control voltage shall be 24 VAC, 0-20VDC, or 4-20ma as required. Actuators shall be available with spring return to the normal position when required. Actuators shall have a position indicator for external indication of damper position. Actuators shall have manual override capability without disconnecting damper linkage. Actuators shall include a signal mode switch for floating or modulating inputs, self-centering single screw shaft adaptor, and integral wiring access cover. Actuators shall have a five-year parts warranty.
- C. Minimum design life of modulating actuators shall be for 1,500,000 repositions and 60,000 spring returns, except 2-position actuators shall be for 50,000 returns.

2.05 CONTROL PANELS

- A. Unitized cabinet type for each system under automatic control. Mount relays and controls in cabinet. Mount temperature, humidity, airflow and pressure indicators, pressure gauges, pilot lights, pushbuttons and switches flush on cabinet panel face.
- B. Steel, NEMA 1, general-purpose enclosure with lugged door and key lock. All cabinets shall use a common key. Provide means of storing control system instructions and drawings inside cabinet.
- C. Finish: Factory applied enamel, except that panels in finished spaces shall be primed for field painting when custom color factory finishes are not available. Coordinate with Section 09900.
- D. Provide surface mounted or freestanding, steel supported types for mechanical equipment rooms. Provide fully recessed wall mounted types elsewhere.

2.06 ELECTRICAL EQUIPMENT AND WIRING

- A. Follow Section 15050 and Division 16 for means, methods and materials. Provide powered control circuits required for control system use. Provide 120-volt power wiring from spare circuit breakers in electrical panels to ATC control panels. Provide necessary transformers. Coordinate with Division 16.
- B. Classify line (120 volt) and low (below 120 volt) voltage wiring from ATC and other control panels to control(ed) devices as control wiring.
- C. Low Voltage Control Wiring: No. 18 AWG twisted shielded where required by system manufacturer compatible with specific application and in accordance with Division 16.

2.07 SEQUENCE OF OPERATION

- A. As specified in the drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that systems are ready to receive the work.

3.02 INSTALLATION, GENERAL

- A. Install the work in such manner to ensure correct function and operation.
- B. Where control devices are to be surface mounted on components scheduled to be insulated, provide insulation between device and component to prevent condensation or heat transfer. Use insulating materials and thicknesses specified in Section 15250.

3.03 SYSTEM START-UP AND ACCEPTANCE TEST PROCEDURES

- A. General Requirements:
 - 1. Intent of acceptance test procedure is to demonstrate that exact functions of control systems meet requirements.
 - 2. Verify each air handling unit and condensing unit is working correctly.
 - 3. Indicate type and cause of failures, as well as required remedial actions, on test report. Startup and testing will be witnessed and verified by Owner. Requested tests, not outlined herein, will be evaluated for feasibility and impact on schedule and cost.
 - 4. Systems will not be accepted by Owner without approval of tests and required remedial action.
- B. Submit Acceptance Test reports indicating operating conditions after detailed check out of systems.

3.04 DEMONSTRATION AND INSTRUCTIONS

- A. For each system, demonstrate:
 - 1. Cold Start.
 - 2. Sequence of Operation.
 - 3. Seasonal Control.
- B. Provide complete demonstration of equipment or systems requiring seasonal operation, during operating season. Perform multiple demonstrations when required within six months.

END OF SECTION

SECTION 15990

TESTING AND BALANCING OF HVAC SYSTEMS

PART 1 - GENERAL

1.01 SELECTION AND PAYMENT

- A. Installer shall employ and pay for services of an independent balancing agency to perform specified testing and balancing.

1.02 REFERENCES

- A. AABC - National Standards for Field Measurement and instrumentation, Total System Balance.
- B. ASHRAE - 2007 Application Handbook: Chapter 37, Testing, Adjusting and Balancing.
- C. NEBB - Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

1.03 SUBMITTALS

- A. Statement of Balancing Agency Qualifications.
- B. Installer Submittals:
 - 1. Name and address of balancing agency, together with a copy of AABC certification, within 30 days after award of contract.
 - 2. Name of installer's representative responsible for coordination with balancing agency.
- C. Balancing Agency Submittals:
 - 1. Copy of AABC certification within 30 days after award of contract.
 - 2. Name of agency's representative responsible for coordination with installer.
 - 3. Copy of AABC National Project Performance Guaranty prior to commencing system balance.
 - 4. List of each instrument to be used, and latest date of calibration.
 - 5. Report:
 - a. Submit on AABC forms. Complete all applicable parts of each form.
 - b. Modify forms or submit multiple forms where required for maximum and minimum flows, occupied and unoccupied flows, temporary and future conditions, or other conditions, to suit the project.
 - c. Submit report for review prior to final acceptance of the project.
 - d. Bind reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side.

- e. Air distribution test and balance report shall include:
 - 1) Schematic diagram of each system showing size and CFM (design and actual) for main ducts; all dampers and regulating devices; terminal units; and each inlet and outlet with design and actual CFM.
 - 2) Test data form for each fan, air handling unit or other equipment.
 - 3) Tabulation of design, preliminary and final CFM for each diffuser, register, mixing box or other terminal. Summary of CFM tabulations by systems and comparison with respective fan data.
 - 4) Heat exchangers, including nameplate data, and both design and actual inlet and outlet water temperature and pressure drop at full flow through the unit.
- f. In addition to data required on AABC or NEBB forms, the following additional information is required for all scheduled equipment.
 - 1) Motors - Type, frame number and series number.
 - 2) Fans - Blade design type such as airfoil, backwardly inclined (BI), single inlet single width (SISW) or double inlet double width (DIDW), class and number of blades.
 - 3) Pumps:
 - a) Design Data – Impeller size, motor Hp, RPM, net positive suction head (NPSH) required at design flow, and total dynamic head (TDH) at zero flow.
 - b) Test Data – Suction and discharge pressures at full flow (not throttled to obtain rated flow), and zero flow.
 - 4) Hydronic Systems - GPM in each significant branch, and position of each balancing valve.

D. Certificates:

- 1. By Installer: Certify that each system is prepared for testing and balancing and that products and systems meet or exceed specified requirements.
 - 2. By Balancing Agency: Certify that instruments, flow measuring primary elements and read-out meters have been calibrated to NBS Standards. Include Installer furnished permanently installed and portable devices.
- E. List of exceptions to specifications on a line-by-line basis. Include proposed materials, methods, and cost difference where substitutions are allowed.

1.04 QUALITY ASSURANCE

- A. Total system balance shall be performed in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance.

1.05 QUALIFICATIONS

- A. Balancing Agency: Company specializing in adjusting and balancing of HVAC systems; certified by AABC. Perform Work using only qualified technicians under supervision of AABC Certified Engineer.

1.06 PRE-INSTALLATION MEETING

- A. Convene a meeting two weeks prior to commencing agency work.

1.07 SEQUENCING AND SCHEDULING

- A. Installer and Agency Joint Responsibility: Sequence and schedule work following Section 01010.
- B. Agency Responsibility:
 - 1. Sequence work to start after completion of system installation and finish before substantial completion.

PART 2 - PRODUCTS

(Not Used).

PART 3 - EXECUTION

3.01 INSTALLER WORK

- A. Review drawings, specifications, addenda, bulletins and A/E reviewed submittals. Verify that piping, instruments, wells, taps, valves, ductwork, duct specialties, dampers, flow-measuring elements, access openings and other accessories, have been provided in correct quantity and at correct locations to permit balancing piping and air systems under all testing and operating conditions. Make required modifications.
- B. Inform balancing agency of deviations from contract documents made to systems during construction. Provide a complete set of Record Documents for Agency use.
- C. Coordinate with other trades, Balancing Agency, Owner and A/E to establish a schedule for testing and balancing.
- D. Submit a schedule stating when each system is expected to be ready for testing and balancing. Indicate specific building area, floor and system. Update schedule when changes occur.
- E. Certify that each operation listed below has been satisfactorily completed before testing and balancing begins.
 - 1. Physical installation of air and piping systems.
 - 2. Equipment is in operable condition, with all accessories installed.

3. Thermal overload protection is in place for electrical equipment.
 4. Linkages and equipment have been serviced and lubricated and tested for operation.
 5. Duct systems are clean of debris.
 6. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 7. Coil fins have been cleaned and combed.
 8. Fire and volume dampers are in place and open.
 9. Fluid systems have flushed, filled with the proper fluid and vented. Air vents at coils and high points in system are installed and operating. Expansion tanks are filled and in working order.
 10. Temperature control systems are completely installed and operable.
 11. Control valves and dampers are in working order and are positioned for full flow through equipment.
 12. Prime movers, such as fans, have been operated at specified loads and checked for misalignment, imbalance, excess vibration, improper rotation or motor overload. Correct deficiencies prior to balancing.
- F. Provide support services from equipment manufacturers and from other sources as required during testing and balancing. Include labor, materials, tools and equipment for operation of equipment and systems, and for adjustments, calibrations and repairs of mechanical and automatic control devices and their components. Make these services available on each working day, and without undue delay, as required by balancing agency.
- G. Provide a representative to accompany balancing agency, at times required by agency, during testing and balancing.
- H. Take full responsibility for protection and operation of equipment and systems. Operate systems at designated times and under conditions required for testing, adjusting and balancing.
- I. Furnish flow indicating meters and devices intended for use with permanently installed primary flow elements to balancing agency.
- J. Equipment with V-belt drives will have fixed pitch sheaves per Section 15170. Provide replacement sheaves and belts when required, in sizes determined by balancing agency.
- K. Notify balancing agency upon completion of sheave replacement.
- L. Make modifications to rectify discrepancies and deficiencies reported by balancing agency, indicating non-compliance with contract documents.

3.02 BALANCING AGENCY WORK

- A. General:

1. Keep copies of referenced standards at job site and make them available to Installer, Owner and A/E.
 2. Review drawings, specifications, addenda, bulletins and A/E reviewed submittals. Verify that piping, instruments, wells, taps, valves, ductwork, duct specialties, dampers, flow-measuring elements, access openings and other accessories, have been provided in correct quantity and at correct locations to permit balancing of piping and air systems under testing and operating conditions.
 3. Provide additional balancing devices as required.
 4. Attend pre-construction and progress meetings.
 5. Coordinate with all trades, installer, owner A/E to establish a schedule for testing and balancing.
 6. Report defects or deficiencies noted to A/E.
 7. Provide inspection, of both function and operation of all ATC for air and hydronic controls to insure proper operation of control system
 8. Promptly report design or other conditions which prevent system balance to A/E.
 9. A/E may witness balancing of systems. Notify A/E a minimum of 5 days notice prior to balancing of systems.
 10. In cases where recorded data is interpreted by A/E to be inaccurate, inconsistent or erroneous. A/E may request additional testing and balancing. Balancing agency shall, at no additional cost, perform such retesting and rebalancing as directed by and in the presence of owner C/M.
 11. Repair or replace finished products damaged as a result of agency's work.
- B. Calibration:
1. Provide verification of accuracy of instruments, meters and devices used for balancing. Show date and method of calibration.
 2. Verification of permanently installed meters and devices may be by calculation and calibration, or by an independent measurement of the same flowing medium with calibrated devices.
- C. General Balancing Procedures:
1. Do not begin testing and balancing a system until Installer has certified it to be complete.
 2. Test and balance air systems with maximum attainable internal load (lights and equipment).
 3. Use only direct flow measurement unless otherwise specified. Do not use indirect calculations such as heat balance or pressure drop in heat exchanger.
 4. Adjust systems and equipment to specified installation tolerances.
 5. Except for air outlets and inlets, where actual measurements recorded for final balance show deviation of more than 5 percent from design, and deviation cannot be corrected by balancing with installed layout and elements, note this deviation in report, along with recommendations for corrective action.

6. Verify that thermostats, and devices they control, operate as intended and in the sequence specified.
 7. Establish correct fan RPM and advise Installer of required fixed sheave diameter. Check and verify fan RPM following sheave replacement.
 8. Where, in opinion of balancing agency, excessive vibration, movement or noise from any piece of equipment, ductwork, or piping remains, note these conditions in report along with recommendations for corrective action.
- D. The Engineer shall have the option to spot check system balance and the balancing agency shall provide all equipment and labor as required.
- E. With controls functioning properly and proper water flow rates, test and record air dry bulb and wet bulb temperature of entering outside air, return air, mixed air, supply air, and air entering and leaving each coil for each air handling unit. Where feasible, measure air dry bulb and wet bulb temperatures with the mechanically aspirated psychrometer.

3.03 INSTALLATION TOLERANCE

- A. Adjust air systems to plus or minus 5 percent, maximums and minimums from figures indicated.
- B. Adjust air terminal devices (outlets and inlets) to plus or minus 5 percent between rooms, except that multiple devices on the same system branch within each room may be adjusted to plus or minus 10 percent.

3.04 ADJUSTING

- A. Recorded data shall represent actual measured or observed condition.
- B. Permanently mark settings of valves, dampers and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted, or that such disruption has been rectified.
- D. Leave systems in proper working order. Replace belt guards, close access doors, close doors to electrical switch boxes, and restore thermostats to specified settings.

3.05 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide design supply, return and exhaust air quantities.
- B. Measure air quantity in ducts by Pitot tube traverse of entire cross sectional area of duct. Make Pitot tube traverse of all main supply, return and exhaust ducts. Adjust all air ducts to proper design CFM. Air quantities shall be adjusted by volume with balancing dampers. Dampers and other balancing devices shall have their adjusted positions marked in an inconspicuous permanent manner.
- C. Measure air quantities at air inlets and outlets.

- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume dampers in necks of air devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct mounted volume dampers located at branch take-offs.
- F. Measure static air pressure conditions on air handling units, including filter, coil and other component pressure drops, and total pressure across the fan. Make allowances for 100 percent loading (initial versus change pressure drop) of filters.
- G. All filters shall be clean and in place before starting fans. All air filters shall be artificially loaded by partial blanking or other means to produce air pressure drop at dirty conditions as specified. Controls and dampers shall be set for normal full airflow testing and balancing.
- H. Adjust automatic dampers to check leakage. Measure temperature conditions across dampers when appropriate.
- I. Where modulating dampers are provided, take measurements and balance at extreme conditions.

END OF SECTION

Carpenter Square Townhouses

Project Number: 12-03-01A

ELECTRICAL SPECIFICATION LIST

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SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 GENERAL

- A. Division 1 requirements shall be considered part of the Electrical Specifications.
- B. This section applies to all other sections of Division 16.

1.02 INTENT

- A. It is the intent of this specification and accompanying drawings to describe and indicate the manufacture, erection and installation of the equipment and connections to same specified herein and shown on the drawings. It is not intended that the specifications and drawings describe and indicate each piece of equipment required for installation, for where items are intended or as required for the satisfactory installation and are considered to be the accepted practice of the trade, they shall be considered to be both specified and indicated.
- B. The Electrical Contractor shall furnish all parts, labor and material necessary for the complete and satisfactory installation of all electrical work for this contract.
- C. The Electrical Contractor shall assume the entire responsibility for the materials, workmanship, and satisfactory operation of the various electrical systems, and other work as specified herein and or as shown on the drawings.

1.03 SUMMARY OF WORK

- A. These specifications, together with the electrical drawings, are intended to provide a complete electrical installation.

1.04 CONTRACTOR'S RESPONSIBILITY

- A. The Contractor shall be responsible for establishing elevations, and checking of all interferences, and shall verify all dimensions and locations in the field.
- B. The drawings are diagrammatic and indicate the general arrangement of the various systems and the approximate and relative locations of the materials and equipment included by these specifications. The work shall be coordinated with and have the approval of the A/E for the exact location of materials and equipment. The Contractor shall check the drawings and work required of all other trades to verify space conditions and headroom requirements. Where space conditions or headroom requirements appear inadequate, the A/E shall be notified before submitting a bid. No consideration or allowance will be granted for failure to notify the A/E, or for any alleged misunderstanding of the aforementioned requirement. Installation, connection, and interconnection of all

components of these systems shall be complete and made in accordance with the requirements of the contract, the manufacturer's instructions and best practices of the trade.

- C. The Contractor shall specifically note that the electrical drawings are intended to indicate only diagrammatically, the extent, general character and locations of work included. Work intended, but with minor details obviously omitted, shall be furnished and installed complete to accomplish the function required. If any obstructions or interferences should be encountered which are not shown on the drawings or described in the specifications, the Contractor shall install the fixtures, equipment, panelboards, etc., as closely as possible to the locations indicated on the drawings. Fixture installation shall approximate the mounting heights of the adjacent fixtures. Such changes shall be subject to the approval of the A/E prior to the installation and shall be made at no increase in contract price.
- D. Conduit and circuiting, designations, etc., shall be installed as indicated on the drawings unless prior approval in writing has been obtained for such changes. When changes occur, sketches shall be submitted to the A/E showing all deviations from the contract drawings.
- E. The locations of equipment, conduits, outlets, etc., as shown on the drawings are correct to the extent permitted by the scale of the drawings but are subject to such modifications as may be found necessary or desirable at the time of installation in order to meet any structural conditions. Such changes shall be made by the Contractor without extra charge.
- F. Before installation of branch circuits, the Contractor shall check the swing of all doors, and if switch outlets as shown on drawings are behind doors, the location of such outlets shall be changed, without charge, to the wall on the opposite side of the doors.
- G. The A/E specifically reserves the right, up to the time of roughing-in, to exactly define the position of the equipment to be installed and connected to the arrangement of these connections.
- H. Special attention is called to the contract drawings and specifications involving General Construction, Plumbing, Heating, Ventilating, Air Conditioning, and Sprinkler work and details thereon. Bidders are notified to carefully scrutinize these documents for the details affecting the performance of the Electrical work.
- I. The Contractor shall be responsible for the coordination, delivery and admission of materials and equipment to the site in accordance with the construction progress schedule.
- J. Portions of the work delineated on the drawings were derived from information prepared as part of the design process by second tier consultants such as, but not limited to, lighting designer, fire protection consultant, kitchen equipment consultant, interior designer, who were retained independently by parties other than the engineer. The A/E by including the information prepared by those consultants does not take any responsibility or assume liability for the accuracy, adequacy, sufficiency, or coordination of the work prepared by the other consultants as may be shown on the plans where circuiting, rough-in, service connections, or dimensions are given. Connections, details, and/or mechanical/electrical requirements were obtained from those various consultants; and, to the best knowledge of the engineer, represent the final design criteria as issued by those designers. The contractor should take sufficient steps to insure himself prior to connection and rough-in in the field

that there have been no changes, revisions or relocations of the information contained on the engineer's drawings which were derived from those consultants.

1.05 VERIFICATION OF MEASUREMENTS

- A. This Contractor shall be solely responsible for the verification of field measurements before ordering any materials or equipment, and before commencing any work.
- B. This Contractor shall be responsible for coordinating the locations and sizes of concrete pads, sleeves, inserts, openings and chases.
- C. No extra claims, charges, or compensation will be allowed due to any differences between the actual dimensions and any dimensions indicated on the drawings.
- D. Any discrepancies which may be found shall be reported at once to the A/E for consideration and this Contractor shall wait for a decision before proceeding with any work in the affected area.
- E. The A/E's decision in such matters shall be final and binding upon this Contractor, and this Contractor shall make his installation accordingly.

1.06 SCHEDULE OF WORK

- A. The Contractor shall schedule all of his work to conform to the Job Progress Schedule as submitted by the General Contractor and as approved by the A/E.
- B. The Contractor shall be responsible for scheduling and sequencing all work including phasing of work to coincide with phased construction by other trades.

1.07 VISIT TO SITE

- A. Before commencing work, this Contractor shall visit the site; verify all measurements, and field conditions affecting his work. He shall be responsible for the correctness of all measurements and for any connections to existing work. Submission of the proposal shall be considered evidence that this Contractor has visited and examined the site. No extra payment shall be allowed this Contractor for extra work caused by his failure to visit the site and to verify all conditions and measurements.

1.08 MINIMUM REQUIREMENTS

- A. References to the National Electrical Code and National Fire Protection Association (NFPA) are a minimum installation requirement standard. Design drawings and other specification sections shall govern in those instances where requirements are greater than those specified in the NEC and NFPA.

1.09 STANDARDS, REGULATIONS AND CODES

- A. All material and equipment shall be listed, labeled or certified by Underwriters' Laboratories, Inc., where such standards have been established. Equipment and material

which are not covered by UL Standard will be accepted provided equipment and material is listed, labeled, certified or otherwise determined to meet safety requirements of a nationally recognized testing laboratory. Equipment of a class which no nationally recognized testing laboratory accepts, certifies, lists, labels or determines to be safe will be considered, if inspected or tested in accordance with national industrial standards, such as NEMA, IPCEA or ANSI. Evidence of compliance shall include certified test reports and definitive shop drawings.

- B. This Contractor shall perform his work in accordance with the respective applicable requirements of the Institute of Electrical and Electronic Engineers (IEEE), National Fire Protection Association (NFPA), National Electrical Code (NEC), Underwriters' Laboratories (UL), National Electrical Manufacturers' Association (NEMA), Insulated Power Cable Engineers' Association (IPCEA), Utility Companies, OSHA, other local, state and all other authorities having jurisdiction for this work.

1.10 CONTRACTOR KEEPING STAFF AT THE SITE

- A. The Contractor shall, upon initiation of construction, keep a suitable force of staff on the site at all times in order to place all sleeves, inserts, outlet boxes, fixtures and provide all other openings as are required for the satisfactory installation of equipment.
- B. The contractor shall give his personal superintendence to the work, or he shall have a competent superintendent present on the site at all times during the construction of the work. The superintendent shall have the full authority to act for the contractor in matters relating to the work. The responsible party providing superintendence for and on behalf of the contractor shall be fully skilled, knowledgeable, and competent in the trade he is supervising. He shall have had extensive and substantial experience in the reading, comprehension, and interpretation of contract documents of this nature. He shall be competent to direct the tradesmen installing the work described in these documents.

1.11 SHOP DRAWINGS

- A. This Contractor shall submit shop drawings of equipment and materials under this section for approval by the A/E.
- B. The shop drawings are to be submitted promptly without causing any delays in the construction progress schedules. Shop drawings shall be stamped with each Contractor's and the General Contractor's approval, as evidence that it was checked for accuracy, and that all the dimensions and data were verified prior to submitting them. Approval of the submittals by the A/E shall not relieve the Contractor from the responsibility for any errors contained within them or for compliance with the requirements of the plans and specifications, unless specific mention is made of variations therefrom and approval obtained for same.
- C. Approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage or installation of equipment or material which has not had prior approval will not be permitted at the job site.

- D. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings and other data necessary to ascertain that the proposed equipment and materials comply with specification requirements. Catalog cuts submitted for approval shall be legible and shall clearly identify equipment being submitted.
- E. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval.
- F. Submittals shall be marked to show specification reference including the section and paragraph numbers.
- G. Submit each section separately and include the following:
 - 1. Information which confirms compliance with contract requirements. Include the manufacturer's name, model or catalog number, catalog information, technical data sheets, shop drawings, pictures, nameplate data and test reports as required.
 - 2. Elementary and interconnection wiring diagram for communication and signal systems, control system and equipment assemblies. All terminal points and wiring shall be identified on wiring diagrams.

1.12 SAMPLES

- A. This Contractor shall submit, for approval, samples of materials deemed necessary by the A/E. Samples shall be supplemented by essential catalog data specifically applying to the samples submitted for approval, where such data would be necessary to properly evaluate the quality of the sample. Samples shall be specifically identified as to the service and location where they are to be used in the project.

1.13 RECORD DRAWINGS

- A. The Contractor shall prepare, at his own expense, installation record drawings showing the exact dimensioned locations, grade elevations and sizes of all the concealed work, exterior and interior underground conduit, junction and pull boxes, sleeves and equipment. Show locations of any conduit or equipment not installed as per the original drawings. Dimensions shall indicate the distance from the building walls, building floor levels, curb lines and finished grade lines. The Contractor shall make a record of all changes involved as the conduit and equipment is being installed. He shall check all dimensions, grades, etc.; at the time the work is being installed to represent an accurate record of the project. The Contractor may use an original set of contract drawings to make the above-mentioned details by using colored leads. All drawings are to become the property of the A/E and must be delivered to him before the final payment is certified.
- B. During the progress of project work, this Contractor shall keep, on the set of prints of drawings, which are kept at the job site, an accurate record of all deviations, changes and corrections from the layouts shown on the drawings. After completion of work at the site, this Contractor shall submit to the A/E for review, comment and approval, a set of reproducible drawings recording the information and coordinate with Architect.

- C. The Contractor shall provide an electronic set of record set documents incorporating all field changes. These shall be in AutoCAD format and compatible with design documents for layering version, etc.

1.14 SPECIAL WARRANTY

- A. In addition to the requirements stated in the Electrical specifications, the Contractor shall warranty all equipment, materials, and appurtenances installed by him to be free from all defects in construction and workmanship for a period of one year from date of occupancy. Upon written notice from the A/E, the Contractor shall promptly correct all defects without additional cost to the Owner. This Contractor shall adjust each part of the entire installation for proper working order. Reports are to be submitted to the A/E and adjustments repeated until the entire system is satisfactory. The Contractor shall make good, at his own expense, any defects in materials or workmanship that may appear. The Contractor shall render to the A/E such services as he may require for the final inspection and testing of the complete installation.
- B. The Contractor shall turn over to the Owner all papers of warranty for equipment as are issued by the manufacturer. All warranties shall be organized into a single record book and submitted with operating and maintenance manuals.
- C. Complete service and maintenance of all equipment shall be the responsibility of the Contractor until the date of final acceptance.

1.15 PERMITS, CERTIFICATES AND FEES

- A. This Contractor shall pay all fees for procuring the permits and certificates required.
- B. This Contractor shall prepare all of the information and data for submittal to any authority as required for obtaining certificates of compliance for the permits.
- C. The Contractor shall obtain final approved inspection certificates from authorities having jurisdiction for the entire electrical installation. Electrical inspections shall be performed by a certified and recognized Underwriter. Final electrical certificates from that organization for all work required by this Contract shall be delivered to the Owner before final payment will be made.
- D. The contractor shall retain an independent inspection agency even if electrical inspections are made by governmental agencies or departments.

1.16 EQUIPMENT PROTECTION AND PAINTING

- A. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, moisture, cold and rain.
- B. Electrical equipment and switchgear shall be stored indoors or otherwise securely protected and kept free of condensation by adequate electric heat.

- C. During installation, equipment, controls, controllers, circuit protective devices, etc., shall be protected against entry of foreign matter on the inside; and vacuum cleaned both inside and outside before testing, operating and painting.
- D. Damaged equipment shall be, as determined by the A/E, placed in first class operating condition or be returned to source of supply for repair or replacement.
- E. Painted surfaces shall be protected with removable heavy kraft paper, sheet vinyl or equal, installed at the factory, and removed prior to final inspection.
- F. Damaged paint on equipment and materials shall be repainted with painting equipment and finished with same quality of paint and workmanship as used by manufacturer so repaired areas are not obvious.
 - 1. Protective coating of rust resistant paint on all bare ferrous materials in unfinished or concealed spaces or where exposed to the weather.
- G. The Contractor shall be responsible for all field painting. Finish painting of all equipment and materials furnished by the Contractor in the mechanical and electrical equipment rooms shall include, but not be limited to, all ferrous structural supports and hangers, conduits, boxes, panels and other exposed materials and equipment. Painting shall conform to applicable sections of the specification.
- H. All major pieces of equipment such as motor control centers, panelboards, lighting fixtures emergency lighting system equipment, etc. furnished as part of this contract shall have a factory applied finished coat of paint.

1.17 EQUIPMENT IDENTIFICATION

- A. In addition to the requirements of the National Electrical Code, install an identification system which will clearly indicate information required for use and maintenance of items such as panelboards, cabinets, motor controllers (starters), safety switches, separately enclosed circuit breakers, individual breakers and controllers in switchgear and motor control assemblies, conductors, control devices and other significant equipment.
- B. Nameplates shall be laminated black phenolic resin with a white core and engraved lettering. Lettering shall be white, a minimum of 1/4-inch high.
- C. Provide approved tags for all feeders, at both ends, and at intermediate junction and pull boxes. Tag shall indicate feeder designation or equipment served, and state phase of cable and voltage of feeder.
- D. On the inside cover of each fusible device, identify it by using plastic adhesive tape or paint with red letters "USE ___ A. FUSE ONLY" and fill in proper value as indicated on the drawings or as required.
- E. Panelboard directories shall be completed and typed with date of installation.

1.18 DEFINITIONS

- A. Following definitions of terms and expressions used in this section are in addition to listing given in Supplementary Conditions:
1. "Provide" shall mean, "furnish and install" unless otherwise indicated.
 2. "Herein" shall mean the content of a particular section where this term appears.
 3. "Indicated" shall mean, "Indicated on contract drawings".
 4. "Concealed" where used in conjunction with conduit, junction boxes, outlet boxes and accessories shall mean that they are hidden from sight as in trenches, chases, furred spaces, shafts or hung ceilings.
 5. "Exposed" where used in conjunction with conduit, junction boxes, outlet boxes and accessories shall mean that they are not "concealed" as defined herein above.
 6. "Unit Price" shall indicate a fully installed, tested, warranted system or component.

1.19 TEMPORARY SERVICE

- A. Temporary services including temporary power, lighting and telephone facilities are specified under Division 1, "General Requirements".
- B. Provide temporary connections and power to allow work of this and other trades. This includes, but is not limited too, extension of partially demolished circuits. Temporary power to equipment prior to final electrical work and relocation of existing electrical work due to new work.

1.20 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. The Contractor shall at the completion of the contract deliver to the A/E **[three (3)]** copies of maintenance and operating manuals for each separate piece of equipment and/or system. Manuals shall be complete in full detail for the operation and maintenance of all systems and/or equipment furnished as a part of this contract.
- B. Manuals shall be complete detailed guides for the operation and maintenance of the systems and/or equipment. Manuals shall include complete information necessary for starting, adjusting, maintaining in continuous operation for long periods of time and dismantling and reassembling of the complete units and subassembly components.
- C. Manuals shall include an index covering all component parts and part ordering numbers clearly cross-referenced to diagrams and illustrations. Illustrations shall include "exploded" view showing and identifying each separate item. The function of each piece of equipment, component, accessory and control shall be clearly and thoroughly explained.
- D. Wiring diagrams to be included in the manuals for instrumentation, interlocking between pieces of equipment, internal wiring of components, communication and signal systems, control and similar type systems shall indicate number and size wires from point to point and method of termination. Where terminations are identified on the component, terminal

blocks or similar pieces of equipment by numbers or other such symbols, these shall also be identified on the wiring diagrams.

- E. All necessary precautions for the operation of the systems and/or equipment, and the reason for the precaution shall be clearly set forth in the manuals. Manuals must reference the exact model, style and size of the piece of equipment and/or system being furnished. Manuals referencing equipment similar to but of a different model, style and size than that furnished will not be accepted.
- F. All such information shall be arranged in an orderly manner in hardbound, loose-leaf type binders.
- G. The Contractor shall schedule certain days and hours for instruction of the Owner's operating and maintenance personnel. Instructions shall be given by the Contractor's personnel in conjunction with fully authorized factory representatives of equipment manufacturers.
- H. Provide to owner at time of final inspection, 4 sets of keys for cabinets, panelboards and key interlocked systems specified herein or indicated.

1.21 ELECTRICAL WIRING AND EQUIPMENT FOR DIVISION 15

- A. All power connections and wiring for equipment furnished under DIVISION 15 - MECHANICAL shall be the responsibility of the Electrical Contractor under DIVISION 16 - ELECTRICAL, except that control wiring for Automatic Temperature Controls (ATC) specified in Section 15950 shall be the responsibility of the Division 15 Contractor. Line disconnecting or protective devices shall be furnished and installed by the Division 16 Contractor unless specified under DIVISION 15 to be furnished as integral part of equipment (control panel) with such equipment. Motor starters, variable frequency drives and contractors required to operate the equipment shall be furnished and installed by the DIVISION 16 Contractor. Motor starters specified to be integral to mechanical equipment shall be furnished by the respective Contractor furnishing such equipment.
- B. Where controllers, starters, etc., are furnished as an integral part of any equipment, the Contractor supplying the equipment shall also furnish complete control wiring between controllers, starters and motors, unless otherwise noted.
- C. The Division 15 Contractor shall set all motors and furnish, set and pipe, as necessary, the flow and pressure switches, temperature control and other special automatic temperature controls.
- D. The Division 15 Contractor shall furnish the Division 16 Contractor with complete wiring diagrams as required.
- E. All motors shall be of size; class and type suited for the purpose intended and conform with the latest standards of the IEEE and NEMA. Electric motors shall be designed for continuous duty, 40°F temperature rise, with sliding bases unless directly connected. All belted fan motors shall have adjustable pitch sheaves for approved V-belts and protected with guards.

- F. Current characteristics shall be 120 volts, single phase, 60 cycle, alternating current for all fractional horsepower motors under 3/4 HP, unless otherwise noted.
- G. All motors 1 HP and over shall be suitable for the voltage indicated, three phase, 60 cycle, alternating current, unless otherwise noted or required.
- H. The Division 15 Contractor under his section of the specifications shall be completely responsible for the ATC wiring incidental to the temperature control system. The full extent of this work depends on the particular equipment being furnished. All control and electrical power interlocks shall be installed in accordance with the respective manufacturer's recommendations and coordinated by the Division 15 and Division 16 Contractors.
- I. All electrical equipment and prewiring of control devices and equipment shall conform to the requirements of the National Electrical Code, NEMA and the authorities having jurisdiction.

1.22 CONSTRUCTION SAFETY

- A. Each contractor including the general contractor and/or construction manager shall be responsible for compliance with all local, state and federal laws which pertain to the safeguarding of life, limb and health of employees, inspection personnel and passerby, on, about, or adjacent to the construction area.
- B. This requirement is a contractual obligation, and it shall remain in effect for the duration of the contract, from the commencement of the work to the time of completion.
- C. The following standards shall also be observed where applicable: The National Fire Codes as published by the National Fire Protection Association and the Occupational Safety and Health Act. (OSHA).
- D. The contractor shall be governed by all regulations in effect at the time of the signing of the contracts, and he shall consult all additional local, state and federal regulations that have a bearing on the work.
- E. The A/E is not responsible for the contractor's failure to maintain safe working conditions on the project or for the contractor's failure to install his work in a safe manner. The A/E had not been retained to provide ongoing supervision or direction of the contractor's work. Any visitations to the job site by the A/E, either periodic or random, should not be construed to relieve the contractor of his sole obligation to maintain safe and proper conditions for workmen or the general public. Each contractor agrees to indemnify and hold the engineer harmless from any claim made by any party arising out of any alleged unsafe working conduit.

1.23 TEMPORARY OFFICE AND STORAGE FACILITIES

- A. The contractor shall provide his own shanty, conex, trailer, or other temporary office and storage spaces that he may require, and upon the completion of the work, he shall remove the temporary office and storage from theft or damage of his equipment and materials.

PART 2 - PRODUCTS

2.01 QUALITY OF MATERIALS

- A. Where a specific model and manufacturer of equipment is specified, the Contractor shall provide what is specified without substitution. Where specified as "Substitutions: Follow Division 1." the Contractor may substitute equipment except that the burden is upon the Bidder to prove such equality. If the Bidder elects to prove such equality, he must request the approval of the Engineer in writing, to substitute such item for the specified item, stating the cost difference involved with supporting data, and samples, if required, to permit a fair evaluation of the proposed substitute with respect to quality, serviceability, warranty and cost.
- B. The naming of alternate manufacturers within the contract documents is no assurance that the offering of a substitution by the contractor of an alternate named item will be accepted by the engineer. The liability and responsibility for the proper performance of any substituted or alternate material or method is solely to be borne by the entity initiating the proposed change. The A/E has not, as part of the design process, designed a system to be necessarily compatible with named alternate items. The use of alternate named items may require other changes to the design which may impact on the overall cost. Any such changes or costs shall be borne by the contractor proposing the use of the alternate item.

2.02 MANUFACTURERS SERVICE ORGANIZATION

- A. Manufacturers furnishing major pieces of equipment or systems shall provide proof that they have within four hour travel time of the project a reliable service organization which can if necessary, provide service personnel and parts. This shall include such systems as fire alarm and equipment such as standby emergency generators which may require a trained service technician.
- B. It shall be understood by manufacturers whose equipment is accepted that trained service personnel shall be available to the Contractor to assist in any problems he may encounter at the job site. The Contractor shall give the manufacturer one (1) week's notice in advance when he requires assistance at the site. In emergency cases, the manufacturer will be expected to have a representative at the site within 24 hours after notification.
- C. Manufacturers who cannot comply with the above will not be considered acceptable.

2.03 MANUFACTURED PRODUCTS

- A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts should be available. Items not meeting this requirement, but which otherwise meet technical specifications, and merits of which can be established through reliable test reports or physical examination of representative samples, will be considered.
- B. When more than one unit of the same class of equipment or material is required, such units shall be the products of a single manufacturer.

- C. Equipment Assemblies and Components:
 - 1. All components of an assembled unit need not be products of the same manufacturer.
 - 2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
 - 3. Components shall be compatible with each other and with the total assembly for the intended service.
 - 4. Constituent parts which are similar shall be the product of a single manufacturer.
 - 5. Moving parts of any element of equipment of the unit normally requiring lubrication, shall have means provided for such lubrication, and shall be adequately lubricated at factory prior to delivery.
- D. All Factory wiring shall be identified on the equipment being furnished and on all wiring diagrams.
- E. When Factory Testing Is Specified:
 - 1. A/E shall have the option of witnessing factory tests. The Contractor shall notify the A/E a minimum of 15 working days prior to the manufacturer's making the factory tests.
 - 2. Four copies of certified test reports containing all test data shall be furnished to the A/E prior to final inspection and not more than 90 days after completion of tests.
 - 3. When equipment fails to meet factory test and reinspection is required, the contractor shall be liable for all additional expenses.
 - 4. This Contractor shall insure that all materials and equipment furnished under this Division have been given standard commercial tests prior to delivery to the site. He shall adjust and calibrate the equipment as may be required.
- F. Furnish all labor, materials and equipment as required by the A/E in the making of any examinations or tests of the work during the course of construction.

PART 3 - EXECUTION

3.01 EQUIPMENT INSTALLATION AND REQUIREMENTS

- A. Installation:
 - 1. "Install" as used on the drawings and in the specifications shall mean, install, connect, adjust and test except where otherwise specified.
- B. Equipment Location: Shall be as close as practicable to locations shown on drawings.
- C. Working spaces shall be not less than specified in the National Electrical Code for all voltages specified.

- D. Inaccessible Equipment:
1. Where A/E determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled as directed at no additional cost.
 2. "Conveniently accessible" is defined as being capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping, and duct work.
- E. Equipment and Materials:
1. New equipment and materials shall be installed unless otherwise specified.
 2. Equipment and materials shall be designed to assure satisfactory operation and operating life for environmental conditions where being installed. NEC and other code requirements shall apply to the installation in areas requiring special protection such as explosion-proof, vapor-proof, watertight and weatherproof construction.
 3. The equipment and materials under this Division of the specifications shall be installed in accordance with the recommendations of the respective manufacturer.
- F. This Contractor shall cooperate and coordinate his work with the other trades. The locations of pipes, ducts, conduits, panelboards, lighting outlets, air outlets, motor controls and other equipment must be coordinated in order to avoid any interferences or placing services at the wrong locations. Exact locations of outlets, conduits and other materials and equipment must be coordinated with and approved by the Engineer.
- G. All materials and equipment shall be properly isolated against the transmission of vibration or noise to any part of the building. Correct sound or vibration conditions considered objectionable by architect and owner at contractor's expense, and without cost to owner.
- H. Investigate the structural and finish conditions affecting the work.
- I. Offsets, bends or other items required by the work may not be shown due to the small scale of the drawings; provide such offsets, bends or other items as required to meet structural or finish conditions.
- J. Coordinate and be responsible for the required clearances of the work in shafts, chases, double partitions and suspended ceilings. Coordinate and cooperate with the trades responsible for construction such spaces, together with other trades sharing such spaces, and advise other trades of the requirements of the work. Immediately submit for review space requirements that exceed those shown.
- K. Install material and equipment as high as possible; at minimum, to clear the top of all doors, windows and other structural openings. Maintain maximum headroom and space conditions in every case. Where headroom or space conditions appear inadequate, notify the architect before proceeding with installation.
- L. Install conduit, fittings, etc., to provide not less than 1/2" between their finished covering and the structure for adjacent work of any kind.

- M. Make reasonable modifications in the layout of the work, as directed, to provide proper clearances or accessibility, or to prevent conflict with the work or other trades, at no increase in the contract sum.
- N. Cooperate fully with the contractor for general construction in regard to location of electrical equipment and work progress schedules. Notify him of all flush panelboard location so that wall of proper thickness is provided.
- O. Prepare large scale composite working drawings, including such section views and details as are necessary to clearly show how the work is to be installed in relation to the work of other trades. Issue such drawings to the other trades for coordination of their work. Where such drawing show deviation from the contract drawings or conflict with other trades, detail and submit such deviation or conflicts to the architect for review.
- P. If work is installed before coordination with all other trades and owner's work, or so as to cause interference with the work of other trades, or so as not to provide proper access for maintenance or repair, make necessary changes in work to correct the condition at no cost to the owner.

3.02 CHASES, RECESSES AND OPENINGS

- A. The General Contractor shall be responsible for providing all chases, recesses and openings in the new construction when this Contractor under this Division complies with the following:
 - 1. This Contractor under this Division requiring an opening, chase or recess in the new construction for his work shall furnish the General Contractor with the exact location, size and other necessary information in ample time to have them incorporated into the new structure during construction as approved by the Engineer.
 - 2. If the Division 16 Contractor under this Division fails to comply with the above information requirements, then he shall do the necessary cutting and patching at his own expense under the direct supervision of the General Contractor and as approved by the A/E.
 - a. Any cutting and patching effecting the new roof construction shall be performed by the General Contractor at this Contractor's expense.
 - 3. Where openings in masonry are required which have not been provided for through the approved sleeve drawings, they shall be made by coring only.
 - 4. Contractor shall comply with all restrictions delineated in the structural drawings and applicable specification section for cutting openings in masonry walls, precast concrete floor/roof systems or other structural systems.
 - 5. Where concealed work proves to be defective during the guarantee period, the contractor shall engage the services of trades that installed the original work to remove the walls, ceiling, or other required work. The contractor shall correct the effective installation. The walls, ceiling, etc., shall be replaced by the general contractor to match the adjacent finish. All costs involved in this phase of the work shall be borne by the contractor.

3.03 SLEEVES

- A. Sleeves shall be installed in all construction. Sleeves shall be standard weight iron pipe for passing conduits. The pipe sleeves shall be two pipe sizes larger than passing conduit and extend approximately 2" above finished floor or through the wall.
- B. Sleeves shall be the proper design for waterproofing and flashing around the sleeves where required. Provide approved waterproofing.
- C. Base flashing shall be the responsibility of the General Contractor. Counterflashing shall be as specified under Division 1 Specifications, and furnished and installed by this Contractor under his section of the specifications, unless otherwise shown or specified.
- D. This Contractor shall furnish the sleeves and set them in the new construction as required for the installation of his work.
- E. Sleeve drawings shall be prepared by this Contractor and submitted for coordination to the Contractor responsible for the structural system being penetrated prior to submittal to the A/E for approval prior to the setting of sleeves.

3.04 THRU-PENETRATIONS FIRE STOPPING

- A. Fire stopping of thru-penetrations such as floors and partitions shall be performed in accordance with the guidelines set forth in the current UL Fire Resistance Directory. Work shall be installed in accordance with the local authority having jurisdiction.
- B. Where sleeves containing a single conduit penetrate FIRE RATED walls, floors, partitions or slabs, fill and seal conduit to the sleeve with a 1-part intumescent caulk/putty sealant creating a fire stop equal to or exceeding fire rating of construction material being penetrated. Fire sealant shall prevent spread of flame, smoke, air and water through the sleeve and shall pass 3 hour test per ASTM E814 and UL 1479. Fire sealant shall be installed in accordance with manufacturer's written instructions.
- C. Where sleeves containing multiple conduits or multiple cables penetrate FIRE RATED walls, floors, partitions, or slabs, fill and seal spaces between the conduits or cables and the sleeve with 2-part intumescent foam sealant creating a fire stop equal to or exceeding fire rating of construction material being penetrated. Fire sealant shall prevent spread of flame, smoke, air and water through the sleeve and shall pass 3 hour test per ASTM E814 and UL 1479. Fire sealant shall be installed in accordance with manufacturer's written instructions.
- D. Where sleeves penetrate exterior walls, fill and seal ends around conduits and/or cables with duct sealant compound or Link Seal. Install seals in accordance with the manufacturer's recommendations to provide air tightness above ground and hydrostatic sealing below grade. Caulking or other type mastic is not acceptable.
- E. Where outlet boxes or junction boxes are located in fire rated walls, provide code compliant putty pad or box guard as manufactured by Rectorseal.

3.05 FASTENINGS, SUPPORTS AND HANGERS

- A. Provide materials, equipment, supplies and labor necessary as required to adequately support, brace and strengthen all equipment and materials furnished as part of this work.
- B. Conduit Supports
 - 1. Single Runs: Galvanized conduit straps or ring bolt type hangers with specialty spring clips. Do not use plumbers' perforated straps. Maximum spacing 8 feet on centers.
 - 2. Multiple Runs: (three or more parallel raceways) Conduit channel trapeze rack with 25% spare capacity. "U" bolt conduits to rack.
 - 3. Vertical Runs: Channel support with "U" bolt type conduit fittings.
 - 4. Support conduits securely and independently so that strain will not be transmitted to outlet and pull box supports. Supports shall be sufficiently rigid to prevent distortion of conduits during wire pulling. Provide supports on both sides of expansion joint fittings.
 - 5. Secure flexible metal conduit and armored cable by staples, straps or similar approved fittings, designed and installed not to injure cable. Cable secured in place at intervals not exceeding 4 1/2 feet and within 12 inches from every cabinet, box or device.
- C. General Equipment Supports
 - 1. Support groups of conduits, switches, starters and apparatus on channel-type steel framing, bolted together and braced to form a rigid structure securely anchored to floor and ceiling slabs.
 - 2. Support raceways, boxes, cable trays, flexible cable and wireways above suspended ceilings directly from structure, independent of ceiling system, duct, piping or other work.
 - 3. Equipment, conduit, tray and all other electrical components shall be supported by means meeting the seismic requirements of International Building Code and all other applicable codes.
- D. Anchor Methods
 - 1. Hollow Masonry: Toggle bolts or spider type expansion anchors.
 - 2. Solid Masonry: Lead expansion anchors or preset inserts. Do not use wooden plugs or anchors, lead caulking anchors or plastic anchors.
 - 3. Metal Surfaces: Machine screws, bolts or welded studs.
 - 4. Wood Surfaces: Wood screws.
 - 5. Concrete Surfaces: Self-drilling expansion anchors or powder-driven studs.
 - 6. Structural Steel: Beam clamps, angle clips welded or powder-driven studs.

7. Exterior: Anchors, screws, bolts, etc., exposed to weather and corrosion shall be rustproof finished or nonferrous material.

E. Seismic Restraints

1. Where required, provide seismic restraints in accordance with applicable code

3.06 ACCESS DOORS

- A. Access doors, not less than 12" x 12", and of the type to suit application, shall be furnished by the Division 16 Contractor and installed by the General Contractor where required for access to concealed junction/pullboxes, devices and other equipment. This Contractor shall furnish the General Contractor with the location and access requirements for all equipment furnished and installed under this Division.

3.07 ESCUTCHEON PLATES

- A. Where conduits are exposed in finished areas, provide heavy malleable iron type, enamel painted escutcheon plates.

3.08 EXCAVATING AND BACKFILLING

- A. The Division 16 Contractor under this section of the specifications shall be responsible for the excavation, backfilling, shoring and care for all ground water for the complete installation of his work.
- B. The Division 16 Contractor shall also provide suitable indemnity for all accidents to humans, animals or equipment caused by his excavation work. He shall provide suitable guards or barricades, red lanterns, flares and other precautions for an approved and safe installation.

3.09 EXPANSION AND VIBRATION PROVISIONS

- A. Expansion fittings in raceways shall be installed at all building construction expansion joints.
- B. Flexible raceways shall be used at all motor connections and wherever required to isolate equipment from the structure.

3.10 CONNECTIONS TO EQUIPMENT BY OTHERS

- A. The Contractor shall furnish all disconnecting devices where required, wiring, labor and final connections to electrically operated equipment furnished for this project by the Division 15 Contractors, General Contractor and their subcontractors.

- B. The aforementioned Contractors shall install all motors as part of their equipment and furnish all starters and push-button controllers to the Division 16 Contractor for installation, except where starters and push-button controllers are indicated to be installed in a motor control center which shall be provided by the Division 16 Contractor.
- C. All temperature control wiring, except as shown or noted, will be furnished and installed by the automatic temperature control subcontractor. The Division 16 Contractor shall furnish and install all power wiring up to and connect same to the A.T.C. panels and equipment.

3.11 TESTS

- A. On completion of the contract work, the installation shall be entirely free from grounds and short circuits and a thorough test shall be made and written report furnished to Owner.
- B. At the time of final inspection and test, all connections at panels and fixtures and all splices shall have been made. All fuses and circuit breakers must be in place and circuits continuous from service switches to all lamp sockets, receptacles, motors, etc. The entire wiring system shall have an insulation resistance between conductors and between conductors and ground based on minimum load, not less than the requirements of the latest edition of the National Electrical Code.
- C. The insulation resistance between all current carrying parts on switchboards and panelboards shall be at least one (1) Megohm.
- D. The Contractor shall be required to take amprobe readings of all motors installed under this Contract, preferably with the Contractor responsible for the driven equipment. These readings shall be recorded and delivered to the A/E. Where actual current draw exceeds the nameplate rating the Contractor shall tag the motor control "Do Not Operate" and notify the Contractor responsible for the motor immediately, to determine what adjustments can be made to bring the actual current drawn within the allowable nameplate ratings. Overload heaters shall be inspected, verified and recorded that they are of the proper size. A copy of the record shall be forwarded to the Owner.
- E. All feeders and branch circuits below 600 volts shall be meggered with a 1000 volt megger between phase conductors and between phase conductors and ground. All connections and splices shall be made and all overcurrent devices in place before the test is made.
- F. Resistance tests of the ground source shall be made on all cables, bus work and transformer windings to ground.
- G. All circuits, which under any circumstances could be paralleled, shall be tested for proper phasing using hot phasing or other approved techniques.
- H. Full load currents of all feeders serving single-phase loads shall be measured. If necessary, branch circuits shall be reconnected to achieve a good load balance on each phase.
- I. Proper operation of all control and alarm circuits shall be demonstrated.

- J. Three (3) copies of the reports on all field tests shall be turned over to the Owner.
- K. This Contractor shall perform electrical continuity tests and megohmmeter tests of the entire installation, voltage level, load balance and high-potential tests where specified and required, other miscellaneous tests, and shall also perform start-up tests of all equipment furnished, installed or connected under this Division. All labor, materials and equipment required to perform these tests, and corrections required by their results, shall be furnished by this Contractor, as part of this Contract.

3.12 CLEANING

- A. The raceway systems, materials, equipment and fixtures shall be completely and thoroughly cleaned prior to testing and placing the systems in operation.
- B. The Contractor shall at all times keep the premises free from the accumulation of waste materials or rubbish caused by his employees or work. At the completion of the work he shall remove all superfluous materials, equipment and debris resulting from the work.

3.13 COORDINATION WITH EXISTING UTILITIES

- A. The Contractor must coordinate with the owner and the authorized representative of the existing site utilities. Call State-One-Call System for confirmation of underground utilities.
- B. Caution shall be exercised in avoiding interference with or damage to all existing underground utilities not in this contract during the installation of new work.
- C. Arrange and pay for the relocation, disconnection or removal of existing utilities and services where shown and where such utilities or services interfere with new construction, whether shown or not. Provide all excavation, backfilling and paving, manholes, and cables required by such work.
- D. Perform alteration of utilities and services in accordance with the rules, regulations and requirements of the involved utility companies and regulatory agencies having jurisdiction.

END OF SECTION

SECTION 16111
CONDUITS AND OUTLET BOXES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Wherever the terms "conduit" or "raceway" appear hereinafter, it shall be understood to mean any one or combination of the following types:
 - 1. Electrical metallic tubing (EMT).
 - 2. Flexible metallic conduit.
 - 3. Non-Metallic (PVC).
 - 4. Liquid tight flexible metal conduit.
- B. Conduits shall comply with NEMA standards. All components shall be UL listed and labeled.

1.02 SUBMITTALS

- A. Submit manufacturer's data, including specification, installation instructions and general recommendations for each type of raceway required.

PART 2 - PRODUCTS

2.01 ELECTRICAL METALLIC TUBING AND FITTINGS

- A. Electrical metallic tubing shall be standard hot dipped galvanized thin wall steel conduit conforming to the latest edition of Federal Specification WW-C-563 and ANSI C80.3.
- B. Fittings for EMT shall be setscrew or compression type and where buried in masonry or concrete, shall be concrete tight type. In wet and exterior locations use raintight type. Indentor type fittings are not acceptable.
- C. Electrical metallic tubing shall be manufactured by:
 - 1. Allied.
 - 2. Triangle.
 - 3. National Electric.
 - 4. Substitutions: Follow Division 1.

2.02 FLEXIBLE METAL CONDUIT

- A. Flexible metal conduit shall conform to the requirements of Federal Specification WW-C-566 and NEC-350, and made of heavily zinc-coated sheet metal strip in interlocked construction.
- B. Connectors for flexible metallic conduit shall be the angle wedge with nylon insulated throat.
- C. Flexible raceway shall only be permitted at motor terminal boxes not to exceed thirty (30) inches in length.
- D. Fittings shall have nylon-insulated throat conforming to Federal Specification W-406, Type 1, Class A, Style A.

2.03 NON-METALLIC (PVC) CONDUIT

- A. Rigid non-metallic polyvinyl-chloride conduits (PVC) shall be Schedule 40 Heavy Wall. PVC joints shall be solvent welded and watertight.
- B. PVC Conduits shall be manufactured by:
 - 1. Carlon.
 - 2. Allied.
 - 3. Substitutions: Follow Division 1.

2.04 LIQUID-TIGHT FLEXIBLE METAL CONDUIT

- A. Liquid-tight shall be metal conduit constructed of single strip, flexible, continuous, interlocked and double wrapped steel; galvanized inside and outside and coated with pre-jacket.
- B. Fittings for liquid-tight shall conform to Federal Specification W-406, Type 1, Class 3, Style G.

2.05 JUNCTION BOXES AND PULL BOXES

- A. Junction and Pull boxes shall be hot dipped galvanized sheet steel and code thickness with welded seams. Junction and pull boxes shall be installed where required by the National Electrical Code. Each box shall be provided with removable cover with stainless steel screws. Boxes shall be smooth, square and true, shall be set parallel with the walls and ceilings, and shall not be placed in locations made inaccessible by piping, ducts or other equipment.
- B. Junction boxes shall be proper depth and proportions to house wiring within, without harming insulation, and without the necessity of forcing covers in place.
- C. Boxes 12" x 12" or smaller shall be No. 14 gauge, between 12" x 12" and 24" x 30", No. 12, and boxes larger than 24 inches by 30 inches, No. 10 ga.

- D. Use exposed boxes in unfinished areas such as mechanical/electrical rooms, utility and storage rooms and above removable ceilings. Use flush boxes in finished areas and in nonremovable ceilings using overlapping prime-painted covers with flush head screws.
- E. Use hot dip galvanized steel boxes in outdoor applications or where box is exposed to water or moisture. Boxes shall be provided with gasketed covers.
- F. Boxes shall be manufactured by Appleton, Mid-land Ross, O-Z Gedney, RACO, Steel City or T&B.

2.06 OUTLET BOXES

- A. Outlet shall be hot dipped galvanized sheet steel and code thickness: Provide boxes with knockout openings in bottom and sides, corrosion resistant cover and grounding screws.
- B. Furnish and install for each outlet indicated, an outlet box suited to the use for which the outlet is intended and to the location in which it occurs. The number of conductors in outlet boxes shall not exceed the maximum number of conductors as determined by the N.E.C.
- C. Outlet boxes shall be not less than 1-1/2" deep and 4" square. Multiple gang boxes shall be not less than 2-1/2" deep.
- D. Flush mounted outlet boxes in plastered ceilings and walls shall be 4" x 1" deep square, with 3/4" minimum depth plaster cover.
- E. Outlet boxes on the exterior of the building including those under overhangs or canopies shall be of cast rust-resistant metal with heavy threaded hubs for use with rigid conduit, except as specified herein. Cast metal boxes used indoors shall have flat faces (no ridges) to accommodate standard device plates. Cast metal boxes used on the exterior of the building shall be equipped with gaskets.
- F. Provide plaster ring for single or 2 gang outlets as required.

PART 3 - EXECUTION

3.01 GENERAL CONDUIT INSTALLATION

- A. All conduit shall be concealed in finished areas.
- B. A separation of six inches (6") shall be maintained between all conduits and hot water and steam lines in the building. When conduits and hot water and steam lines are closer than six (6") inches, an approved insulation covering shall be used on the conduit.
- C. Each end of every conduit run terminating in a pressed steel box of any type shall be provided with a galvanized or sherardized locknut inside and outside the box and with an approved bushing. Locknuts shall be tightened properly to assure electrical continuity of conduit system. Bushings shall be of the insulating type.

- D. Conduit expansion fittings complete with grounding jumpers shall be provided at all places where conduits cross expansion joints and also in all straight runs of conduit 200 feet or longer. Conduits shall cross expansion joints at right angles to the joints.
- E. Manufactured ells shall be used for all ninety-degree bends in conduits 1" and larger. All other bends in raceways shall be of the prefabricated type or machine-made without kinks. Couplings shall be pulled up tight to provide a good electrical bond with all joints watertight. Running threads shall not be permitted. Approved unions or Erickson couplings may be used where required. Bends in concealed conduit runs shall be of the long radius type.
- F. Thoroughly swab and clean out all conduits before installing conductors. Do not install wire in conduits until all conduit work is completed and building is closed.
- G. Pipe sleeves shall be installed where conduits pass through concrete beams or foundation walls. The sleeves shall be set by the Electrical Contractor.
- H. Horizontal conduit runs shall not be installed in masonry walls.
- I. Minimum size of raceways shall be 3/4".
- J. Changes in direction of runs shall be made with symmetrical bends or cast metal fittings. Field-made bends and offsets shall be made with an approved hickey or conduit-bending machine. Crushed or deformed raceways shall not be installed. Trapped raceways in damp and wet locations shall be avoided where possible. Care shall be taken to prevent the lodgment of plaster, dirt or trash in raceways, boxes, fittings and equipment during the course of construction. Clogged raceways shall be entirely free of obstruction or shall be replaced.
- K. Conduits stubbed up through concrete floors for connections to free-standing equipment shall be provided with a short elbow and an adjustable brass top or coupling of brass or bronze threaded inside for plugs, set flush with the finished floor. Wiring shall be extended in rigid threaded conduit to equipment, except that, where required, flexible conduit may be used 6" above the floor. Screwdriver-operated threaded flush plugs shall be installed in conduits from which no equipment connections are made.
- L. All raceways and related fittings and appurtenances in concrete construction shall be approved by the Architect. In general, the following criteria shall be met in the installation of raceways in concrete:
 - 1. When conduits or pipes embedded in slabs are of larger outside diameter than 1", or when they come closer than 1" from either upper or lower surface of the slab, expanded metal or wire mesh shall be laid and extended beyond such conduit or piping at least 8" on all sides.
 - 2. Conduits or pipes shall be spaced not closer than three diameters on centers and they must be so placed as to avoid changing the locations of the reinforcement.
 - 3. No conduits or sleeves shall be placed in beams or slab bands unless approved by and coordinated with the Architect/Engineer.

4. Except when plan of conduits and pipes are approved by the Architect/Engineer, embedded pipes or conduits, other than those merely passing through, shall not be larger in outside diameter than one-third the thickness of the slab, wall or beam in which they are embedded.
- M. All conduits shall be secured and supported from the structure. Conduits shall be fastened to all outlet boxes and cabinets with two locknuts where insulating bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, a single locknut and bushing may be used. All conduit clamps and fasteners shall be galvanized or enamel painted similar to steel raceways.
- N. In all instances, where recessed type panelboards are installed, provide (3) 1" conduits for future use. These conduits shall be extended between the panelboard cabinet and a convenient location above the ceiling construction or as required by the Architect.
- O. The Electrical Contractor may furnish and install electrical metallic tubing in all locations except:
 1. Underground.
 2. In gravel or other sub-base floor fills.
 3. Horizontal runs in concrete floor slabs.
 4. In masonry walls below grade.
 5. Vertically in poured concrete walls.
 6. Exposed in any weatherproof area.
 7. Subject to damage.
 8. Hazardous areas.
- P. PVC conduit shall be installed in all areas and locations where EMT is not permitted for service.
- Q. Aluminum conduit shall not be used.
- R. No more than four (4) right angle bends shall be permitted in a conduit run between any two terminations or pull boxes. In long conduit runs, pull boxes shall be used every 100 feet maximum.
- S. All conduit ends shall be square cut and reamed to remove burrs. All concealed conduits shall be run as straight and direct as possible to reduce the number of bends. Conduits shall be installed in such a manner that wire may be easily removed and replaced at any later date.
- T. All empty conduits for future use shall be provided with 200-lb. nylon pull lines. Cap and plug all empty conduits.
- U. Make final corrections to motor and movable equipment in dry locations with flexible metallic conduit. In damp or wet locations use liquid tight flexible metallic conduit with liquid tight connectors.

- V. Use flexible conduit or tubing for the 72 inch maximum fixture connection above suspended ceiling.

3.02 UNDERGROUND CONDUIT INSTALLATION

- A. Provide underground ducts in a straight line. Slope ducts toward spliceboxes/manholes. Pockets where water can accumulate in conduits will not be permitted.
- B. All underground conduits shall be watertight. Dope threads of steel conduit before joining. PVC conduits shall be chemically bonded around entire circumference of the conduit at each joint.
- C. Provide all required excavation trenching, backfilling, compacting in accord with this Division. Refer to general contract specifications, and comply with all requirements.
- D. Provide, in trench containing electric and communication duct systems, an underground utility marking tape. Tape shall be buried 1 foot below grade and run continuous the entire length of duct trench. Tape shall have magnetic strip and shall be brightly colored polyethylene long life type with printed warning to read "CAUTION, BURIED ELECTRIC LINE BELOW".
- E. Underground exterior lighting circuits and gate circuits shall be installed in PVC conduit.
- F. Provide approved grounding conductor in all nonmetallic conduit.

3.03 OUTLET BOX INSTALLATION

- A. Mount outlet boxes flush in areas other than mechanical rooms, electrical rooms, and above removable ceilings. Secure firmly in place and set true and square with finished surfaces.
- B. Adjust position of outlets on finished masonry walls in line with and perpendicular to masonry course lines.
- C. Locate boxes in masonry walls so that only a corner need be cut from masonry units.
- D. Do not install boxes back-to-back in same wall. Coordinate cutting of masonry walls to achieve neat openings for boxes. Use rotary cutting equipment to cut masonry for installation of electrical fittings.
- E. Do not use sectional or handy boxes unless specifically directed.
- F. For boxes mounted in exterior walls install insulation behind outlet boxes to prevent condensation in boxes and air movement.
- G. For outlets mounted above counters, benches or splashbacks, coordinate location and mounting heights with built-in units. Adjust outlet mounting height to agree with required location for equipment served.

END OF SECTION

SECTION 16120

CONDUCTORS AND CABLE (600 VOLT)

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Unless otherwise noted on the drawing, all wire and cable for power, lighting and control wiring shall be single conductor, 98% conductivity at 20°C, copper, labeled by Underwriters' Laboratory, and shall conform to the latest requirements of the current edition of NEC and shall comply with the latest standard of the IPCEA.
- B. All wire and cable shall be marked with identification in accordance with the regulations of the Underwriters' Laboratory.
- C. Wire in sizes up to No. 10 AWG inclusive shall be solid; No. 8 AWG and larger, stranded.
- D. The minimum sizes of wire shall be as follows:
 - 1. Lighting, convenience outlets and power circuits No. 12 AWG.
 - 2. Signal circuits as indicated on drawings.
 - 3. Control circuits No. 14 AWG.
- E. Except in the case of a motor circuit, minimum size wire shall be compatible with size of circuit breaker protecting same, i.e., 30A breaker, use No. 10 wire; 50-amp breaker, use No. 6 wire.
- F. Minimum size wire for 120V home runs in excess of 100 feet shall be No. 10.
- G. Conduit sizes shown on drawings are based on copper conductors with THHN insulation.
- H. Where conductors connect directly to equipment, the insulation temperature rating of the conductor shall meet or exceed the equipment temperature rating.

1.02 SUBMITTALS

- A. Submit manufacturer's data on electric wire, cable and connectors.

1.03 MANUFACTURER

- A. Wire and cable shall be manufactured by:
 - 1. Advance Wire and Cable.
 - 2. AFC Cable Systems.
 - 3. General Cable.
 - 4. Hi-temp Wires.

5. Rome Cable.
6. Southwire.
7. Triangle.
8. Pyrotenax.
9. Raychem.
10. Substitution: Follow Division 1.

PART 2 - PRODUCTS

2.01 WIRE AND CABLE

- A. Unless indicated otherwise, all wire and cable utilized for general wiring shall be single conductor copper and insulated with a color-coded thermoplastic material.
- B. All wire and cable assemblies shall be UL listed for their intended application.
- C. The following types are acceptable: THW, THHN, XHHW or THWN insulation:
 1. Type THW 75°C.
 2. Type THHN or XHHW 90°C. (If utilized, provide the same gauge as THW; do not use equivalent ampere rating.)
 3. Exterior wiring shall be THWN insulation.
- D. Nonmetallic sheathed cable, Type NM, shall have a temperature rating of 90°C, copper conductors, 600 volt insulation, with moisture resistant, flame retardant, non-metallic outer sheath and insulated grounding conductor. Outer sheath shall be color coded, identifying conductor size.
- E. Underground feeder cable, Type UF, shall have a temperature rating of 90°C, copper conductors, 600 volt insulation with moisture resistant, sunlight resistant, fungus resistant gray PVC outer jacket and non-insulated grounding conductor.
- F. Service entrance cable, Type SE, shall have a temperature rating of 90°C, aluminum conductors, 600 volt insulation, with moisture resistant, sunlight resistant, gray PVC outer jacket, insulated neutral, and non-insulated grounding conductor.
- G. Armored Cable, Type AC, shall have a temperature rating of 90°C, copper conductors, 600 volt insulation, with galvanized interlocking steel strip armor, paper wrap conductor insulation covering and non-insulated bonding strip.
- H. Metal clad cable, Type MC, shall have a temperature rating of 90°C, copper conductors, 600 volt insulation, with galvanized interlocking steel strip armor, polypropylene tape assembly cover and insulated green grounding conductor.

2.02 CONNECTORS

- A. Bolted Pressure Connectors.
 - 1. O.Z. Gedney.
- B. Crimp or compression type connectors shall be as manufactured by:
 - 1. Ideal Industries, Inc.
 - 2. Thomas and Betts Company.
 - 3. Penn Union.
- C. Tape shall be as manufactured by:
 - 1. Minnesota Mining and Manufacturing Company (3M).
 - 2. Greenlee.
 - 3. Marsh.
- D. Connectors and terminations shall be approved for type of conductor or cable assembly specified.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. All wiring shall be run in conduit as specified herein or shown on the plans and shall be installed in accordance with the applicable provisions of the NEC.
- B. Care shall be exercised while installing wires in the conduits so as not to injure the insulation. Approved compound shall be used to assist in the pulling of wires.
- C. No wire shall be installed in such conduits until the construction has progressed to such a stage that there will be no possibility of water entering the conduit.
- D. Where permitted herein, and by NEC and authority having jurisdiction, specified cable assemblies may be utilized.
- E. Service entrance cable under jurisdiction of the utility company shall meet requirements of respective company.
- F. Grounding conductors and straps shall be copper. Run grounding conductors with their respective circuits and, unless noted otherwise, may be either bare or insulated wire. Insulated wire shall be colored green or an identifying band of green tape applied at all terminations, joints and junction or pull boxes.
- G. All wiring for emergency lighting and power circuits and fire alarm systems shall be in metallic raceways.
- H. Leave at least 6 inches of free conductor at each outlet box for making splices or connection to fixtures or devices.

- I. Where required by NEC section 517, wiring shall be installed in conduit.
- J. Where specifically shown or where approved by the Architect, install exposed branch circuit wiring in finished areas in formed metallic surface raceway systems using suitable factory fabricated fittings and devices as specified herein.
- K. Exercise great care in trunking branch circuits. All multiwire branch circuits shall have different phase legs so the neutral conductors will not be overloaded.
- L. A common neutral may not be used for more than one multiwire branch circuit and it must be run in the same raceway as its associated phase wires. The continuity of a neutral conductor shall not be dependent upon device connection, such as lampholders, receptacles, etc., where removal of such devices would interrupt the continuity of circuit.
- M. Use wire pulling lubricant in conduits for pulling No. 4 AWG and larger.
- N. All conductors of a parallel feeder shall be of the same length.
- O. Lace or clip groups of conductors at lighting and distribution panels, pull boxes and wireways.
- P. Where ground fault interrupting (GFI) branch circuits are indicated, provide a separate neutral conductor for each such branch circuit to its respective GFI breaker and terminal.
- Q. Where dimmers are provided, install a separate neutral conductor for each branch circuit.
- R. Protect cables from physical damage where necessary by conduit, pipe, guard strips or other approved means.
- S. Where groups of cables extend from surface-mounted panelboards, collector troughs, pull boxes or the like, secure and assemble them in an orderly manner on vertical cable trays or channel ladders.
- T. Not more than 4 cables shall be grouped or bundled together throughout the installation.
- U. Support all cable from building structure. Cables shall not be supported from piping, ductwork, suspended ceilings etc.
- V. Where feeder cables and signal circuits pass through the junction boxes, wire and cable circuits shall be identified as to service, circuit number and feeder designations.
- W. Circuit numbers noted on the drawings indicate panel circuit connections. No deviations from this circuit numbering will be permitted except by written permission of the Engineer.
- X. Splicing shall be at a minimum, as required and approved by the Engineers. All splicing shall be done in outlet boxes and junction boxes and not in conduit. All splices shall be made with crimp or compression type connectors or solderless connectors, and covered with plastic or rubber insulating tape. All connectors shall be installed so as to maintain a tight grip and good electrical connection between spliced conductors. Splices shall possess

equivalent or better mechanical strength and insulation ratings than conductors being spliced.

1. Solderless pressure connectors, properly taped and wire connectors of insulating material shall be used for all splices where practicable.
 2. Splices of #10 wire and smaller shall be made with approved type pressure connectors and spring-loaded insulating caps. Splices of #8 wire and larger shall be made with compression type sleeves and installed with a proper tool and then insulated to the same thickness as the original insulation with an approved type tape having high dielectric strength.
 3. Soldered mechanical joint insulated with tape shall not be used.
- Y. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque-tightening values. Where values are not given, comply with tightening torques specified in UL Standard 486A.
- Z. All conductors used in all systems shall have insulation that is inherently colored. All conductors of a system performing the same function shall be colored alike through the project.
1. Equipment grounding conductors for all systems shall be Green.
 2. On larger conductors, where colored insulation is not available, colored tape adhesive plastic bands 1 inch wide may be installed 6 inches maximum from the end of the conductor. Where passing through pull boxes without splice each conductor shall be banded.
 3. For 120/240 Volt System:

A Phase	Black
B Phase	Red
Neutral	White/Grey

3.02 PHASE ARRANGEMENT

- A. Exercise great care in maintaining a uniform and consistent arrangement of phase conductors on all systems. Throughout the entire wiring systems, each phase conductor must always be in the same physical position with respect to the other phase wires at equipment terminals.
- B. Identify phase wires by color coded conductors.
- C. Determine the existing established phase arrangement and use it throughout the renovation or addition.

3.03 600 VOLT WIRE AND CABLE TEST

- A. 600-volt wire shall be meggered with a 500-volt megger for one (1) minute, and values must be approximately as follows:

<u>Conductor Capacity Amperes</u>	<u>Resistance Ohms</u>
0 - 24	1,000,000
25 - 50	250,000
51 - 100	100,000
101 - 200	50,000

The above values shall be determined with panelboards, fuse holders, switches, and overcurrent devices in place. Devices containing semi-conductors, such as diodes, transistors, and other devices which can be damaged by the megger, shall not be connected during meggering. Wire and cable shall be meggered after installation, not on the reel.

- B. Wiring to be meggered shall be limited to branch circuit panels, individual pieces of mechanical equipment and all other similar equipment. Wiring for mechanical equipment connected to branch circuit panels shall also be meggered.
- C. The Contractor shall perform all phasing tests and shall make changes necessary to assure proper rotation of all motors, the correct phasing and phase sequence of all circuits susceptible to being paralleled, the proper polarity on all instrument transformer wiring, and such other phasing tests and changes as may be required for the equipment being connected under this contract.

END OF SECTION

SECTION 16140
WIRING DEVICES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Where indicated on the drawings, the Contractor shall furnish for every outlet indicated, devices and plates as called for in the notes, legends, or as specified.
- B. All wiring devices shall be specification grade unless catalog number noted calls for material of a different classification.

1.02 QUALITY ASSURANCE

- A. Wiring devices shall comply with NEC, UL 20, 486A, 498 and 943 pertaining to installation, IEEE Standard 241 and NEMA WD-1, WD-2 and WD-5.

1.03 SUBMITTALS

- A. Submit manufacturer's data on electrical wiring devices.

PART 2 - PRODUCTS

2.01 LOCAL SWITCHES

- A. Local switches shall be specification grade, AC rated, 20 ampere, 120/277 volt, toggle type, heat-resistant plastic housing and self grounding metal strap with specifically designed mechanism for quiet operation. Switches shall be of the flush type, mounted vertically. Switches shall be design for side or back wiring with up to Number 10 AWG wire.
- B. Color shall be white.
- C. Switches shall be single pole unless indicated or required to be three-way, four-way or double pole.
- D. Not more than one switch shall be installed in a single gang position.
- E. Pilot lights as required shall consist of yoke-mounted candelabra-base sockets rated 7.5 watts, 125 volts, fitted glass or plastic jewels. A clear 6-watt lamp shall be furnished and installed in each pilot switch. Jewels for use with switches controlling motors shall be green, and jewels for other purposes shall be red. Jewels shall be blue for switching or indicator lights.
- F. Switches: (Decora Style for Townhoumes)

1. Leviton – 5601-2W Series.

G. Switches/Jamb Type:

2.02 WALL BOX DIMMERS

- A. Wall box dimmers shall be solid state, semiconductor type capable of controlling light intensity of the complete range from off to full brightness in a Square Law Dimming curve. Dimmer shall incorporate separate control of intensity and on/off. Rotary controls will not be acceptable.
- B. All dimmers and switches shall provide power failure memory. Should power be interrupted and subsequently returned, the lights will come back on to the same levels set prior to the power interruption.
- C. Dimmers and switches shall meet ANSI/IEEE Std. C62.41-1980, tested to withstand voltage surges of up to 6000V and current surges of up to 200 A without damage.
- D. Dimmers and switches shall meet the UL 20-limited short circuit test requirement for snap switches.
- E. Dimmers shall be voltage regulated so that $\pm 10\%$ variation in line voltage shall cause not more than a $\pm 5\%$ variation in load voltage when dimmer is operating at 40V (5% light output).
- F. Dimmers shall be usable in three-way control configurations with solid state touch-control switches as provided by the specified dimmer manufacturer.
- G. Dimmers and touch-control switches shall be suitable for mounting in 1-gang flush outlet box or multiple ganging as recommended by the manufacturer. Faceplate shall snap on to device with no visible means of attachment. Heat-fins shall not be visible on front of device. Multi-ganged switches shall be mounted on a common, seamless faceplate. Dimmer ganging shall be accomplished as specified by the dimmer manufacturer to avoid de-rating. Contractor is responsible for coordination of proper backbox size and faceplate type.
- H. Dimmers shall be rated to carry the indicated load of fluorescent or incandescent light source at 120 or 277 volts in an ambient temperature of 120° F. Dimmers shall be UL listed. Dimmers controlling low-voltage fixture loads shall be rated for low-voltage loads.
- I. Color shall be white.
- J. Wall Box Dimmers:
 1. Leviton – ML Series, 350VA, 600VA or 1000VA to match load being controlled.

2.03 RECEPTACLES

- A. General Description:

1. All 120 volt convenience outlets shall be 20 amp, duplex-grounding type. Receptacles shall be designed to accept standard 2-wire parallel blade connector caps or 3-wire grounding type connector caps.
 2. Colors shall be white.
 3. Hubbell SnapConnect devices shall be acceptable.
 4. Acceptable Manufacturers:
 - a. Duplex Convenience Receptacles:
 - 1) Leviton 5325W.
- B. Ground Fault Receptacles:
1. Ground fault interrupter receptacles shall be hospital grade, duplex, 2-pole, 3-wire, U-grounding type, rated 20 amperes at 125 volts and having test and reset buttons. Receptacles shall be 8898-HG, [commercial 8899]. Ground fault circuit interrupter receptacles shall interrupt leakage currents between 4-6 M.A. having a maximum circuit current of 20 amperes. Employ feed through or non-feed through devices as indicated, and provide code required visual LED end of life function.
 - a. Ground Fault Circuit Interrupters:
 - 1) Arrow Hart XGF20B Series.
 - 2) Hubbell GFR5352L Series.
 - 3) Bryant GF53L Series.
- C. Weather Resistant Receptacles For Dwelling Units:
1. Receptacles shall have weather resistant label. Weatherproof receptacles shall consist of a GFI receptacles in a weatherproof cover designed to mount on a junction box to ensure weather protection for the receptacle.
 - a. The cover shall include a weatherproof cover/base assembly, a gasket, two universal inserts and mounting hardware. The weatherproof cover shall include two inserts to provide flexibility in installation. The outlet cover shall meet or exceed UL requirements for wet locations while in use. Receptacles shall bear the "WR" marking visible on the device. The weatherproof cover shall be designed to meet requirements of NEC Article 410.57 (b) and shall be NEMA 3R rated.
 - b. The weatherproof cover shall be constructed entirely of UV stabilized high impact polycarbonate. The cover, which encloses the cord set, shall be clear to allow visual inspection. The cover shall meet agency requirements for cold impact at -60°F (-51°C).
 - c. Weatherproof cover shall be INTERMATIC Model WP1000 series.
- D. Tamper Resistant Receptacles:
1. Receptacles shall have sliding-shutter barrier design limits insertion of small objects such as pins, paper clips and nail files. Receptacle shall allow easy insertion of

properly rated grounded and ungrounded plugs. Receptacles shall bear the "TR" marking visible on the device.

2. Dwelling unit shall be any living facility including a permanent provision for sleeping, cooking and sanitation.
 - a. Decorator style tamper resistant receptacles shall be Leviton T5825-W.
 - b. Tamper resistant GFCI receptacles shall be GFT5825-W.

2.04 TIMER SWITCHES

A. Programmable, 24 hour, compatible with electronic ballast.

1. Leviton 6124H-W.

2.05 FAN SPEED SWITCH

A. Speed switch shall give 3 speeds, on and off.

1. Leviton 6629-1W for fans up to 1.5 amps.
2. Leviton 6637-PW for fans up to 5 amps.

2.06 WALL PLATES

- A. Unless otherwise specified, all outlets for switch, receptacle, telephone and all special purpose outlets shall be provided with plates, high performance nylon, Leviton, #80401-NW Series satin finished with beveled edges to lay flat against the wall. Where more than one device occurs at one point, gang plates shall be used.
- B. Plates for Surface Boxes shall be beveled, cadmium plated steel, pressure formed for smooth edge to fit-box.
- C. Weatherproof plates shall be "in-use" type, gasketed, UV stabilized, high impact, clear, polycarbonate cover.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Locate wall switches at strike side of doors and at height indicated on "Mounting Height" schedule. Review all door swings with Contractor for General Construction prior to rough-in.
- B. Locate jam and switches within 6" of the top of the door.
- C. In areas where shelving, cabinets, sinks, baseboard heating elements, etc., are to be installed, the Contractor shall verify dimensions given above and on drawings with equipment supplier's shop drawings. Where conflicts occur, the Contractor shall notify the Architect.

- D. Where the wall and partitions are of unplastered brick or masonry, the height of wall outlets as given above shall be adjusted so that one horizontal edge of the box lines up with a horizontal joint in the masonry. Outlets specified to be 48" or more above floor shall be lowered and other outlets raised, as necessary to meet the jointing. Verify all locations with Architect.
- E. Locate receptacles at heights indicated in "Mounting Height" schedule. Mount receptacles vertically, ground pole at top. When installed above 27 inches, mount horizontally, ground pole at left.
- F. All plates shall be set true and plumb and shall be flat against finished wall surfaces, and attached to outlets with flush stainless steel machine screws.
- G. Install appropriate finished blank cover plate on all outlet boxes without a device.

3.02 GROUNDING

- A. Provide equipment-grounding connections for wiring devices unless otherwise indicated. Tighten connections to make an effective ground.

3.03 BRANCH CIRCUIT TESTING

- A. Ground (bonding) Continuity: Coupling, fittings and threaded connections at outlet boxes shall be securely tightened, providing a positive bond between components. (Careful attention must be given to attachment of grounding conductor to receptacles and metal enclosures.)

3.04 CONVENIENCE OUTLET TESTING

- A. Voltage and Polarity: Outlets shall be checked for proper voltage, polarity, and grounding.
 - 1. Each outlet shall be checked using a Hubbell #5200 outlet testing unit or equal. All outlets that do not test correctly shall be rewired as required.

3.05 GROUND FAULT OUTLETS OR GROUND FAULT PROTECTED OUTLETS

- A. Overload Protection: Protective rating of fuses or circuit breakers shall not exceed the maximum current rating of the outlet as defined by the National Electrical Code.
- B. Voltage and Polarity: Outlets shall be tested for proper voltage, polarity, and ground connection.
- C. Ground Fault Test: Each outlet shall be tested using a Hubbell #GGFT-2G GFI tester or equal to verify that outlet or breaker will trip at maximum 6 MA leakage current. Units that fail to trip shall be replaced.

END OF SECTION

SECTION 16181
FUSES (LOW VOLTAGE)

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The Electrical Contractor shall furnish and install all fuses for service equipment, distribution panels, disconnect switches, and similar equipment as indicated on the drawings or hereinafter specified.

1.02 QUALITY ASSURANCE

- A. Applicable Standards:

1. UL Standard UL 198.2: High-interrupting capacity current limiting type fuses.
2. UL Standard UL 198.3: Class L fuses.
3. UL Standard UL 198.4: Class R fuses.
4. UL Standards applicable to fuses for control circuits.

1.03 SUBMITTALS

- A. Submit the following in accordance with Section 16010, Basic Electrical Requirements.
- B. Shop Drawings:
1. Catalog cuts and manufacturer's published data for each different type of fuse provided for use on this project.

PART 2 - PRODUCTS

2.01 GENERAL

- A. General: Furnish and install fuses for each piece of fusible equipment including control power fuses provided for use on this project.
- B. Ratings: Fuse size shall be as indicated on the drawings or as required by equipment manufacturer. Fuse types and characteristics shall be as follows:
1. Motor Circuits: UL Class RK5, Type FRN-R up to 250 volts, Type FRS-R up to 600 volts, dual-element, time delay, current limiting and 200,000 ampere interrupting capacity.
 2. Feeder (non-motor) Circuits: UL Class RK-1, Type KTN-R up to 250 volts; Type KTS-R up to 600 volts, or UL Class J, Type JKS.

3. Fuse Types: Fuse types as shown above are those of Bussmann, Cooper Industries or approved equal.
- C. Current Limiting Fuse: Shall be silver-sand type, capable of safely interrupting short circuit currents of up to 200,000 amperes symmetrical.
- D. The fuses as installed shall provide proper selective coordination in the system and shall provide proper back-up protection for all equipment not designed to carry or interrupt the full short circuit current available at the point of applications.
- E. The fuses shall fit rejection type fuse clips only to prevent changing of specified fusing on the system.
- F. Provide spare fuses of each different type used, having capacity and size as required for the protection of the respective piece of equipment. Provide for each separate type and rating not less than 30 percent spare fuses, and in no case less than three (3) fuses for each different size and rating.
- G. This Contractor shall replace all fuses which cleared during construction including those fuses which clear due to malfunction or testing of HVAC, Plumbing, Fire Protection, or the General Contractor's systems or equipment.

PART 3 - EXECUTION

3.01 GENERAL

- A. Provide proper size and type fuses, as required to protect circuit.
- B. Shine fuse ferrules and clips with fine sandpaper prior to placing fuses.

END OF SECTION

SECTION 16190
SUPPORTING DEVICES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section contains methods of fastening and supporting conduit, raceways, boxes, panels, cabinets, lighting fixtures, disconnects, and other electrical equipment relating to this project.
- B. Provide materials, equipment, supplies and labor necessary as required to adequately support, brace and strengthen all equipment and materials furnished as part of this work.

1.02 QUALITY ASSURANCE

A. Applicable Standards:

- 1. ASTM A123: Zinc (Hot Galvanized) Coating on Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars and Strips.
- 2. ASTM A153: Zinc Coating (Hot Dip) on Iron and Steel Hardware.
- 3. ASTM A235: Carbon Steel Forgings for General Industrial Use.
- 4. ASTM A307: Low-carbon Steel Externally and Internally Threaded Standard Fasteners.

1.03 SUBMITTAL

- A. Do not submit unless requesting means other than those described in this specification.

PART 2 - PRODUCTS

2.01 SUPPORTS

- A. Provide supporting devices of types, sizes and materials indicated, and having the following construction features:
 - 1. Clevis Hangers: For supporting 2" rigid metal conduit; galvanized steel with 1/2" dia. Hole for round steel rod; approx. 54 pounds per 100 units.
 - 2. Riser Clamps: For supporting 5" rigid metal conduit; black steel; with 2 bolts and nuts and 4" ears approx. 510 pounds per 100 units.
 - 3. Reducing Couplings: Steel rod reducing coupling, 1/2" x 5/8"; black steel; approx. 16 pounds per 100 units.
 - 4. C-Clamps: Black malleable iron; 1/2" rod size; approx. 70 pounds per 100 units.

5. I-Beam Clamps: Black steel, 1-1/4" x 3/16" stock; 3/8" cross bolt; flange width 2"; approx. 52 pounds per 100 units.
6. One-Hole Conduit Straps: For supporting 3/4" rigid metal conduit; galvanized steel; approx. 7 pounds per 100 units.
7. Two-Hole Conduit Straps: For supporting 3/4" rigid metal conduit; galvanized steel; 3/4" strap width; and 2-1/8" between center of screw holes.
8. Hexagon Nuts: For 1/2" rod size; galvanized steel; approx. 4 pounds per 100 units.
9. Round Steel Rod: Black steel; 1/2" dia.; approx. 67 pounds per 100 feet.
10. Offset Conduit Clamps: For supporting 2" rigid metal conduit; black steel; approx. 200 pounds per 100 units.

B. General Equipment Supports:

1. Support groups of conduits, switches, starters and apparatus on channel-type steel framing, bolted together and braced to form a rigid structure securely anchored to floor and ceiling slabs.
2. Support raceways, boxes, cable trays, flexible cable and wireways above suspended ceilings directly from structure, independent of ceiling system, duct, piping or other work.
3. Equipment, conduit, tray and all other electrical components shall be supported by means meeting the seismic requirements of International Building Code and all other applicable codes.

2.02 ANCHORS

A. Provide anchors of types, sizes and materials indicated and having the following construction features:

1. Lead Expansion Anchors: 1/2"; approx. 38 pounds per 100 units.
2. Toggle Bolts: Springhead: 3/16" x 4"; approx. 5 pounds per 100 units.

B. Anchor Methods:

1. Hollow Masonry: Toggle bolts or spider type expansion anchors.
2. Solid Masonry: Lead expansion anchors or preset inserts. Do not use wooden plugs or anchors, lead caulking anchors or plastic anchors.
3. Metal Surfaces: Machine screws, bolts or welded studs.
4. Wood Surfaces: Wood screws.
5. Concrete Surfaces: Self-drilling expansion anchors or powder-driven studs.
6. Structural Steel: Beam clamps, angle clips welded or powder-driven studs.
7. Exterior: Anchors, screws, bolts, etc., exposed to weather and corrosion shall be rustproof finished or nonferrous material.

2.03 SLEEVES AND SEALS

- A. Provide sleeves and seals, of types, sizes and materials indicated and having the following construction features:
 - 1. Provide factory-assembled watertight wall and floor seals, of types and sizes indicated; suitable for sealing around conduit, pipe, or tubing passing through concrete floors and walls. Construct with steel sleeves, malleable iron body, neoprene sealing grommets and rings, metal pressure rings, pressure clamps, and cap screws.

2.04 CONDUIT CABLE SUPPORTS

- A. Provide cable supports with insulating wedging plug for non-armored type electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers. Construct body of malleable-iron casting with hot-dip galvanized finish.
- B. Conduit Supports:
 - 1. Single Runs: Galvanized conduit straps or ring bolt type hangers with specialty spring clips. Do not use plumbers' perforated straps. Maximum spacing 8 feet on centers.
 - 2. Multiple Runs: (three or more parallel raceways) Conduit channel trapeze rack with 25% spare capacity. "U" bolt conduits to rack.
 - 3. Vertical Runs: Channel support with "U" bolt type conduit fittings.
 - 4. Support conduits securely and independently so that strain will not be transmitted to outlet and pull box supports. Supports shall be sufficiently rigid to prevent distortion of conduits during wire pulling. Provide supports on both sides of expansion joint fittings.
 - 5. Secure flexible metal conduit and armored cable by staples, straps or similar approved fittings, designed and installed not to injure cable. Cable secured in place at intervals not exceeding 4 ½ feet and within 12 inches from every cabinet, box or device.

2.05 U-CHANNEL STRUT SYSTEMS

- A. Provide U-channel strut system for supporting electrical equipment, 16-gage hot-dip galvanized steel, of types and sizes indicated; construct with 9/16" dia. holes, 8" o.c. on top surface, with standard green finish, and with the fittings which mate and match with U-channel:
- B. Fittings: Punch press made from hot rolled, pickled and oiled steel plates or strip.
- C. Nuts: Machined, cast-hardened steel with unified and American coarse screw threads.
- D. Finish: Hot-dipped galvanized.

2.06 PIPE SLEEVES

- A. Provide pipe sleeves of one of the following:

1. Sheet-Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gauges: 3" and smaller, 20 gauge; 4" to 6", 16 gauge over 6", 14 gauge.
 2. Steel-Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.
 3. Iron-Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.
 4. Plastic-Pipe: Fabricate from Schedule 80 PVC plastic pipe; remove burrs.
- B. Sleeve Seals:
1. Provide sleeve seals for sleeves located in foundation walls below grade, or in exterior walls, of one of the following:
 - a. Lead and Oakum: Caulked between sleeve and pipe.

PART 3 - EXECUTION

3.01 GENERAL

- A. All fastenings, supports and hangers, clamps and anchors shall be of the type made for the specific purpose for which they are used. Where more than one type of device meets indicated requirements, selection is installer's option.
- B. Provide not less than a safety factor of 5, which shall conform with any specific requirements as shown on the drawings or in the specifications.
- C. Comply with requirements of NECA, NEC and ANSI/NEMA for installation of supporting devices.

3.02 FASTENING HARDWARE

- A. Conduit supports, clamps, hangers, fittings, channels, wireways, surface metal raceways, boxes, disconnects, and other electrical equipment where required to be surface fastened to ceiling, walls or partitions, shall be secured as follows:
 1. Masonry, Concrete or Brick: Use bolts and expansion shields.
 2. Hollow Tile, Wall Lath, Gypsum Wallboard: Use toggle bolts or bolt fastenings.
 3. Wood: Use brass screws, lag screws or bolts.
 4. Do not use explosive nail driver devices.
 5. Structural Steel: Machine screws.

3.03 CONDUITS

- A. Surface fastenings of exposed conduits to walls and slabs shall be made with clamp back-spacer and conduit clamp assemblies.
- B. Single conduits surface mounted tight to structural beams shall be supported with beam clamps.

- C. Single suspended conduits shall be supported by galvanized conduit hangers and threaded galvanized rods as follows:
 - 1. 3/4" through 1-1/4" Conduit: 1/4" Rod.
 - 2. 1-1/2" through 3-1/2" Conduit: 5/16" Rod.
 - 3. 4" Conduit: 7/16" Rod D. Single conduits suspended from slabs or structural steel beams shall be supported by mineralacs attached to conduit hangers and threaded galvanized rods (sizes as indicated above). Rods shall be attached to beam clamps or fastening devices as specified herein before.
- D. Multiple parallel-suspended conduits shall be supported by steel channel trapeze type framing members. Provide necessary rods, anchors, inserts, clamps, spacers, shims, bolts, and miscellaneous steel as required for each support.
- E. In outdoor areas and in damp interior or corrosive areas, paint all field cuts in galvanized support members (with zinc chromate paint).
- F. Where exposed to the weather or high humidity, use nuts, bolts, washers, shims, and other small materials of non-corrodible metal or galvanized or cadmium-plated.
- G. Provide support, at spaced intervals, as required by the NEC for the type of conduit being installed.
- H. Construct all supports with sufficient rigidity to hold all mounted equipment and material in permanent and neat alignment.
- I. The underside of metal decking (floor framing or roof) shall not be used to support hangers or threaded rods.
- J. To prevent swaying, vibrating and/or sagging, conduit shall be rigidly and firmly installed by using malleable or wrought steel hangers of standard design, with pipe clamps or fabricated steel supports, such as Kindorf or Unistrut. Perforated straphangers will not be allowed. Provide supplementary steel hangers for recessed lighting fixtures as required to coordinate with ceiling suspension system.

3.04 BOXES

- A. Surface Mounting: Boxes shall be fastened directly to the walls upon which they are mounted using appropriate fastening hardware as specified above.
- B. Recessed Mounting: Boxes mounted in brick, masonry, or concrete walls shall be fastened directly to the wall using appropriate fastening hardware. Boxes mounted in hollow tile, wire lath or gypsum wallboard shall be fastened to the framing members of the wall directly or to brackets attached to the framing members.

3.05 PANELS AND CABINETS

- A. Surface Mounting: Equipment shall be mounted on steel channel framing members. Framing members shall be provided by this Contractor and shall be fastened directly to

masonry or concrete walls, wall framing members or structural beams. Do not fasten to gypsum wallboard partitions directly.

- B. Recessed Mounting: Equipment shall be mounted directly to masonry or concrete walls. Mount to framing members of hollow tile, wire lath, or gypsum wallboard partition.

3.06 SLEEVES

- A. Tighten sleeve seal nuts until sealing grommets have expanded to form watertight seal.

3.07 SEISMIC RESTRAINTS

- A. Where required, provide seismic restraints in accordance with applicable code.

END OF SECTION

SECTION 16195

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section contains the materials and methods required to provide visual identification of the electrical system components. This identification is in addition to any standard nameplates or other means of identification installed by the manufacturers of the various equipment.

PART 2 - PRODUCTS

2.01 IDENTIFICATION AND MARKING

- A. All branch circuits shall be identified at the load end with panel name and circuit identification using letters and/or numbers.
- B. Electrical circuits feeding from panels shall be identified in the panel directories by area and load type served. (Room number, Lighting, etc.)
- C. Provide approved tags for all feeders, at both ends, and at intermediate junction and pull boxes. Tag shall indicate feeder designation or equipment served, and state phase of cable and voltage of feeder.
- D. Light switches and receptacles shall use "Dymo" clear plastic tape indicating panel and circuit numbers.
- E. Disconnect switches, panels, bus ducts, motor control centers panelboards and similar items of equipment shall be identified a laminated plastic nameplate of molded phenolic compound to indicate the device and equipment served. Characters shall be white, not less than 1/4 inch (1/4") high on a black background. Nameplates shall include voltage, phasing, ampere capacity and where equipment is being fed from.
- F. On the inside cover of each fusible device, identify it by using plastic adhesive tape or paint with red letters "USE ___ A. FUSE ONLY" and fill in proper value as indicated on the drawings or as required.
- G. Provide panelboard nameplates on interior with name and interrupting rating and caution as follows: (Example: "L3A". 14,000 amperes interrupting rating. Caution: replace circuit breakers with equivalent rated breakers.)

END OF SECTION

SECTION 16440

SAFETY SWITCHES AND MOTOR STARTERS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The Contractor shall furnish and install all safety switches and motor starters for all mechanical and building equipment, whether or not indicated, unless otherwise noted on drawings or specified.
- B. All safety switches and motor starters located in areas exposed to the weather shall be furnished with weatherproof enclosures.
- C. Unless provided in motor control centers, variable frequency drives shall be furnished by Mechanical Contractor and wired by Electrical Contractor.

1.02 SUBMITTALS

- A. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.

PART 2 - PRODUCTS

2.01 SAFETY SWITCHES

- A. Safety switches shall be of the size and type indicated on the drawings.
- B. Safety switches shall be NEMA 1 General Duty or WP enclosure, as required. Safety switches shall be horsepower rated, quick-make, quick-break with interlocked cover.
- C. Equip with operating handle which is integral part of enclosure base and whose position is easily recognizable, and is pad lockable in OFF position.
- D. Construct current carrying parts of high-conductivity copper with silver-tungsten type switch contacts.
- E. Unless otherwise noted on drawings, all safety switches shall be of the non-fused type. Where fuse type switches are indicated they shall be equipped with dual element (time delay) fuses.
- F. Safety switches shall be as manufactured by:
 - 1. General Electric Co.
 - 2. Square D.

3. Siemens.
4. Cutler Hammer.
5. Substitution: Follow Division 1.

2.02 MANUAL MOTOR STARTER (THERMAL OVERLOAD SWITCHES)

- A. Where indicated on the drawings, the Contractor shall furnish and install thermal overload switches specifically designed for motor control operation. Each switch shall be provided with proper size heater element for the motor to be controlled and shall be furnished with pilot lights. Thermal overload switches shall consist of an ON and OFF switch combined with a thermal overload device operating on the soldered ratchet principle. Switch shall be incapable of staying in the closed position under a sustained overload and shall be reset by throwing lever to the OFF position.
- B. Switch shall have locking attachment. Switch nameplate shall be mounted on a standard switchplate to identify it.
- C. Thermal overload switches shall be surface or flush mounted as indicated on the drawings and shall be manufactured by:
 1. General Electric Co.
 2. Square D.
 3. Cutler Hammer.
 4. Siemens.
 5. Allen-Bradley.

PART 3 - EXECUTION

3.01 MOUNTING

- A. All safety switches, thermal overload switches and combination starters shall be mounted within sight of the equipment they serve.
- B. Mount on walls or columns when available. Where no walls or columns are within sight of the equipment, provide a floor mounted rack fabricated of channel and/or angle iron. Locate the rack near the housekeeping pad secured to the floor with expansion shields.
- C. Coordinate with other trades to determine quantity and size of motor starters in accordance with shop drawings.

3.02 GROUNDING

- A. Provide equipment-grounding connections, tightened in accordance with manufacturers published torque values to make an effective ground.

3.03 INSPECTION OF DISCONNECT SWITCHES

- A. Inspect contacts; clean as required.
- B. Inspect arc chutes.
- C. Inspect fuses for proper rating, type, and size.

END OF SECTION

SECTION 16450

GROUNDING AND BONDING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Grounding shall be in strict accordance with all provisions of the National Electrical Code, Article 250, as specified hereinafter and as indicated on the drawings.
- B. The Contractor shall provide solid and effective grounding for the following:
 - 1. Neutral leads on secondary service at transformer location.
 - 2. Conduit System.
 - 3. Panels.
 - 4. Electrical Service.
 - 5. Non-current carrying metal parts of fixed equipment such as starter and control cabinets, lighting fixtures and electrical equipment and equipment supports.
 - 6. Outdoor Lighting.
- C. Maximum resistance between grounding system and earth ground shall not exceed ten 10 ohms. The ground resistance shall be measured by either the triangulation or Ratio of Fall-of-Potential Method. Submit test results.

1.02 SUBMITTALS

- A. None required.

PART 2 - PRODUCTS

2.01 MATERIAL

- A. Size and type of ground wires shall be as indicated on the drawings or as specified herein. When not indicated, grounding shall be as per N.E.C. Article 250.
- B. Ground wires shall be copper and installed as indicated and as required by Code.

2.02 GROUNDING CONNECTORS

- A. Ground lugs for attachment of ground wires must be of cast brass, bronze or copper and shall be of the compression type.
- B. All connections to apparatus and conduits shall be made with and approved type of solderless connector. Connectors shall be securely bolted or clamped to the equipment.

All contact surfaces shall be thoroughly cleaned and bright before connections are made in order to insure a good metal-to-metal contact. Ground terminals of each receptacle shall be connected with bonding jumpers. All connections to ground conductors shall be made accessible for visual inspection.

2.03 GROUND RODS

- A. Ground rods shall be ten (10') feet long, three-quarter (3/4") inch diameter of copper clad steel.

PART 3 - EXECUTION

3.01 MAIN GROUND CONDUCTORS

- A. A copper ground cable in conduit shall be bonded to the street side of the incoming water line and to the service ground bus.
- B. A copper ground shall be exothermically welded to three 10' long x 3/4" diameter copper clad steel ground rods driven 6'-0" apart in a triangular arrangement 10'-0" beyond building exterior. Ground cable shall be connected to the service ground bus.
- C. A ground cable shall be exothermically welded to building steel and connected to the service ground bus.
- D. The #4/0 bare copper ground wires installed with the primary cable shall be connected into the primary grounding system and to the service ground.

3.02 ELECTRIC DISTRIBUTION

- A. Lighting System: In addition to the branch circuit wiring, an insulated green ground conductor shall be installed with each circuit.
- B. Receptacles: Ground receptacles by connecting an insulated ground conductor to the receptacle-grounding terminal run with the phase conductors.
- C. Equipment Grounds: Equipment grounding conductors shall be sized on Table 250.95 of the National Electrical Code. In no case shall the ground wire be smaller than #12 AWG copper. All inaccessible connections shall be made with the exothermic welding process.
- D. In boxes containing 5 ground wires or less, the ground wires shall be joined by use of Burndy Type 670-1 lugs or I.T.E. type 3021 lugs. Where more than five grounds occur, utilize a grounding terminal bar.
- E. Where more than five grounds occur, utilize a grounding terminal bar.
- F. Separate green-jacketed grounding conductors shall be provided for the grounding of all raceways.

- G. Conduits and raceways, where terminated at boxes, cabinets, and panelboards by means of locknuts and bushings, shall be terminated with double locknuts for all voltages. Enclosure panels at which conduits are terminated shall be securely bonded to the frame of the enclosure by means of bonding jumpers or by means of welding in those cases where the panels need not be removable.
- H. Bond building steel to electrical grounding system.

3.03 TESTING

- A. Test grounding conductors for continuity and resistance.
- B. Test grounding electrodes for resistance to ground using the Fall of Potential Method per ANSI/IEEE Standard 81, or the Stakeless Method.

END OF SECTION

SECTION 16470

PANELBOARDS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Furnish and install where indicated on drawings, dead front type panelboards equipped with automatic circuit breakers.
- B. Panelboards shall be furnished with numbers and types of overcurrent protective devices, bus capacities and modifications as indicated herein, and as indicated on the drawings.
- C. It shall be the responsibility of the Contractor to inform the manufacturer as to where the main lugs are to be located.

1.02 QUALITY ASSURANCE

- A. Panelboards shall meet the requirements of the latest edition of the NEC, Article 384.
- B. The panelboards shall be of the dead-front type and shall be in accordance with Underwriters Laboratories, Inc. "Standard for Panelboards UL67" and "Standard for Cabinets and Boxes UL50" and shall be so labeled.
- C. Panelboards shall conform to FED SPEC W-P-115a.

1.03 SUBMITTALS

- A. Submit shop drawings for review and approval before fabrication. Shop drawings shall include front view, floor plan, side view, wiring diagrams, metering and bussing details, in addition to manufacturer's standard drawings.

PART 2 - PRODUCTS

2.01 PANELBOARDS AND LOAD CENTERS

- A. General:
 - 1. Panelboards and Load Centers, shall be dead-front safety type, equipped with thermal-magnetic molded case circuit breakers with frame and trip ratings as shown on the schedule. Panelboards and Load Centers shall be listed by the Underwriters' Laboratories and bear the UL label.
 - 2. Acceptable Manufacturers
 - a. Cutler Hammer
 - b. General Electric

- c. Siemens.
- d. Square D.

B. Circuit Breakers:

1. Panelboard circuit breakers shall be plug-on or bolt-on quick-make, quick-break, thermal-magnetic, trip indicating, molded case type and have common trip on all multi-pole breakers. Trip indication shall be clearly shown by the breaker handle taking position between ON and OFF when the breaker is tripped.
2. Load center breakers shall be plug-in, quick-made, quick-break, thermal-magnetic, trip indicating, molded case type and have common trip on all multi-pole breakers. Trip indication shall be clearly shown by the breaker handle taking position between ON and OFF when the breaker is tripped.
3. UL Class A, 5 milli-ampere sensitivity ground fault circuit protection shall be provided on 120 volt AC branch circuits specified on the panelboard schedule. This protection shall be an integral part of the branch circuit breaker which also provides overload and short circuit protection for branch circuit wiring. Tripping of a branch circuit breaker containing ground fault circuit interruption shall not disturb the feeder circuit to the panelboard. A single pole circuit breaker with integral ground fault circuit interruption shall require no more panelboard branch circuit space than a conventional single pole circuit breaker.
 - a. Ground fault protection shall be provided where indicated or required by code.
4. Arc fault circuit Interrupters (AFCI) Circuit Breakers shall meet the requirements of UL1699.
 - a. AFCI breakers shall provide protection against the effects of arcing faults by recognizing characteristics that are unique to arcing fault conditions and by functioning to de-energize a circuit when an arcing fault occurs.
5. Circuit breakers used for switching of lights shall be rated SWD.
6. Circuit breakers serving Heating and Air Conditioning equipment shall be HACR rated.
7. Circuit breakers shall be labeled with numbers, mounted adjacent to them on the panel cover. Numbers shall correspond to directory listing.

C. Panelboard Bus Assembly:

1. Bus bar connections to the branch circuit breakers shall be the "phase sequenced" type. Three-phase, four-wire bussing shall be such that any three adjacent single-pole breakers are individually connected to each of the three different phases in such a manner that two- or three-pole breakers can be installed at any location. All current-carrying parts of the bus assembly shall be plated [copper]. Mains' rating shall be as shown in the panel schedules on the drawings.
2. Neutral bus bar shall be fully rated and mounted at opposite end of structure from main incoming cable.

3. Each panelboard shall be equipped with an equipment-grounding bus block, with lugs and terminals for each branch circuit's equipment-grounding conductor. Provide an insulated grounding bus block for isolated grounding circuits as indicated.
4. Where required panel shall be approved for use as service entrance equipment.
5. "Spaces" shall be fully bussed and drilled, ready for breaker installation.
6. Panelboards shall include a UL short circuit current rating label. Panelboards rated 240 volts or less shall have short circuit current ratings not less than 10,000 amperes RMS symmetrical or as shown on the drawings.
7. When series ratings are applied with integral or remote upstream devices, a label shall be provided and permanently affixed to the panel dead front. Series rating label shall cover all installed devices. It shall state the conditions of the UL series ratings including: size and type of upstream device, branch devices that can be used and the applicable UL series short circuit current rating.

D. Wiring Terminals:

1. Terminals for feeder conductors to the panelboard mains and neutral shall be UL listed as suitable for the type of conductor specified. Terminals for branch circuit wiring, both breaker and neutral, shall be UL listed as suitable for the type of conductor specified.

E. Cabinets and Fronts:

1. The panelboard bus assembly shall be enclosed in a galvanized sheet steel cabinet. The size of the wiring gutters and gauge of steel shall be in accordance with NEMA Standards Publication No. PBI-1971 and UL Standard No. 67 for panelboards. The box shall be fabricated from code gauge galvanized steel or equivalent rust-resistant steel 16-gage thickness. Provide fronts with flush hinges and doors, door-in-door construction (trim clamps are not acceptable). Fasten fronts to the cabinets with machine screws. Doors shall have flush, brushed stainless steel, cylinder tumbler-type locks with catches and spring-loaded door pulls. The flush lock shall not protrude beyond the front of the door. All panelboard locks shall be keyed alike. Fronts shall have adjustable indicating trim clamps which shall have completely concealed steel hinges.
2. Mount a directory card on the inside of hinged fronts and doors. A metal circuit directory permanent frame and card with heavy duty clear plastic covering shall be provided with a space at least 1/4" high by 3" long or equivalent for each circuit with spaces for circuit numbers, outlets controlled, and room numbers.. Plastic envelope type directory mounted by any kind of tapes shall not be accepted. The directory shall be typed to identify the load fed by each circuit. Cabinet fronts shall be of code gauge, full finished steel with rust-inhibiting primer and baked enamel finish.
3. Whenever additional equipment like contactors are specified for a panelboard mounting, provide enclosure of adequate size to accommodate this equipment.
4. Where indicated or required panelboards shall be rated NEMA 3R, 4, 4x or 12.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Panelboard cabinets shall be installed so that the operating handle of the top most circuit breaker is not more than seventy eight (78") inches above finished floor and the bottom of the cabinet is not less than twelve (12") inches above finished floor.
- B. Anchor enclosure firmly to walls and structural surfaces, ensuring that they are permanently and mechanical secure.

3.02 LIGHTING, POWER DISTRIBUTION PANELBOARDS - TESTING

- A. Insulation
 - 1. Megger between each phase conductor and each of the other phase conductors.
 - 2. Megger each phase conductor between conductor and ground.
 - 3. The minimum megger reading shall be one (1) megohm with load connections removed from the equipment. Megger test voltage shall be 500 volts.
 - 4. Megger: Biddle, Amprobe, Associated Research or equal.

END OF SECTION

SECTION 16475

CIRCUIT BREAKERS AND FUSIBLE SWITCHES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide circuit breakers and fusible switches to mount in panelboards or separately enclosed.

1.02 SUBMITTALS

- A. Submit manufacturer's data on each safety switch and starter with identification of motor served.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Cutler-Hammer.
- B. General Electric.
- C. Square D.
- D. Siemens.

2.02 MOLDED CASE PROTECTIVE DEVICES

- A. Protective devices shall be molded case circuit breakers with inverse time and instantaneous tripping characteristics and shall be Cutler-Hammer type Westinghouse Series C or approved equal.
- B. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be nonwelding silver alloy and arc extinction shall be accomplished by means of DE-ION arc chutes. A push-to-trip button on the front of the circuit breaker shall provide a local manual means to exercise the trip mechanism.
- C. Circuit breakers shall have a minimum symmetrical interrupting capacity as indicated on the drawings.
- D. Circuit breakers 250- ampere frame and below shall be Cutler-Hammer type Westinghouse Series C with thermal-magnetic trip units and inverse time-current characteristics.

- E. Ground fault protection shall be provided where indicated.
- F. Where indicated circuit breakers shall be UL listed for series application.
- G. Where indicated circuit breakers shall be current limiting.
- H. Where indicated provide UL listed circuit breakers for applications at 100% of their continuous ampere rating in their intended enclosure.

2.03 ACCESSORIES

- A. Provide shunt trips, bell alarms and auxiliary switches as shown on the contract drawings.

2.04 QUICK-MAKE/QUICK-BREAK FUSIBLE SWITCHES

- A. Protective devices shall be quick-make/quick-break fusible switches as manufactured by Cutler-Hammer type Westinghouse FDP. Fusible switches 30-amperes through-600 amperes frames shall be furnished with rejection class "R" or "J" type fuse clips unless otherwise scheduled. Switches shall incorporate safety cover interlocks to prevent opening the cover with the switch in the ON position or prevent placing the switch in the ON position with the cover open. Provide defeater for authorized personnel. Handles shall have provisions for padlocking and shall clearly indicate the ON or OFF position. Front cover doors shall be padlockable in the closed position.
- B. Provide a zero sequence ground protection system including test panel. Ground fault relay shall include separate time and current pick-up adjustments.

PART 3 - EXECUTION

3.01 MOUNTING

- A. Mount in panelboard. Mount separately enclosed breakers or on walls or columns when available.

3.02 GROUNDING

- A. Provide equipment grounding connections, tightened to make an effective ground.

END OF SECTION

SECTION 16500

INTERIOR LIGHTING FIXTURES, LAMPS AND BALLASTS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Furnish and install all lighting fixtures, ballasts, lamps, apparatus in accordance with the fixtures schedule as indicated on the drawings, unless otherwise noted. Fixtures shall be furnished complete with sockets, glassware, reflectors, lamps, supports, hangers and other appurtenances required for a complete installation. Coordinate the exact location of all fixtures and outlets with the Architect and the reflected ceiling plans.
- B. All fluorescent lamps shall be low mercury.

1.02 STANDARD OF QUALITY

- A. The specifications establish the standards of quality required, either by description or by references to brand name, name of manufacturers or manufacturer's model number.
- B. Where one product only is specifically identified by name or manufacturer's model number, the Contractor shall base his bid on the use of the name product. Where multiple names are used, the Contractor shall base his bid on the use of any of those products named.
- C. The Contractor shall submit with his bid, the names of products which are proposed as substitutions for products named in the specifications. Each proposed substitution shall be accompanied by a written sum of money to be added or deducted from his bid. The Owner reserves the sole right to accept or reject said substitutions with or without cause.
- D. When equipment and/or materials are proposed to be purchased from a manufacturer other than those specified, the Contractor shall provide, complete data adequate for the Design Professional's review of the proposed substituted equipment. The burden of proof that the substitution is equal or superior to the specified equipment shall rest on the Contractor.
- E. When the equipment other than that specified is used, the Contractor shall be responsible for any extra cost of required revisions such as structural steel, concrete, electrical, piping, etc. Such additional costs shall be identified at the time such substitutions are proposed.
- F. Fixtures shall comply with NEC, NEMA, ANSI and be UL-listed and labeled.
- G. Ballasts shall carry the CBM label.

1.03 SUBMITTALS

- A. Shop drawings shall be in the form of standard catalog cuts in an alphabetical order booklet and shall indicate the following:

1. Fixture type designation, manufacturer and manufacturer's catalog number.
 2. Lamp type, source, envelope, base phosphor color, wattage, voltage.
 3. Ballast type and voltage.
 4. Fixture voltage and wattage.
 5. Manufacturer's certified photometric data.
 6. Fixture dimensions, mechanical and electrical connections, pendants, and flanges.
 7. Any deviation from the specification must be clearly identified.
- B. For items being resubmitted, clearly identify changes made from the initial submittal requested by the Design Professional. The Design Professional will review only those changes requested and identified by the Contractor.
- C. Submit warranty for electronic ballasts.

PART 2 - PRODUCTS

2.01 PRODUCTS

- A. APPROVED MANUFACTURER - The following manufacturers are approved for use. No substitutions.
1. Fluorescent Lamps shall be manufactured by:
 - a. OSRAM/Sylvania - "Octron 800 ECO".
 - b. General Electric – Ecolux with starcoat.
 - c. Phillips - "TL-70/ TL-80" TL-700/TL-800 Alto.
 2. T5 Fluorescent Lamps shall be manufactured by:
 - a. Osram/Sylvania – “Pentron”.
 - b. General Electric – T5 Starcoat.
 - c. Philips – “Silhouette”.
 3. Fluorescent Lamp Ballasts:
 - a. Advance - "Standard" Series.
 - b. Universal Lighting Technologies – Triad Series.
 - c. Energy Savings – Super Lampguard.

2.02 LAMPS

- A. Lamps: The proper type, wattage and voltage rating shall be delivered to the project in the original cartons and installed in the fixtures just prior to the completion of the project.
- B. Linear Fluorescent Lamps:

1. Four foot (4') 32 watt T-8, 265 ma, rapid-start fluorescent lamps shall be 3500 degree Kelvin (unless noted otherwise on the Lighting Fixture Schedule), rated not less than 2900 lumens initial output and 82 CRI, 20,000 hours life, based on three (3) hours burning periods. Other lengths shall be similar type.
 - a. Four foot T-8 lamps shall have maximum 3.5 mg mercury.
 - b. Three foot and two foot T-8 lamps shall have maximum 6mg mercury.
 - c. Compact fluorescent lamps shall have maximum 5 mg mercury.
2. Four foot nominal (45") 28 watt T-5 fluorescent lamps shall be programmed rapid start, 3500 degree Kelvin (unless otherwise noted on the lighting fixture schedule) rated not less than 2900 lumens initial output and 85 CRI, 20,000 hours life, based on three (3) hours burning period and 95% lumen maintenance. Other lengths shall be similar type.
 - a. T-5 and T-5HO lamps shall have maximum 2.5 mg mercury.
3. Four foot nominal (45") 54 watt T-5HO fluorescent lamps shall be programmed rapid start, 3500 degree Kelvin (unless otherwise noted on the lighting fixture schedule) rated not less than 5000 lumens initial output and 85 CRI, 20,000 hours life and 94% lumen maintenance.

2.03 BALLASTS

- A. General: Ballasts for fluorescent fixtures shall be suitable for the electrical characteristics of the supply circuits to which they are to be connected, and shall be suitable for operating the specified lamps.
- B. Ballast types shall have high power factor (over 90%) and ballast factor, CBM certified by Electrical Testing Laboratories, bearing UL Class P label and identified as to their ambient temperature-application classification, in accordance with NEMA Standards. Ballasts shall have internal thermal protection and Class "A" sound rating.
- C. Ballasts shall meet minimum efficiency standards of Public Law No. 100-357, National Appliance Energy Conservation Amendments of 1988, and meet requirements of the FCC regulations Part 18, governing Electromagnetic and Radio Frequency interface, and ANSI standards C82.11 and C62.41.
- D. Fluorescent Ballasts
 1. Electronic ballasts shall be rated 20 KHz or greater to operate without visible flicker. Maximum input current at the third harmonic shall be 13%. Ballasts shall be configured for use on 2, 3 and 4 foot, 265 ma, rapid start T-8 lamps.
 2. Single, two-lamp, three-lamp or four-lamp fluorescent ballasts shall be used in any one luminaire. Luminaires shall be tandem-wired wherever possible to make use of multiple-lamp ballasts.
 3. Ballasts shall have an average lamp current crest factor below 1.7.
 4. Maximum ballast case operating temperature shall not exceed 70°C.

2.04 LUMINAIRES

- A. All luminaires are located, detailed, and identified on the drawings; and specified in the Lighting Fixture Schedule.
- B. The specified fixture shall be the first named manufacturer and the catalog number. Equal fixtures by the other manufacturers named will also be acceptable.
- C. Luminaires shall be constructed and internally wired in compliance with all applicable national, state and local codes. Luminaires shall conform to UL Standards and to applicable codes exceeding those standards.

2.05 DIMMING BALLASTS

2.06 FINISH

- A. All luminaires shall be provided with a finish published as standards on the manufacturer's data sheets, except where indicated otherwise. Finishes indicated as "selected by Design Professional" shall be interpreted as a non-standard finish which must be matched by the manufacturer.

2.07 ACCESSORIES

- A. Luminaires shall be furnished with all necessary hardware (stems, mounting frames, hangers, etc.) for the safe and proper support of the luminaires. All supports for luminaires (stems, chains, anchors, hangers, etc.) shall be adequate to support the weight of the luminaires. The use of perforated band iron will not be permitted. All stem hangers shall be furnished with suitable aligner canopies or outlet box covers so that the luminaires hang vertical to the finished floor irrespective of the angle of the surface from which they are suspended. Where raceways and outlet boxes serving the luminaires are surface mounted to the ceiling or wall, finishing rings shall be provided, unless specifically indicated otherwise, to conceal the outlet box. All visible hanging devices and appurtenances shall have the same finish as the luminaire, unless specifically indicated otherwise.
- B. Accessories: Straps, mounting plates, nipples, brackets, canopies and related items shall be provided for proper installation.

PART 3 - EXECUTION

3.01 INSTALLATION OF LIGHTING FIXTURES

- A. All fixtures and lamps shall be installed in accordance with the recommendations of the respective manufacturers.
- B. All luminaires shall be installed complete with lamps as specified and/or shown in the Lighting Fixture Schedule. Provide all equipment and materials for a complete and fully operating installation.
- C. All luminaires, when installed, shall be set plumb and true, and shall be free of light leaks, warps, dents and other irregularities.

- D. Rows of luminaires recessed, surface or pendant mounted shall be installed accurately in a straight line.
- E. Luminaires shall be installed at the mounting heights shown or as approved by the Architect. Pendant-mounted luminaires in the same room or area shall be installed at uniform height above the finished floor. Verify the mounting height of pendant-mounted fixtures with the Owner's Representative before any installation.
- F. Provide supports for luminaires recessed in suspended ceilings in accordance with Article 410-16 of the National Electrical Code. Contractor shall be responsible for providing supplemental suspension and/or ceiling framing members for luminaire support where required because of mechanical conflicts.

3.02 INSTALLATION OF LAMPS

- A. Install all lamps and test for correct operation.

3.03 REJECTIONS

- A. Replace irregular, blemished, damaged, and unsatisfactory luminaires with new units.

3.04 TIMING OF INSTALLATION

- A. Reflectors, cones, aperture plates, lenses, diffusers, louvers, and decorative elements of luminaires shall not be installed until completion of plastering, ceiling tile work, painting and general clean-up in the area.

3.05 CLEANING

- A. Immediately prior to occupancy, clean all reflectors, cones, aperture plates, lenses, diffusers, louvers, lamps, and decorative elements. Upon completion of the installation of luminaires and at the time of final inspections, all luminaires shall be clean and free from defects in operation and appearance.

3.06 LIGHTING SYSTEM

- A. Test lighting systems for proper operation in conjunction with the energy management system control, indicated switch control, dimming, etc.

END OF SECTION

SECTION 16740

TELEPHONE, CABLE TV AND INTERCOM DISTRIBUTION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Furnish all labor, materials, equipment and incidentals required for a complete and tested system, as shown on the drawings and as specified herein.

1.02 COORDINATION WITH TELEPHONE AND CATV COMPANY

- A. The Contractor shall confer and cooperate with the local companies and perform all work in accordance with their rules and regulations for that portion of the work involving the company.

1.03 SCOPE OF WORK

- A. Provide all wiring and outlet boxes for the entire system.
- B. Plywood backboards and patch panels equipment racks shall be provided as indicated.
- C. Provide labeling and testing of the entire system.
- D. Provide intercom system.

1.04 SUBMITTAL

- A. Submit manufacturer's data on each component.
- B. Submit installers qualifications for installation.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Materials and installation shall be in accordance with other applicable sections of these Electrical Specifications and as specified hereinafter.
- B. In the Service location provide a painted 3/4" plywood board, interior grade, size as indicated, for mounting of cable management and telephone termination hardware. Paint board with two (2) coats of gray enamel both sides and edges prior to installation. All core bores must meet appropriate fire and safety codes.

2.02 TELEPHONE WIRING

- A. Telephone wiring shall be category 5E to each outlet location run back to service location.

2.03 CATV WIRING

- A. CATV wiring shall be RG6 quad shield to each outlet location run back to service location.

2.04 TELEPHONE OUTLETS

- A. Leviton 40149W.

2.05 CATV OUTLETS

- A. Leviton 80381-W with F connector.

2.06 INTERCOM

- A. Provide exterior grade front door entry system with interior call stations where shown. System shall provide 2-way communications.
- B. Aiphone Corporation, 1700 130th Avenue NE, Bellevue, Washington 98005. Toll Free (800) 692-0200. Phone (425) 455-0510. Fax (425) 455-0071. Website www.aiphone.com. E-mail info@aiphone.com.
- C. Hands-Free Color Video Intercom Master Monitor Station: Model JK-1MD.
 - 1. Power: 18 V DC.
 - 2. Current Consumption: 400 mA maximum.
 - 3. Calling: Chime and image, approximately 45 seconds.
 - 4. Communication:
 - a. Hands-Free Mode: Hands free 60 seconds.
 - b. PTT Mode: Press-to-talk, release-to-listen 60 seconds.
 - 5. Video Monitor:
 - a. 3.5-inch direct-view TFT color LCD.
 - b. Scanning Lines: 525.
 - 6. Door Release Contact: 24 V AC/DC, 500 mA (N/O dry closure contact L, L).
 - a. Minimum Contact: 100 mV DC, 0.1 mA.
 - 7. Operating Temperature: 32 degrees F to 104 degrees F (0 degrees C to 40 degrees C).
 - 8. Microphone.
 - 9. Red door release LED.
 - 10. DOOR RELEASE button.
 - 11. ZOOM/WIDE button.
 - 12. ADJUST button.

13. PAN/TILT button.
14. CALL button.
15. Option button.
16. Red transmit LED.
17. TALK button.
18. OFF button.
19. MONITOR button.
20. POWER switch.
21. Speaker.
22. Screen brightness control.
23. Receive volume control.
24. Chime tone volume.

D. Hands-Free Color Video Intercom Sub Monitor Station: Model JK-1HD.

1. Power: 18 V DC.
2. Current Consumption: 200 mA maximum.
3. Calling: Chime and image, approximately 45 seconds.
4. Communication:
 - a. Hands-Free Mode: Hands free.
 - b. PTT Mode: Press-to-talk, release-to-listen. Communication time based on connected monitor station.
5. Video Monitor:
 - a. 3.5-inch direct-view TFT color LCD.
 - b. Scanning Lines: 525.
6. Operating Temperature: 32 degrees F to 104 degrees F (0 degrees C to 40 degrees C).
7. Microphone.
8. Red door release LED.
9. DOOR RELEASE button.
10. ZOOM/WIDE button.
11. ADJUST button.
12. PAN/TILT button.
13. CALL button.
14. Option button.
15. Red transmit LED.
16. TALK button.
17. OFF button.

18. MONITOR button.
 19. POWER switch.
 20. Speaker.
 21. Screen brightness control.
 22. Receive volume control.
 23. Chime tone volume.
- E. Vandal-Resistant Video Door Station: Model JK-DV.
1. Faceplate: Stainless steel.
 2. Surface mount.
 3. Microphone.
 4. Speaker.
 5. Camera:
 - a. Complementary metal oxide semiconductor (CMOS).
 - b. Scanning Lines: 525.
 - c. Minimum Subject Illumination: 5 Lux at 50-cm (1-foot 6-inch) distance.
 6. CALL button.
 7. Vandal resistant.
 8. Weather resistant.
 9. Operating Temperature: 14 degrees F to 140 degrees F (minus 10 degrees C to 60 degrees C).
- F. Power Supply:
1. PS-182002.

2.07 ACCESSORIES

- A. Access Control Keypad: Model AC-10S.
1. Faceplate: Die-cast zinc to match fixed video door station Model JK-DV.
- B. 30-Degree Angle Box: Model KAW-D.
1. For fixed video door station Model JK-DA.
- C. 1-Gang Mounting Plate: Model MKW-P.
1. For fixed video door station Model JK-DV.
- D. Mullion Mounting Bracket: Model KMB-45.
1. For fixed video door station Model JK-DA.
- E. Security Lock Box: Model SBX-LSE.
1. For fixed video door station Models JK-DV or JK-DVF.

2. Lock not included.
- F. Surface Mount Box: Model SBX-DVF.
 1. For fixed video door station Model JK-DVF.
- G. Surface Mount Box: Model SBX-ACE.
 1. For fixed video door station Model JK-DA.
- H. Long-Distance Door Station Adaptor: Model JKW-BA.
- I. Electric Door Strike: Model EL-12S or door strike suitable for door being released.
 1. 12 V AC, 125 mA.
 2. 12 V DC, 200 mA.
 3. When using electric door strikes not manufactured by Aiphone, specify selective door release adaptor Model RY-3DL or Form C door release relay Model RY-18L.
- J. Form C Door Release Relay: Model RY-18L.
 1. For 1 door.
- K. Call Extension Speaker: Model IER-2.
- L. External Signaling Relay: Model TAR-3 with Model SKK-620 power supply.

PART 3 - EXECUTION

3.01 GENERAL

- A. Install wire to each device. Terminate on each end.
- B. Test all lines.

END OF SECTION

SECTION 16930

BUILDING LIGHTING CONTROL SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide control system for operation of interior building lighting as specified herein, including:
 - 1. Wall Box Dimmers.
 - 2. Occupancy Sensors.
 - 3. Photocell.
 - 4. Timeclock.
 - 5. Contactors.

1.02 SUBMITTALS

- A. Shop Drawings:
 - 1. Provide a system single-line diagram. Identify all components and dimming circuits. Show interconnection of all components with electrical characteristics of each circuit including number and size of all conductors, circuit loads and ratings of integral protective.
 - 2. Provide a schedule of all dimmable circuits listing type and rating of dimmer and connected load as indicated on the drawings.
- B. Product Data:
 - 1. Submit manufacturer's descriptive data showing general appearance; finish; dimensions; power requirements; noise ratings; UL certification; description of operation; installation, maintenance and repair data (including parts list).
- C. Product Samples:
 - 1. Provide operable product samples as directed in Part 2 of this Section.
 - 2. Provide material finish samples as directed in Part 2 of this Section. Finish samples shall be a minimum of nine square inches in surface area and applied to construction material of the specified product.

1.03 REGULATORY AGENCIES, CODES AND REFERENCE STANDARDS

- A. Federal, State and Local Codes having jurisdiction.
- B. Applicable Sections of the National Electrical Code and Local Inspection Authorities.
- C. National Electrical Safety Code.

- D. Underwriters Laboratories, Inc. (UL) labeling and listing.
- E. National Electrical Manufacturers Association (NEMA).
- F. Institute of Electrical and Electronics Engineers (IEEE).

1.04 QUALITY ASSURANCE

- A. All equipment shall be the product of manufacturers who have previously demonstrated, by performance and reputation, the ability to manufacture products of the quality specified. Such manufacturers must maintain an organization and manufacturing facility capable of actually manufacturing the specified equipment.

PART 2 - PRODUCTS

2.01 WALL BOX DIMMERS

- A. Wall box dimmers shall be solid state, semiconductor type capable of controlling light intensity of the complete range from off to full brightness in a Square Law Dimming curve. Dimmer shall incorporate separate control of intensity and on/off. Rotary controls will not be acceptable.
- B. All dimmers and switches shall provide power failure memory. Should power be interrupted and subsequently returned, the lights will come back on to the same levels set prior to the power interruption.
- C. Dimmers and switches shall meet ANSI/IEEE Std. C62.41-1980, tested to withstand voltage surges of up to 6000V and current surges of up to 200 A without damage.
- D. Dimmers and switches shall meet the UL 20-limited short circuit test requirement for snap switches.
- E. Dimmers shall be voltage regulated so that $\pm 10\%$ variation in line voltage shall cause not more than a $\pm 5\%$ variation in load voltage when dimmer is operating at 40V (5% light output).
- F. Dimmers shall be usable in three-way control configurations with solid state touch-control switches as provided by the specified dimmer manufacturer.
- G. Dimmers and touch-control switches shall be suitable for mounting in 1-gang flush outlet box or multiple ganging as recommended by the manufacturer. Faceplate shall snap on to device with no visible means of attachment. Heat-fins shall not be visible on front of device. Multi-ganged switches shall be mounted on a common, seamless faceplate. Dimmer ganging shall be accomplished as specified by the dimmer manufacturer to avoid de-rating. Contractor is responsible for coordination of proper backbox size and faceplate type.

- H. Dimmers shall be rated to carry the indicated load of fluorescent or incandescent light source at 120 or 277 volts in an ambient temperature of 120° F. Dimmers shall be UL listed. Dimmers controlling low-voltage fixture loads shall be rated for low-voltage loads.
- I. Finish of dimmers, touch-control switches and faceplates shall be as selected by the Design Professional from the manufacturer's standard finishes. Submit finished samples for selection.
- J. Wall Box Dimmers:
 - 1. Lutron - "Nova" Series.
 - 2. Lightolier.
 - 3. Leviton.

2.02 OCCUPANCY SENSORS

- A. Passive Infrared Wall Switches:
 - 1. Occupancy sensor switches shall be UL listed, infrared with fixed 180 degree aiming with 900 sf coverage. Sensor shall include adaptive technology. An integral manual override switch shall be provided with each sensor to turn load "on" in case of sensor failure. Color shall be selected by Architect from manufacturer's standard colors, white, ivory, gray, almond, black.
 - 2. Time delay setting shall be continuously adjustable from a duration of 30 seconds to 30 minutes. Sensor shall be provided in a molded high-impact ABS resin with UV inhibitors, mountable on a standard two-gang box.
 - 3. Sensors shall include photocell for day light sensing.
 - 4. Sensor shall employ zero arc point switching to eliminate high inrush currents from fluorescent ballasts. There shall be no minimum load requirement. Maximum load shall be 800 watts incandescent, 1000 watts fluorescent (120 volts).
 - a. Hubbell IWSZP3P.
 - b. Hubbell AP1277.
- B. Acceptable Manufacturers for Occupancy Sensor Switches:
 - 1. Hubbell (Unenco or H-Moss).
 - 2. Watt Stopper.
 - 3. Sensor Switch.
 - 4. Leviton.

2.03 PHOTOCCELL SWITCH

- A. Photocell shall be hermetically sealed cadmium sulfide or silicon-diode cell rated 120 volts ac, 60 Hz, with single pole double-throw contacts for mechanically held contactors rated 1000 watts and 120 volts. Switch shall turn on below 3 footcandles and off at 3 to 10 footcandles. Provide a turn directional lens in front of the cell to prevent fixed light

sources from creating a turnoff condition. A time delay shall prevent accidental switching from transient light sources.

- B. Where multiple circuits are controlled, provide panel contactor.
- C. Photocell switches shall be as manufactured by Intermatic or Tork.

2.04 TIMECLOCK, INTERMATIC ETC ET173C

- A. The time switch shall be a solid state electronic control capable of permitting 20 on/off set points to be distributed on independent daily schedules through a 7-day time period.
- B. The time switch shall include a 7-day repeat feature.
- C. The time and set points shall be programmable to the nearest minute with a minimum on duration of 1 minute and a maximum on duration of 6 days, 23 hours, 59 minutes. The timer shall have a digital led readout to show day of week and time-of-day using 12 hour am/pm indicator. The time switch shall provide a manual override control for both temporary or permanent override. Time switch shall operate over a temperature range of -40°F (-40°C) to 155°F (58°C).
- D. Switch configuration to be DPST with a UL listed rating of:
 - 1. 30 amp inductive/resistive, 24/120/240 volts AC, 60 HZ.
 - 2. 20 amps resistive, 28 VDC.
 - 3. 1 HP, 120 volts AC, 60 HZ.
 - 4. 2 HP, 240 volts AC, 60 HZ.
 - 5. 5 amps tungsten, 120/240 volts AC, 60 HZ.
 - 6. 20 amps ballast, 120-277 volts AC, 60 HZ.
- E. The time switch shall be powered by a 120 volt 60 HZ source.
- F. The time switch shall be enclosed in lockable steel Nema 1 rated enclosure. The time switch shall be UL listed under UL Category 916 Energy Management Equipment.

PART 3 - EXECUTION

3.01 INSTALLATION OF OCCUPANCY SENSORS

- A. It shall be the contractor's responsibility to provide the quantity of occupancy sensors required for complete and proper volumetric coverage without gaps within the range of coverage(s) of controlled areas. Rooms shall have one hundred percent (100%) volumetric coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any single location within the room. The locations and quantities of sensors shown on drawings are diagrammatic and indicate

only rooms which are to be provided with sensors. The contractor shall provide additional sensors and/or adjust sensor locations if required to properly and completely cover the respective room.

- B. Install each system and its associated equipment and wiring in strict accordance with manufacturer's recommendations and instructions. Ceiling-mounted occupancy sensors shall not be installed adjacent to HVAC system exhaust or supply air diffusers.
- C. Install all low-voltage wiring for systems specified herein in a workmanlike manner. Size and install system raceways as noted and in accordance with manufacturer's requirements for installation of system's wiring. Outlet and mounting boxes required as part of mounting arrangements shall be in accordance with the equipment manufacturer's specifications.
- D. Passive infrared sensors should be aimed so as to maximize the coverage and to avoid detection outside of the area to be controlled.
- E. Field verification of lighting circuits may be required to accurately determine the final quantity of power packs required. One power pack is required per circuit (Not per switch leg).
- F. Power packs are to be installed before the switch and should remain "Powered Up" at all times.
- G. Control zones may also affect the quantity of power packs. At least one power pack will be required based on quantity of sensors to be controlled and/or quantity of circuits present in a control zone.
- H. Placement of restroom sensors would have the sensors mounted above the centermost stall with the receiver aimed towards the corridor entry door.
- I. Sensitivity settings of all passive infrared sensors should be set to "Maximum" and adjusted down on an "As Needed" basis.
- J. Sensitivity setting on ultrasonic sensors should be as follows:

Hallways:	6-8
Open Office:	6-8
Enclosed Offices:	5-7
Restrooms:	2-3

The above settings are the initial recommended settings. Further adjustment may be required.

- K. Time delays on all sensors should be set to no less than fifteen (15) minutes.
- L. Sensors should be installed six feet from an air supply register and on a vibration-free surface whenever possible.

- M. Control zones may be enlarged or reduced based on usage of the space to be controlled. This may affect the quantity of power packs required.

3.02 INSTALLATION OF WIRING

- A. Protect exposed wiring above hung ceiling construction from physical damage where necessary by using conduit, pipe, guard strips or other approved means. Install all drops to wall devices in conduit. Properly support low-voltage cables of ceiling construction and secure by approved staples, straps or similar approved fittings so designed and installed so as not to injure cable. Secure cable in place at intervals not exceeding 4-1/2 feet and within 12 inches from every cabinet, box or device.
- B. All low-voltage wiring or fiber optic cable installed within air handling plenum ceiling areas shall have Teflon insulation, or be installed in rigid raceways, EMT minimum, and extend 3 feet beyond and outside of plenum barriers and walls.

3.03 TESTING

- A. Test all equipment, including sensing devices, relays, switches and interconnections to verify that items are free from unintended grounds, short circuits and open circuits, and that all equipment will operate as intended.
- B. Arrange for systems to be fully tested and adjusted by the manufacturer or his authorized representative. Correct defects as required for full operation. The manufacturer shall provide a one-year warranty on all system components from time of system start-up.
- C. Submit, to the Owner's Representative, a letter from the manufacturer (or his authorized representative) attesting to the fact that all necessary tests and adjustments have been made, and that the entire system is functioning properly in every respect.
- D. Upon completion of all systems, the Electrical Contractor and manufacturer's authorized field engineer shall conduct functional and instructional tests for the Architect and the Owner's Representative.
- E. Electrical Contractor shall provide one site visit by factory-trained technicians to provide additional adjustments to the occupancy sensor and Bi-Level system. This will include adjustments to location, aiming, sensitivity and time delays as required by the Owner's Representative for satisfactory operation of their system. The timing of the visit shall be coordinated with the Owner's Representative, but shall occur at least 30 days after the owner occupies the space and before the end of the one-year warranty period.

END OF SECTION

SECTION 32 90 00

VEGETATIVE ROOF ASSEMBLY

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes
 - 1. Vegetative roof assembly configured and located as indicated on Drawings, be installed in conjunction with a compatible roof membrane system as specified in Section 07 52 00 Modified Bituminous Membrane Roofing.
- B. Refer to Section 01 81 13 Sustainable Project Requirements for requirements affecting the Work of this Section.

1.2 SYSTEM DESCRIPTION

- A. Dual media system consisting of a growth media layer installed over a drainage media layer.
- B. Vegetative roof assembly to be compatible with pedestrian access and integration with patio and walkway elements.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. System Provider's technical literature showing compliance of all components with specified requirements.
- C. Certified laboratory report demonstrating compliance of the proposed media with specified requirements
- D. Shop Drawings: Showing types and thickness of all materials, all proposed vegetation, drainage details, installation details including all terminations, transitions, drains, scuppers, and penetrations.
- E. Samples: Submit two samples, 12 inches long or 12 x 12 inches of each separate material of the system.
- F. Stormwater Management: Computed summary predicting runoff properties of the vegetative roof assembly for a minimum of two rainfall events specified by Owner.
- G. Certificates: Provide certificates by System Provider:
 - 1. Vegetative Roof assembly complies with specified requirements.
 - 2. Vegetative roof assembly provider has reviewed and approved details for the membrane roof system, including all details, and certifies that roof membrane system is completely compatible with vegetative roof assembly.
 - 3. Vegetative roof assembly as provided is eligible for warranty as provided.

- H. Submit Maintenance Program of full maintenance provided in a minimum of 6 site visits within 24 months.

1.4 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Submit instruction for maintenance of lawns and plants during entire year.

1.5 QUALITY ASSURANCE

- A. Installer: Company specializing in work of this Section with minimum five years documented experience and approved by System Provider in writing.

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.
- C. Review layout and plant locations.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver packaged materials in manufacturer's original unopened containers.
- B. Delivered vegetative materials to be watered in conformance with provider's instructions for each variety.
- C. Sedum cuttings shall be shipped to the site in cartons and handled in conformance with provider's written instructions. If materials cannot be installed the same day follow provider's instructions for care and storage in a sheltered area.
- D. Sedum rolled materials to be installed as soon as possible, handled and stored in conformance with provider's instructions.
- E. Turf materials to be installed as soon as possible, handled and stored in conformance with provider's instructions.
- F. Provide a written program for protection of the roofing membrane system during receiving, storing, handling, and installing vegetative roof system materials.

1.8 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Provide 24 month provider's standard warranty and maintenance service for system assembly.

PART 2 PRODUCTS

2.1 VEGETATIVE ROOF SYSTEM

- A. All materials to provide a complete installation of Type III Green Roof System by Roofmeadow.

2.2 COMPONENTS

- A. Root Barrier: 30 mil polyvinyl chloride, polypropylene, polyethylene or thermoplastic polyolefin membrane.
- B. Protection Layer: 16 oz per sq yd polypropylene or polyester non-woven needled fabric as follows:
 - 1. Density: Equal to or greater than 16 oz/sq yd per ASTM D3776.
 - 2. Puncture Resistances: Equal to or greater than 220 lbs, per ASTM D4833.
- C. Drainage Net: Single sided reinforced underlayment of HDPE stranded core with 6 oz/sq yd non-woven fabric bonded to one side.
 - 1. Core thickness: Equal to or greater than 200 mil per ASTM D5199.
 - 2. CBR puncture resistance composite : Equal to or greater than 1000 lbs per ASTM D6241.
- D. Capillary Fabric: Provider's standard capillary fabric that provides a capillary rise of equal to or greater than 6 in.
- E. Drainage Layer:
 - 1. Perforated Conduit: Provider's standard triangular or rectangular perforated conduit, minimum 2025 inches in height, with minimum 10 % open area.
 - 2. Geosynthetic Sheet Drain: Formed polyethylene core with adhered polypropylene, non-woven separation fabric.
 - a. Minimum 0.38 inches thick per ASTM D1777.
 - b. Minimum 15 gal/min/ft transmissivity, per ASTM D4716.
 - 3. Drainage Media: Provider's standard mineral product the provides minimum density at maximum water capacity of 60 lb/cf, per ASTM E2396.
 - 4. Separation Fabric: Provider's standard for application.
- F. Growth Media:
 - 1. Provider's Intensive Growth Media, thoroughly blended at a batch facility.
 - 2. Collect quality control samples for each 100 cy provided to the project. Seal samples in 2 gallon water tight containers, hold for inspection by Owner's representative.

2.3 VEGETATIVE COMPONENTS

- A. Sedum Cuttings:
 - 1. Freshly cut Sedum that is not flowering.
 - 2. Ship so that cuttings are enclosed for no more than 30 hours.
- B. Plugs:

1. 3 inch deep, 72-cell plugs, propagated in sterile nursery medium, according to plant provider's recommendations.
 2. "Harden off" plugs prior to planting by gradually eliminating irrigation over a period of one week.
 3. Pre-Grown Sedum Mats shall contain Sedum varieties as specified by the System Provider and approved by the Architect. The media shall satisfy performance requirements for Roofmeadow® Type M2 growth media. The mats shall be 90% covered when delivered to the project.
 - a. Thickness: 3/4 to 1-1/4 inches.
 - b. Size: 4 ft width by 6.25 ft length.
- C. D. Seed: Consult System Provider for recommended seed varieties and application rates.
- D. E. Turf Type Sod propagated in loamy sand (USDA) soil. The sod shall include a mixture of grass species that are appropriate for heavy traffic and full sun exposure. The thickness of the sod 1 to 1.5 inches.
- E. Perennial Plants
1. 3 in. pots, propagated in sterile nursery medium according to the plant providers recommendation.
 2. "Harden off" pots prior to planting by gradually eliminating irrigation over a period of one week.

2.4 WIND PROTECTION

- A. Temporary Wind Scour Protection: Temporary wind blanket composed of biodegradable coir, type and securing method per provider.
- B. Tackifier Emulsion: Type and frequency of surface application as required by provider.
- C. Hydro Mulch Sealer: Wood fiber hydro mulch that contains tackifier emulsion, to be applied per provider's instructions.
- D. Permanent Wind Scour Protection: Wind blanket consisting of PVC coated geogrid containing high molecular weight/ high tenacity polyester yarn.
- E. River stone, non-carbonate washed, crushed or round river stone graded per AASHTO #3.
- F. Boundary Units: Cantilevered type aluminum edge, profile and thickness as indicated in Shop Drawings.

2.5 DRAIN ACCESS CHAMBERS

- A. Drain Inspection Chamber: System Provider's standard PVC, round chamber.
 1. Heights: As indicated in Shop Drawings.
 2. Diameter: 17 inches nominal.
 3. Inspection chamber to be installed over all drains in vegetated roof area.
- B. Drain Inspection Chamber: System Provider's standard ABS, square chamber.
 1. Variable height with removable lid.

2. Width: 15 inches.
3. Inspection chamber to be installed over all drains in vegetated roof area.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

3.2 INSPECT WATERPROOFING

- A. System Provider shall examine the completed roof membrane waterproofing system, with the Roofing Applicator present, for compliance with Drawings, installation tolerances, and other conditions affecting performance.
 1. For submission to the General Contractor and the Roofing Applicator, System Provider shall provide a written report identifying the specific conditions that may be detrimental to the performance of the work.
 2. System Provider shall provide written approval of condition, compatibility, and provider acceptance of roof membrane system.
 3. Proceed only after unsatisfactory conditions have been corrected.

System Provider to verify that one-hundred percent of all waterproofing seams shall have been tested by the waterproofing installer. Refer to Section 07 52 00 Modified Bituminous Membrane Roofing.

3.3 PREPARATION

- A. Prepare surface of roof membrane system by sweeping and washing to remove all deleterious materials.
- B. Prior to component installation protect prepared roof membrane surface from contamination and foot traffic.
- C. Perform vegetative roof installation in such a manner as to follow instructions for protection of the membrane roof system from the membrane installer.

3.4 INSTALLATION OF ROOT BARRIER

- A. Roll out Root Barrier above the roofing membrane system, minimizing aggregate seam length. Overlap adjoining sheets by minimum of 2 inches. Allow slack to accommodate contraction during cold weather.
- B. Weld seams using hot-air welding equipment (Leister, or equivalent) in accordance with recommendations of the System Provider in order to create a watertight surface. One-hundred percent of all seams shall be tested by hand scribe.
- C. Install terminations according to System Provider recommendations.

3.5 INSTALLATION OF PROTECTON LAYER

- A. Install protection fabric in vegetated areas.
 - 1. Overlap seams a minimum of 6 inches.
 - 2. Extend protection fabric 6 inches minimum up parapets, curbs, and penetrations.
- B. Install single sided composite drainage net in paver areas.
 - 1. Overlap seams a minimum of 6 inches.
 - 2. Extend the single-sided composite drainage net minimum 6 inches up parapets, curbs, and penetrations.

3.6 INSTALLATION OF PERFORATED CONDUIT

- A. Assemble perforated conduit according to the layout provided by System Provider, placed on top of appropriately sized strips of separation fabric in accordance with recommendations of the System Provider.
- B. Cover the assembled perforated conduit with separation fabric.

3.7 INSTALLATION OF PERMANENT WIND SCOUR PROTECTION SYSTEM

- A. Install permanent wind scour protection system at parapets.
- B. Install 6 foot-wide strip of permanent wind blanket on top of the protection layer at parapets according to recommendations by the System Provider.
- C. Place Boundary Units
 - 1. Place geosynthetic sheet drain as an underlayment for the boundary units.
 - 2. Place boundary units and cover with separation fabric.
- D. Place pavers between the boundary units and the parapet.
- E. Temporarily fold the permanent wind blanket back over the parapet to allow for installation of completed growth media surface.
- F. Re-place the permanent wind blanket over the completed growth media surface.

3.8 INSTALLATION OF DRAIN ACCESS CHAMBERS

- A. Assemble drain access chambers on top of 2-foot wide strips of geosynthetic sheet drain. Cover geosynthetic sheet drain with separation fabric to prevent intrusion of media.
- B. Stabilize the drain access chambers using 18-inch wide margin of stone per System Provider's recommendations.
- C. Separate stone from the growth media according to the recommendations of the System Provider.

3.9 INSTALLATION OF PAVER SYSTEM

- A. Install Paver System:
 - 1. Fill Granular Bedding Material to within 3- inches of the finished surface. Compact using a 4-foot wide lawn roller with a total load of not less than 200 lbs and not more than 300 lbs.
 - 2. Place separation fabric and reinforcing grid.
 - 3. Fasten paver edging to the reinforcing grid with nylon tie anchors according to System Provider's recommendations.
 - 4. Place ½ to 1 inch of paver setting bed.
 - 5. Fit concrete pavers snug against paver edging and settle per System Provider's instructions.

3.10 INSTALLATION OF GROWTH MEDIA

- A. Dispense growth media in a manner that will not suddenly increase the load to the roof. Immediately spread growth media to the specified thickness plus ten percent, after moderate compaction using a 4-foot wide lawn roller with a total load of not less than 200 lbs and not more than 300 lbs, unless otherwise indicated.
- B. Thoroughly soak with water using a sprinkler or hand sprayer.

3.11 INSTALLATION OF VEGETATION

- A. A. Pre-grown Sedum Mats:
 - 1. Unroll Pre-grown Sedum Mats on the roof and layout on top of growth media.
 - 2. Provide temporary irrigation for 4 weeks following installation in accordance with System Provider's instructions.
- B. B. Cuttings/Seed
 - 1. The planting mixture to include species that will generate a continuous ground cover. Maximum mature plant heights less than 24 inches. Avoid large drifts of single species.
 - 2. Incorporate non-deciduous or semi-deciduous Sedum species established from fresh cuttings.
 - a. Include a minimum of four species of Sedum in approximately equal quantities.
 - b. Distribute over the surface of the media at a minimum rate of 40 lbs/1000 square feet.
 - c. System Provider to approve specific planting dates relative to local weather conditions.
 - 3. Include a minimum of five perennial varieties in seed mixtures, avoiding any turf forming grasses. Apply seed according to System Provider's instructions.
 - 4. If more than 24 hours has elapsed since installing and soaking the growth media, thoroughly re-soak growth media prior to commencing the broadcast distribution of seed or cuttings.
 - 5. Protect installation with temporary wind blanket as required.
 - 6. Install hydro-mulch according to System Provider's recommendations. Re-apply hydro mulch as needed during the establishment period to prevent erosion of growth media.
 - 7. Apply watering to installation per System Provider's recommendations.

C. Plugs

1. Confirm appropriate timing of plantings with System Provider.
2. Establish plants from 72-cell 3-inch deep plugs (unless indicated in the drawings) propagated in sterile nursery medium, according to the plant provider's recommendations. Install at two plants per square foot unless otherwise indicated.
3. Thoroughly soak growth media prior to commencing planting.
4. Protect with temporary wind blanket, making cuts in temporary wind blanket to insert plugs.
5. Install plugs in growth media to their full depth. Press growth media firmly around the installed plugs. At the end of each day, soak those areas that have been newly planted.
6. Apply tackifier emulsion according to System Provider's recommendations.
7. Do not mulch.

D. Turf Type Sod

1. Unroll sod onto growth media layer.
2. Apply watering to installation per System Provider's recommendations.

3.12 MAINTENANCE SERVICE

A. Provide a 24 month maintenance service to include:

1. Hand weeding and/or chemical weeding and fertilization, as required to maintain the health and vigor of the plants.
2. Plant replacement as needed to achieve the required 80% coverage rate two years following substantial completion.
3. Temporary spray irrigation during the first growing season. All temporary irrigation equipment shall be removed at the conclusion of the maintenance service period.

3.13 CLEANUP AND PROTECTION

- A. During the Work, keep pavements, roof membrane system, and adjacent surfaces clean and in an orderly condition.
- B. Protect the Work and materials from damage due to landscape operations by other contractors and trades and trespassers.
- C. Maintain protection during installation and maintenance periods.
- D. Treat repair or replace damaged Work as directed.

3.14 INSPECTION AND ACCEPTANCE

- A. When the Work is completed, including maintenance, Architect will, upon request, make an inspection to determine acceptability.

1. The Work may be inspected for acceptance in portions as agreeable to Architect, provided each portion of Work offered for inspection is complete including maintenance.
- B. When inspected Work does not comply with requirements, replace rejected Work and continue specified maintenance until reinspected by Architect and found to be acceptable.
- C. Remove rejected plants and materials from the site promptly.

END OF SECTION