PART 1 GENERAL

1.1 PROJECT IDENTIFICATION

A. Project Name: SNYDER HALL REPLACEMENT, located at:

B. Owner's Project Number: 2016414.00.

C. The Owner, hereinafter referred to as Owner: Umpqua Community College (UCC).

D. Owner's Project Manager: Jess Miller, Director of Facilities and Security
   1. Address: 1140 Umpqua College Rd
   2. City, State, Zip: Roseburg, OR 97470
   3. Phone/Fax: (541) 440-7648
   4. E-mail: jess.miller@umpqua.edu

1.2 NOTICE TO PROSPECTIVE BIDDERS

A. These documents constitute an Invitation to Bid to and request for qualifications from General Contractors for the construction of the project described below.

1.3 PROJECT DESCRIPTION

A. As indicated in the Construction Documents, the Project consists of a new 9,500 SF 1-story, wood-framed classroom building, civil site work, connections to existing underground utilities, connections to new underground utilities from the existing adjacent Science Building and landscaping.

B. Contract Scope: New and Remodel Construction.

C. Contract Terms: Lump sum (fixed price, stipulated sum), with monthly progress payments.

D. Existing Site: Existing Snyder Hall, indicated on the Survey, was deconstructed in Fall 2016. Contractor shall verify that all above and below-ground conditions for new construction and modifications to existing, are ready to the new work.

1.4 PROJECT CONSULTANTS

A. The Architect, hereinafter referred to as Architect: Mahlum.

B. Architect's Project Manager: Jeremy Rear AIA, Associate
   1. Address: 1231 NW Hoyt Street, Suite 102.
   2. City, State, Zip: Portland, OR 97209.
   3. Phone/Fax: (503) 224-4032.
   4. E-mail: jrear@mahlum.com.

1.5 PROCUREMENT TIMETABLE

A. Pre- Bid Site Tour: Upon Request.

B. Last Request for Substitution Due: No later than end of business day, 11 May 2017.

C. Last Request for Information Due: No later than end of business day, 11 May 2017.

D. Request for Information and Substitutions Responses Due: 17 May 2017.

E. Bid Due Date: Prior to 3 PM local time, 22 May 2017.

F. Bid Opening: Same day, 4 PM local time.

G. Notice of Award: No later than end of business day, 2 June 2017.

H. Contract Time: 30 calendar days.

I. Required Construction Start: 19 June 2017.

J. Required Substantial Completion Date: 2 March 2018.

K. Required Final Completion Date: 9 March 2018.

L. Completion date is critical due to requirements of Owner's operations.

M. The Owner reserves the right to change the schedule or terminate the entire procurement process at any time.

1.6 PROCUREMENT DOCUMENTS

A. Availability of Documents: Complete sets of procurement documents may be obtained:
   1. At the following address: In Print
      a. Phone Number: (541) 672-3497
      b. Email Address: info@inprintroseburg.com
      c. Website Address: www.inprintroseburg.com

B. Documents may be viewed at Umpqua Community College (UCC) Library.

1.7 BID SECURITY

A. Bids shall be accompanied by a security deposit as follows:
   1. Bid Bond in the amount of 5% of the value of the bid will be included on AIA A310 Bid Bond Form.

1.8 SIGNATURE

A. For: Owner

B. By: Rebecca Redell
   1. Signed: _____
   2. Rebecca Redell, CFO

END OF SECTION

PROCUREMENT AND CONTRACTING REQUIREMENTS

1.1 Division 00 -- Procurement and Contracting Requirements

A. 00 01 02 - Project Information

B. 00 01 10 - Table of Contents

D. 00 21 13 - Instructions to Bidders

E. 00 31 00 - Available Project Information

F. 00 40 00 - Procurement Forms and Supplements

G. 00 41 00 - Bid Form

H. 00 43 01 - Bid Form Supplements Cover Sheet

I. 00 43 22 - Unit Prices Form

J. 00 43 25 - Substitution Request Form

SPECIFICATIONS

2.1 Division 01 -- General Requirements

A. 01 10 00 - Summary

B. 01 21 00 - Allowances

C. 01 22 00 - Unit Prices

D. 01 30 00 - Administrative Requirements

E. 01 33 29.07 - Prohibited Content Installer Certification

F. 01 40 00 - Quality Requirements

G. 01 40 10 - The Air Barrier System

H. 01 40 13 - Freestanding Mockup

I. 01 41 00 - Regulatory Requirements

J. 01 42 16 - Definitions

K. 01 42 19 - Reference Standards

L. 01 45 33 - Code-Required Special Inspections

M. 01 50 00 - Temporary Facilities and Controls

N. 01 57 13 - Temporary Erosion and Sediment Control

O. 01 57 21 - Indoor Air Quality Controls

P. 01 60 00 - Product Requirements

Q. 01 60 11 - Seismic Anchoring Requirements

R. 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions
1. 01 61 16.01 - Accessory Material VOC Content Certification Form

S. 01 62 11 - Delegated Design

T. 01 70 00 - Execution and Closeout Requirements

U. 01 74 19 - Construction Waste Management and Disposal

V. 01 78 00 - Closeout Submittals

W. 01 79 00 - Demonstration and Training

X. 01 83 01 - Leakage Testing for Building Envelopes

Y. 01 91 13 - General Commissioning Requirements

2.2 Division 02 -- Existing Conditions

A. For Site Preparation and Earthwork, see Division 31 and drawings

B. For Pavements and Site Improvements, see Division 32 and drawings

C. For Site Utilities, see Division 33

D. 02 41 00 - Demolition

2.3 Division 03 -- Concrete

A. 03 30 00 - Cast-in-Place Concrete

2.4 Division 04 -- Masonry

A. 04 43 01 - Stone Masonry Veneer

2.5 Division 05 -- Metals

A. 05 12 00 - Structural Steel Framing

B. 05 50 00 - Metal Fabrications

2.6 Division 06 -- Wood, Plastics, and Composites

A. 06 10 00 - Rough Carpentry

B. 06 20 00 - Finish Carpentry

C. 06 41 00 - Architectural Wood Casework

2.7 Division 07 -- Thermal and Moisture Protection

A. 07 11 13 - Bituminous Dampproofing

B. 07 19 00 - Water Repellents and Anti-Graffiti Coatings

C. 07 21 00 - Thermal Insulation

D. 07 21 19 - Foamed-In-Place Insulation

E. 07 25 00 - Weather Barriers

F. 07 32 16 - Concrete Roof Tiles

G. 07 46 23 - Wood Siding and Soffits

H. 07 54 00 - Thermoplastic Membrane Roofing

I. 07 62 00 - Sheet Metal Flashing and Trim

J. 07 92 00 - Joint Sealants

2.8 Division 08 -- Openings

A. 08 11 13 - Hollow Metal Doors and Frames

B. 08 14 16 - Flush Wood Doors

C. 08 31 00 - Access Doors and Panels

D. 08 43 13 - Aluminum-Framed Storefronts

E. 08 46 00 - Glazed Interior Wall and Door Assemblies

F. 08 54 13 - Fiberglass Windows

G. 08 71 00 - Door Hardware

H. 08 80 00 - Glazing

I. 08 91 00 - Louvers

2.9 Division 09 -- Finishes

A. 09 05 61 - Common Work Results for Flooring Preparation

B. 09 21 16 - Gypsum Board Assemblies

C. 09 30 00 - Tiling

D. 09 51 00 - Suspended Acoustical Ceilings

E. 09 68 00 - Carpeting

F. 09 68 13 - Tile Carpeting

G. 09 77 33 - Glass Fiber Reinforced Plastic Panels

H. 09 91 13 - Exterior Painting

I. 09 91 23 - Interior Painting

2.10 Division 10 -- Specialties

A. 10 11 01 - Visual Display Boards

B. 10 14 00 - Signage

C. 10 28 00 - Toilet Accessories

D. 10 44 00 - Fire Protection Specialties

2.11 Division 11 -- Equipment

A. 11 31 00 - Residential Appliances

B. 11 52 13 - Projection Screens

2.12 Division 12 -- Furnishings

A. 12 24 00 - Window Shades

B. 12 36 00 - Countertops

2.13 Division 15 -- (NOT USED) (For Mechanical, see Divisions 21, 22, and 23)

2.14 Division 16 -- (NOT USED) (For Electrical, see Divisions 25, 26, 27, 28, and 29)

2.15 Division 17 -- (NOT USED)

2.16 Division 18 -- (NOT USED)

2.17 Division 19 -- (NOT USED)

2.18 Division 20 -- (NOT USED)

2.19 Division 21 -- Fire Suppression

A. 21 05 00 - General Fire Protection Provisions

B. 21 05 17 - Sleeves and Sleeve Seals for Fire Suppression Piping

C. 21 13 13 - Wet-Pipe Suppression System

2.20 Division 22 -- Plumbing

A. 22 05 00 - General Plumbing Provisions

B. 22 05 13 - Common Motor Requirements for Plumbing Equipment

C. 22 05 17 - Sleeves, Sleeve Seals, & Escutcheons for Plumbing Piping

D. 22 05 19 - Meters and Gauges for Plumbing Piping

E. 22 05 23 - Valves for Plumbing Piping

F. 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment

G. 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment

H. 22 05 53 - Identification for Plumbing Equipment

I. 22 07 19 - Plumbing Piping Insulation

J. 22 11 04 - Plumbing Pumps

K. 22 11 16 - Domestic Water Piping

L. 22 11 19 - Domestic Water Piping Specialties

M. 22 13 16 - Sanitary Waste and Vent Piping

N. 22 13 19 - Sanitary Waste Piping Specialties

O. 22 33 00 - Electrical, Domestic-Water Heaters

P. 22 42 00 - Commercial Plumbing Fixtures

Q. 22 47 13 - Drinking Fountains and Water Coolers

2.21 Division 23 -- Heating, Ventilating, and Air-Conditioning (HVAC)

A. 23 05 00 - General HVAC Provisions

B. 23 05 13 - Common Motor Requirements for HVAC Equipment

C. 23 05 14 - Motor Control Devices for Mechanical Equipment

D. 23 05 19 - Meters and Gauges for HVAC Piping

E. 23 05 48 - Vibration and Seismic Controls for HVAC

F. 23 05 53 - Identification for Plumbing Equipment

G. 23 05 93 - Testing, Adjusting and Balancing for HVAC

H. 23 07 00 - Mechanical Insulation

I. 23 09 10 - Building Automation System

J. 23 09 30 - Field Installed Control System Components

K. 23 09 50 - Sequence of Operation for HVAC DDC

L. 23 21 13 - Above Ground Hydronic Piping

M. 23 21 14 - Underground Hydronic Piping

N. 23 21 19 - Hydronic System Specialties

O. 23 21 23 - Hydronic System Pumps

P. 23 25 13 - Water Treatment for Hydronic Systems

Q. 23 31 13 - Metal Ductwork

R. 23 31 17 - Flexible Ductwork

S. 23 31 19 - Ductwork Hanger, Supports, Seals

T. 23 33 00 - Ductwork Accessories

U. 23 34 00 - HVAC Fans

V. 23 36 00 - Terminal Units

W. 23 37 00 - Air Outlets and Inlets

X. 23 41 00 - Particulate Air Filtration

Y. 23 52 10 - Boiler Stacks, Condensing Boiler

Z. 23 52 16 - Condensing Boilers

AA. 23 73 13 - Modular Indoor Central Station Air Handling Units

BB. 23 82 16 - Air Coils

CC. 23 83 39 - Hydronic Unit Heater

2.22 Division 24 -- (NOT USED)

2.23 Division 25 -- (NOT USED)

2.24 Division 26 -- Electrical

A. 26 01 26 - Submittals and Shop Drawings

B. 26 01 55 - Electrical Systems Firestopping

C. 26 05 00 - Common Work Results for Electrical

D. 26 05 19 - Low-Voltage Electrical Power Conductors and Cables

E. 26 05 26 - Grounding and Bonding for Electrical Systems

F. 26 05 29 - Hangers and Supports for Electrical Systems

G. 26 05 33 - Raceways and Boxes for Electrical Systems

H. 26 05 53 - Identification for Electrical Systems

I. 26 09 24 - Digital Lighting Control Equipment

J. 26 22 13 - Dry Type Transformers

K. 26 24 16 - Panelboards

L. 26 27 26 - Wiring Devices

M. 26 28 16 - Overcurrent Protective Devices

N. 26 29 13 - Motor and Circuit Disconnects

O. 26 32 23 - Emergency Power Supplies

P. 26 51 13 - Indoor Lighting Fixtures Lamps, and Ballasts

2.25 Division 27 -- (NOT USED)

2.26 Division 28 -- Electronic Safety and Security

A. 28 13 00 - Security Access Control System

B. 28 31 00 - Fire Alarm System

2.27 Division 29 -- (NOT USED)

2.28 Division 30 -- (NOT USED)

2.29 Division 31 -- Earthwork

A. 31 22 00 - Grading

B. 31 23 23 - Fill

2.30 Division 32 -- Exterior Improvements

A. 32 84 10 - Design Build Irrigation

B. 32 92 19 - Seeding

C. 32 93 00 - Plants

D. 32 94 45 - Landscape Maintenance

2.31 Division 33 -- Utilities

[REFER TO CIVIL DRAWINGS]

END OF SECTION

PART 1 GENERAL

1.1 PROJECT

A. Project Name: SNYDER HALL REPLACEMENT

B. Owner's Name: Umpqua Community College (UCC).

C. Architect's Name: Mahlum.

D. As indicated in the Construction Documents, the Project consists of a new 9,476, SF 1-story, wood-framed classroom building, civil site work, connections to existing underground utilities, connections to new underground utilities from the existing adjacent Science Building and landscaping.

1.2 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract, lump sum (fixed price), based on a Stipulated Price as described in AIA A101-2007 Standard Form of Agreement Between Owner and Contractor.

1.3 DESCRIPTION OF ALTERATIONS WORK

A. Scope of demolition and removal work is shown on drawings and specified in Section 02 41 00.

1.4 WORK BY OWNER

A. Items noted NIC (Not in Contract) will be supplied and installed by Owner. Some items include:
   1. Furnishings.
   2. Small equipment.
   3. Rugs.
   4. Artwork.
   5. Classroom and Conference Room Input / Output Connections, and Digital Audio / Visual Lectern.

B. Owner will supply the following for installation by Contractor:
   1. Communications server cabinet.
   2. Digital Monitor.
   3. Classroom Projectors.
   4. Security Cameras.

1.5 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Substantial Completion.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

1.6 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.

B. Arrange use of site and premises to allow:

1. Owner occupancy.
2. Work by Others.
3. Work by Owner.
4. Use of site and premises by the public, as determined by Umpqua Community College (UCC).

C. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.

D. Existing buildings' spaces may not be used for storage.

E. Time Restrictions:
   1. Limit conduct of especially noisy, malodorous, and dusty exterior work to the hours of 7:00 am to 9:00 pm on weekdays, and 8:00 am to 8:00 pm on weekend days.

F. Utility Outages and Shutdown:
   1. Limit disruption of utility services to hours the site is unoccupied.
   2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
   3. Prevent accidental disruption of utility services to other facilities.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

C. Defect assessment and non-payment for rejected work.

1.2 RELATED REQUIREMENTS

A. Document 00 21 13 - Instructions to Bidders: Instructions for preparation of pricing for Unit Prices.

B. Document 00 43 22 - Unit Prices Form: List of Unit Prices as supplement to Bid Form

C. Section 01 20 00 - Price and Payment Procedures: Additional payment and modification procedures.

1.3 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.4 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.5 MEASUREMENT OF QUANTITIES

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

B. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect.

C. Assist by providing necessary equipment, workers, and survey personnel as required.

D. Measurement Devices:
   1. Weigh Scales: Inspected, tested and certified by the applicable state Weights and Measures department within the past year.
   2. Platform Scales: Of sufficient size and capacity to accommodate the conveying vehicle.
   3. Metering Devices: Inspected, tested and certified by the applicable state department within the past year.

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

F. Measurement by Volume: Measured loose delivered by cubic dimension using mean length, width and height or thickness.

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

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

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

J. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Architect prior to starting work.

K. Contractor's Engineer Responsibilities: Sign surveyor's field notes or keep duplicate field notes , calculate and certify quantities for payment purposes.

1.6 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.

B. Payment will not be made for any of the following:
1. Products wasted or disposed of in a manner that is not acceptable.
2. Products determined as unacceptable before or after placement.
3. Products not completely unloaded from the transporting vehicle.
4. Products placed beyond the lines and levels of the required Work.
5. Products remaining on hand after completion of the Work.
6. Loading, hauling, and disposing of rejected Products.

1.7 DEFECT ASSESSMENT

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

B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct one of the following remedies:
1. The defective Work may remain, but the unit price will be adjusted to a new unit price at the discretion of Architect.
2. The defective Work will be partially repaired to the instructions of the Architect, and the unit price will be adjusted to a new unit price at the discretion of Architect.

C. The individual specification sections may modify these options or may identify a specific formula or percentage price reduction.

D. The authority of Architect to assess the defect and identify payment adjustment is final.

1.8 SCHEDULE OF UNIT PRICES

A. Item: Over-excavation; Section REFER TO GEOTECHNICAL REPORT.

B. Item: Engineered Fill; Section REFER TO GEOTECHNICAL REPORT.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section includes administrative and procedural requirements for accomplishing an airtight building enclosure that controls infiltration or exfiltration of air.
   1. The airtight components of the building enclosure and the joints, junctures and transitions between materials, products, and assemblies forming the air-tightness of the building enclosure are called “the air barrier system”. Services include coordination between the trades, the proper scheduling and sequencing of the work, preconstruction meetings, inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by Architect, Contractor, Owner, or Building Envelope Consultant.
   2. The Contractor shall ensure that the intent of constructing the building enclosure with a continuous air barrier system to control air leakage into, or out of the conditioned space is achieved. The air barrier system shall have the following characteristics:
      a. It must be continuous, with all joints sealed.
      b. It must be structurally supported to withstand positive and negative air pressures applied to the building enclosure.
      c. Connection shall be made between:
         1) Foundation and walls.
         2) Walls and windows or doors.
         3) Different wall systems.
         4) Wall and roof.
         5) Wall and roof over unconditioned space.
         6) Walls, floor and roof across construction, control and expansion joints.
         7) Walls, floors and roof to utility, pipe and duct penetrations.
      d. Air Barrier Penetrations: All penetrations of the air barrier and paths of air infiltration or exfiltration shall be made air-tight.

B. Inspection and testing services may be required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.

C. Requirements of this section relate to the coordination between subcontractors required to provide an airtight building enclosure, customized fabrication and installation procedures, not production of standard products.
   1. Continuity of the air barrier materials and products with joints to provide assemblies. Continuity of all the enclosure assemblies with joints and transition materials to provide a whole building air barrier system.
   2. Specific quality-control requirements for individual construction activities are specified in the sections of the specifications. Requirements in those sections may also cover production of standard products. It is the Contractor’s responsibility to ensure that each subcontractor is adequately and satisfactorily performing the quality assurance documentation, tests and procedures required by each section.
   3. Specified inspections, tests, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with Contract Document requirements.

4. Requirements for Contractor to provide an airtight building enclosure is not limited by quality-control services required by Architect, Owner, or authorities having jurisdiction and are not limited by provisions of this section.

1.2 RELATED SECTIONS

A. Drawings and general provisions of the Contract, including General Conditions and supplementary Conditions and Division 1 Specification Sections, apply to this section.

B. Section 01 40 13 – Freestanding Mock-up

C. Section 03 30 00 – Cast in Place Concrete

D. Section 06 10 00 – Rough Carpentry

E. Section 06 15 00 – Wood Decking

F. Section 07 21 00 – Thermal Insulation

G. Section 07 21 19 – Foamed-In-Place Insulation

H. Section 07 25 00 – Weather Barriers

I. Section 07 32 16 – Concrete Roof Tiles

J. Section 07 62 00 – Sheet Metal Flashing and Trim

K. Section 07 90 00 – Joint Sealants

L. Section 08 11 13 – Hollow Metal Doors and Frames

M. Section 08 43 13 – Aluminum Framed Storefronts

N. Section 08 54 13 – Fiberglass Windows

O. Section 08 91 00 – Louvers

1.3 RESPONSIBILITIES

A. Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity, Contractor shall provide coordination of the trades, and the sequence of construction to ensure continuity of the air barrier system joints, junctures and transitions between materials, and assemblies of materials and products, from substructure, to walls, to roof. Provide quality assurance procedures, testing and verification as specified herein. Facilitate inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction or by the Owner. Costs for these services are included in the Contract Sum.
   1. Organize preconstruction meetings between the trades involved in the whole building's air barrier system to discuss where each trade begins and ends and the responsibility and sequence of installation of all the air-tight joints, junctures, and transitions between materials, products and assemblies of products specified in the different sections, to be installed by the different trades.
   2. Build a mock-up before proceeding with the work, satisfactory to the Architect, of each air-tight joint type, juncture, and transition between products. materials and assemblies. Test the mock-up per the requirements outlined in Section 01 83 01 Leakage Testing for Building Envelopes.

B. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
   1. Provide access to the Work.
   2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
   3. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
   4. Deliver samples to testing laboratories.
   5. Provide security and protection of samples and test equipment at the Project Site.
   6. Seal off portions of the building prior to testing, per the test requirement outline in the 2014 Oregon Energy Efficiency Specialty Code.

C. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
   1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.
   2. The Contractor is responsible for scheduling times for coordination and testing the whole building for air barrier systems compliance per the 2014 Oregon Energy Efficiency Specialty Code.

D. Mock-up Requirements:
   1. Refer to Section 01 40 13 - Free-standing Mockup. Coordinate mockup construction with Air Leakage Testing Company to ensure mock-up is suitable to meet testing requirements.
   2. Prepare mock-up to test and verify that air leakage at walls and openings meets the air tightness performance requirements.

1.4 PERFORMANCE REQUIREMENTS

A. Compliance:
   1. Materials: materials used for the air barrier system in the opaque envelope shall have an air permeance not to exceed 0.004 cfm/ft2 under a pressure differential of 0.3 in. water (1.57psf) (0.02 L/s.m2 @ 75 Pa) when tested in accordance with ASTM E 2178.
   2. Assemblies of materials and components: shall have an air permeance not to exceed 0.05 cfm/ft^2 under a pressure differential of 0.3 in. water (1.57psf) (0.15 L/s.m2 @ 75 Pa) when tested in accordance with ASTM E 1677 or E783.
   3. Air tightness goal of entire building: The air leakage of the entire building shall not exceed 0.40 cfm/sf under a pressure differential of 0.3 in. water (1.57psf) (0.75 L/s.m2 @ 75 Pa) when tested according to ASTM E 779 following the multi-point test protocol outlined in the 2014 Oregon Energy Efficiency Specialty Code and Army Corps of Engineers Whole Building Air Leakage Test Protocol. Where conflicts exist, the Oregon State Energy Code requirements take precedence.

1.5 SUBMITTALS

A. Submit certified written reports, in duplicate, of each inspection, test, or similar service.
   1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
   2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:

a. Date of issue.
b. Project title and number.
c. Name, address, and telephone number of testing agency.
d. Dates and locations of samples and tests or inspections.
e. Names of individuals making the inspection or test.
f. Designation of the Work and test method.
g. Identification of product and Specification Section.
h. Complete inspection or test data.
i. Test results and an interpretation of test results.
j. Ambient conditions at the time of sample taking and testing.
k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
l. Name and signature of laboratory inspector.
m. Recommendations on retesting.

1.6 QUALITY ASSURANCE

A. Qualifications for Air Barrier Testing and Inspection Agencies: Engage air barrier inspection and testing service agencies, including independent testing laboratories, that are pre-qualified and that specialize in the types of air barrier system inspections and tests to be performed.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 REPAIR AND PROTECTION

A. Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for Division 1 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.

C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

3.2 TESTING AND INSPECTION

A. The Owner will hire a testing and inspection agency to provide periodic observation and inspection during installation of the air barrier system. The testing and inspection agency will provide the following listed services:
1. Qualitative Testing and Inspection:
a. Reports of observations, with copies to the Owner, Contractor and Architect.
b. Continuity of the air barrier system throughout the building enclosure with no gaps, holes.
c. Structural support of the air barrier system to withstand design air pressures.
d. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions and mortar droppings, with mortar joints struck flush, or as required by the manufacturer of the air barrier material.
e. Site conditions for application temperature and dryness of substrates.
f. Maximum length of exposure time of materials to ultra-violet deterioration.

g. Surfaces are properly primed.
h. Laps in material are appropriate, shingled in the correct direction, with no fishmouths.
i. Mastic applied on cut edges.
j. Roller has been used to enhance adhesion.
k. Measure application thickness of liquid-applied materials to manufacturer's specifications for the specific substrate.
l. Materials used for compatibility.
m. Transitions at changes in direction, and structural support at gaps.
n. Connections between assemblies (membrane and sealants) for cleaning, preparation and priming of surfaces, structural support, integrity and continuity of seal.
o. All penetrations sealed.
p. ASTM E1186 "Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Retarder Systems".
    1) Infrared scanning with pressurization/depressurization.
    2) Smoke pencil with pressurization/depressurization.
    3) Pressurization/depressurization with use of anemometer
    4) Chamber pressurization/depressurization in conjunction with smoke tracers.

B. Whole Building Air Leakage Testing
1. The owner is to engage a qualified testing agency to perform a whole building air leakage test at substantial completion of the building air barrier system. Testing and reporting to be in compliance with Oregon State Energy Code.
2. Test Preparation
3. Two weeks in advance of testing, contractor shall coordinate a pre-testing walkthrough with the testing agency and HVAC sub-contractor to discuss pre-test preparation required by the contractor. Contractor shall familiarize themselves with the Army Corps of Engineers Whole Building Air Leakage Test Protocol and pre-testing preparation.
4. Two days prior to testing, contractor shall have all temporary enclosures in place for testing agency review and pre-testing to confirm all extraneous air leakage paths are sufficiently sealed off. Contractor shall undertake any re-sealing/modifications of temporary enclosures to the testing agencies satisfaction.
    a. Contractor to provide temporary enclosures to seal all intentional functional openings such as exhaust and relief louvers, grilles, cooktop vents, dryer vents and garbage chutes that are not used in the test to introduce air, using plastic sheeting and duct tape or similar materials.
    b. Contractor must prop open all doors (bounded in part by and exterior wall, roof or floor included within the test area) for the duration of the test.
    c. All plumbing traps shall be filled with water.
    d. During scheduled testing, the contractor shall provide the testing agency complete, uninterrupted access to the entire building for duration of the test.
    e. During testing, contractor shall coordinate with the Fire Department to have the Fire Alarm set in Test Mode.
    f. During testing, all HVAC systems shall be powered down for the duration of the test.
    g. Contractor shall control access during testing to prevent any unauthorized entrance/exit to the building.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General product requirements.

B. Sustainable design-related product requirements.

C. Re-use of existing products.

D. Transportation, handling, storage and protection.

E. Product option requirements.

F. Substitution limitations and procedures.

G. Procedures for Owner-supplied products.

H. Maintenance materials, including extra materials, spare parts, tools, and software.

1.2 RELATED REQUIREMENTS

A. Document 00 43 25 - Substitution Request Form.

B. Document 00 21 13 - Instructions to Bidders: Product options and substitution procedures prior to bid date.

C. Section 01 10 00 - Summary: Lists of products to be removed from existing building.

D. Section 01 40 00 - Quality Requirements: Product quality monitoring.

E. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

F. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting packaging and substitutions.

G. Division 22: Motors for plumbing equipment.

H. Division 23: Motors for HVAC equipment.

1.3 REFERENCE STANDARDS

A. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content; Current Edition

B. CAN/CSA Z809 - National Standard for Sustainable Forest Management; CSA International Inc; 2008.

C. EN 15804 - Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products; 2012.

D. GreenScreen (LIST) - GreenScreen for Safer Chemicals List Translator; Clean Production Action; www.greenscreenchemicals.org.

E. GreenScreen (METH) - GreenScreen for Safer Chemicals Method v1.2; Clean Production Action; www.greenscreenchemicals.org.

F. HPDC (Tool) - Create an HPD On-Line Tool; Health Product Declaration Collaborative; http://hpdcollaborative.org/manufacturers/.

G. ISO 14025 - Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures; 2006.

H. ISO 14040 - Environmental management -- Life cycle assessment -- Principles and framework; 2006.

I. ISO 14044 - Environmental management -- Life cycle assessment -- Requirements and guidelines; 2006.

J. ISO 21930 - Sustainability in building construction -- Environmental declaration of building products; 2007.

K. NEMA MG 1 - Motors and Generators; 2014.

L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
   1. Submit within 15 days after date of Agreement.
   2. For products specified only by reference standards, list applicable reference standards.

B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

1.5 QUALITY ASSURANCE

A. Health Product Declarations (HPD): Complete, published declaration with full disclosure of known hazards, prepared using HPDC (Tool); HPD's with "unknown" listed for any hazard will not be considered acceptable.

B. Manufacturer's Inventory of Product Content: Publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CAS RN).
   1. For ingredients considered a trade secret or intellectual property, the name and CAS RN may be omitted, provided the ingredient's role, amount, and GreenScreen Benchmark are given.

PART 2 PRODUCTS

2.1 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents, and, or authorized by Umpqua Community College (UCC).

B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

D. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is encouraged.
   1. See drawings for list of items required to be salvaged for reuse and relocation.
   2. If reuse of other existing materials or equipment is desired, submit substitution request.

2.2 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. DO NOT USE products having any of the following characteristics:
   1. Made using or containing CFC's or HCFC's.
   2. Containing lead, cadmium, asbestos.

C. Where all other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 61 16.
   2. If wet-applied, have lower VOC content, as defined in Section 01 61 16.
   3. Are extracted, harvested, and/or manufactured closer to the location of the project.
   4. Have longer documented life span under normal use.
   5. Result in less construction waste.
   6. Are made of vegetable materials that are rapidly renewable.
   7. Are made of recycled materials.
   8. Have a published Environmental Product Declaration (EPD).
   9. Have a published Health Product Declaration (HPD).
   10. Have a published Manufacturer's Inventory of Chemical Content.

D. Provide interchangeable components of the same manufacture for components being replaced.

E. Motors: Refer to Division 21, NEMA MG 1 Type. Specific motor type is specified in individual specification sections.

F. Motors: Refer to Division 22, NEMA MG 1 Type. Specific motor type is specified in individual specification sections.

G. Motors: Refer to Division 23, NEMA MG 1 Type. Specific motor type is specified in individual specification sections.

H. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to NFPA 70, include lugs for terminal box.

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

2.3 PRODUCT OPTIONS

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

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the 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.

2.4 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

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

PART 3 EXECUTION

3.1 SUBSTITUTION PROCEDURES

A. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period and the documents required. Comply with requirements specified in Section 00 21 13.

1. Submit substitution requests by completing the form in Section 00 43 25; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

2. Architect will consider requests for substitutions prior to bid submittal.

3. Substitutions will not be considered when a product becomes unavailable through no fault of the Contractor.

4. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

5. A request for substitution constitutes a representation that the submitter:
   a. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
   b. Agrees to provide the same warranty for the substitution as for the specified product.
   c. Agrees to coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
   d. Waives claims for additional costs or time extension that may subsequently become apparent.
   e. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
   f. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

g. Substitution Submittal Procedure (after contract award):
   1) Submit substitution requests by completing the form in Section 00 63 25; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.
   2) Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
   3) Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
   4) Architect will notify Contractor in writing of decision to accept or reject request.

3.2 OWNER-SUPPLIED PRODUCTS

A. See Section 01 10 00 - Summary for identification of Owner-supplied products.

B. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections, and service.

C. Contractor's Responsibilities:
   1. Review Owner reviewed shop drawings, product data, and samples.
   2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
   3. Handle, store, install and finish products.
   4. Repair or replace items damaged after receipt.

3.3 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

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

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

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

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

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.4 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

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

C. Store with seals and labels intact and legible.

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

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

F. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

H. Comply with manufacturer's warranty conditions, if any.

I. Do not store products directly on the ground.

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

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

L. Prevent contact with material that may cause corrosion, discoloration, or staining.

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

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

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Building demolition excluding removal of hazardous materials and toxic substances.

B. Selective demolition of built site elements.

C. Selective demolition of building elements for alteration purposes.

D. Abandonment in place of existing utilities and utility structures.

E. Abandonment and removal of existing utilities and utility structures.

1.2 RELATED REQUIREMENTS

A. Section 00 31 00 - Available Project Information: Existing building survey conducted by Owner; information about known hazardous materials.

B. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.

C. Section 01 10 00 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

D. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

E. Section 01 57 13 - Temporary Erosion and Sediment Control.

F. Section 01 60 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.

G. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

H. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

I. Section 31 23 23 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

J. Section 31 23 23 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

1.3 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.4 DEFINITIONS

A. Demolish: Completely remove and legally dispose of off-site.

B. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or recycled.

C. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or recycled.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Site Plan: Showing:
1. Vegetation to be protected.
2. Areas for temporary construction and field offices.
3. Areas for temporary and permanent placement of removed materials.

C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
2. Identify demolition firm and submit qualifications.
3. Include a summary of safety procedures.

D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.6 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.
1. Minimum of 5 years of documented experience.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.1 SCOPE

A. Remove all paving and curbs within construction limits indicated on drawings.

B. Within area of new construction, remove any remaining foundation walls and footings, which are not associated with the new work. Ensure all subgrade and adjacent conditions are ready for new work. Refer to the geotechnical report for excavation and preparation of sub-grade.

C. Remove other items indicated, for salvage, relocation, and recycling.

3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with other requirements specified in Section 01 70 00.

B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
1. Obtain required permits.
2. Comply with applicable requirements of NFPA 241.

3. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
4. Provide, erect, and maintain temporary barriers and security devices.
5. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
7. Do not close or obstruct roadways or sidewalks without permit.
8. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
9. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

C. Do not begin removal until receipt of notification to proceed from Owner.

D. Do not begin removal until built elements to be salvaged or relocated have been removed.

E. Do not begin removal until vegetation to be relocated has been removed and specified measures have been taken to protect vegetation to remain.

F. Protect existing structures and other elements that are not to be removed.
1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

G. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

H. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

I. Perform demolition in a manner that maximizes salvage and recycling of materials.
1. Comply with requirements of Section 01 74 19 - Waste Management.
2. Dismantle existing construction and separate materials.
3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

J. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.3 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

3.4 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as shown.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Separate areas in which demolition is being conducted from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 50 00 .

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
   2. Remove items indicated on drawings.

E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. See Section 01 10 00 for other limitations on outages and required notifications.
   4. Verify that abandoned services serve only abandoned facilities before removal.
   5. Remove abandoned pipe, ducts, conduits, and equipment , including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

F. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.

4. Patch as specified for patching new work.

3.5 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Remove from site all materials not to be reused on site; comply with requirements of Section 01 74 19 - Waste Management.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Concrete formwork.

B. Floors and slabs on grade.

C. Concrete reinforcement.

D. Joint devices associated with concrete work.

E. Miscellaneous concrete elements, including equipment pads, light pole bases, and flagpole bases.

F. Concrete curing.

1.2 RELATED REQUIREMENTS

A. Section 07 90 05 - Joint Sealers: Sealants for saw cut joints and isolation joints in slabs.

1.3 REFERENCE STANDARDS

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010.

B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).

C. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).

D. ACI 302.1R - Guide for Concrete Floor and Slab Construction; 2004 (Errata 2007).

E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.

F. ACI 305R - Hot Weather Concreting; 2010.

G. ACI 306R - Cold Weather Concreting; 2010.

H. ACI 308R - Guide to Curing Concrete; 2001 (Reapproved 2008).

I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011.

J. ACI 347R - Guide to Formwork for Concrete; 2014.

K. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete ; 2007.

L. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.

M. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.

N. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2015a.

O. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.

P. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2013.

Q. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2012.

R. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

S. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2014.

T. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.

U. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2014.

V. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures; 2010.

W. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2014.

X. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014.

Y. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2014.

Z. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).

AA. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011.

AB. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2011.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.

C. Mix Design: Submit proposed concrete mix design.
   1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
   2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.

D. Verification Samples: Submit sample chips of specified colors indicating pigment numbers and required dosage rates, for subsequent comparison to installed concrete.

E. Samples: Submit samples of underslab vapor retarder to be used.

F. Samples: Submit two, six inch long samples of construction joint devices.

G. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

H. Sustainable Design Submittals: If any wood or wood-based form materials, including supports, are permanently installed in the project, submit documentation required for sustainably harvested wood as specified in Section 01 60 00 - Product Requirements.

I. Sustainable Design Submittal: If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used .

J. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

K. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.
   1. Maintain one copy of each document on site.

B. Follow recommendations of ACI 305R when concreting during hot weather.

C. Follow recommendations of ACI 306R when concreting during cold weather.

1.6 MOCK-UP

A. Construct and erect mock-up panel for architectural concrete surfaces indicated to receive special treatment or finish as result of formwork.
   1. Panel Size: Sufficient to illustrate full range of treatment.
   2. Number of Panels: As indicated on drawings.
   3. Locate as indicated on drawings.

B. Accepted mock-up panel is considered basis of quality for the finished work. Keep mock-up exposed to view for duration of concrete work.

C. Mock-up may not remain as part of the Work.

1.7 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1 FORMWORK

A. Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.

B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.

1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
2. Earth Cuts: Do not use earth cuts as forms for vertical surfaces. Natural rock formations that maintain a stable vertical edge may be used as side forms.
3. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
4. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

2.2 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Type: Deformed billet-steel bars.
   2. Finish: Unfinished , unless otherwise indicated.

B. Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain type.
   1. Form: Flat Sheets.
   2. Mesh Size: 6 x 6.

C. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
   3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
   1. Acquire all cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C 33.
   1. Acquire all aggregates for entire project from same source.

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

D. Calcined Pozzolan: ASTM C618, Class N.

E. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.

F. Water: Clean and not detrimental to concrete.

2.4 ACCESSORY MATERIALS

A. Underslab Vapor Retarder: Multi-layer, fabric-, cord-, grid-, or aluminum-reinforced polyethylene or equivalent, complying with ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.
   1. Installation: Comply with ASTM E1643 Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
   2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations in vapor retarder.
   3. Manufacturers:
      a. Intertape Polymer Group, Inc ; VaporMaster 15: www.intertapepolymer.com.

b. Stego Wrap 15-mil Vapor Barrier; Stego Industries, LLC: www.stegoindustries.com.
c. 16 Mil Viper VaporCheck; Insulation Solutions, Inc.: www.insulationsolutions.com.
d. Perminator 15 Mil Underslab Vapor Barrier; W.R. Meadows, Inc.: www.wrmeadows.com.
e. Substitutions: See Section 01 60 00 - Product Requirements.

B. Form Release Coating: Multi-Use, Non-Petroleum, Reactive Form Release
1. Product: Ezcote Green by US Mix Co.; www.usspec.com
2. VOC Content: 0
3. Substitutions: See Section 01 60 00 - Product Requirements

C. Epoxy Grout: See Structural drawings General Notes for epoxy grout requirments.

D. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
1. Grout: Comply with ASTM C1107/C1107M.
2. Height Change, Plastic State; when tested according to ASTM C827/C827M:
a. Maximum: Plus 4 percent.
b. Minimum: Plus 1 percent.
3. Minimum Compressive Strength at 48 Hours, ASTM C109/C109M: 2,000 pounds per square inch.
4. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.
5. Products containing aluminum powder are not permitted.
6. Low-Slump, Dry Pack Products:
a. The QUIKRETE Companies ; QUIKRETE® FastSet™ Non-Shrink Grout: www.quikrete.com.
b. Substitutions: See Section 01 60 00 - Product Requirements.

E. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, non-metallic aggregate, and activator.
1. Composition: High solids content material exhibiting positive expansion when tested in accordance with ASTM C827/C827M.
a. Maximum Height Change: Plus 4 percent.
b. Minimum Height Change: Plus 1 percent.
2. Manufacturers:
a. Five Star Products, Inc ; Five Star DP Epoxy Grout: www.fivestarproducts.com.
b. Substitutions: See Section 01 60 00 - Product Requirements.

F. Moisture-Retaining Cover: ASTM C 171; regular curing paper, white curing paper, clear polyethylene, white polyethylene, or white burlap-polyethylene sheet.

G. Liquid Curing Compound: ASTM C 309, Type 1, clear or translucent.

2.5 BONDING AND JOINTING PRODUCTS

A. Epoxy Bonding System:
1. Complying with ASTM C881/C881M and of Type required for specific application.
2. Manufacturers:
a. W.R. Meadows, Inc.; Rezi-Weld Gel Paste, Rezi-Weld Gel Paste State, Rezi-Weld 1000: www.wrmeadows.com/sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
   1. Material: ASTM D1751, cellulose fiber.
   2. Manufacturers:
      a. W.R. Meadows, Inc; Fiber Expansion Joint Filler with Snap-Cap: www.wrmeadows.com/sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

C. Slab Contraction Joint Device: Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.
   1. Manufacturers:
      a. W.R. Meadows, Inc ; Speed-E-Joint: www.wrmeadows.com/sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

D. Joint Filler: Nonextruding, resilient asphalt impregnated fiberboard or felt, complying with ASTM D 1751, 1/4 inch thick and 4 inches deep ; tongue and groove profile.

E. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with minimum 1 inch diameter holes for conduit or rebars to pass through at 6 inches on center; ribbed steel stakes for setting.
   1. Provide removable plastic cap strip that forms wedge-shaped joint for sealant installation.
   2. Height: To suit slab thickness.

F. Sealant and Primer: As specified in Section 07 90 05.

2.6 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
   1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
   1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

C. Normal Weight Concrete:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: As indicated on drawings.
   2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
   3. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
   4. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
   5. Cement Content: As indicated on drawings.
   6. Water-Cement Ratio: As indicated on drawings.
   7. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.
   8. Maximum Slump: 3 inches.
   9. Maximum Aggregate Size: 5/8 inch.

2.7 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.2 PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

B. Verify that forms are clean and free of rust before applying release agent.

C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
   1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.

E. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

F. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
   1. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as shown on the drawings. Do not use sand.

3.3 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.4 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

C. Notify Architect not less than 24 hours prior to commencement of placement operations.

D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

E. Ensure reinforcement, inserts, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

F. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

G. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.5 SLAB JOINTING

A. Locate joints as indicated on the drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
   1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.

D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

E. Repair underslab vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight.

F. Separate slabs on grade from vertical surfaces with joint filler.

G. Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

H. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface. Conform to Section 07 90 05 for finish joint sealer requirements.

I. Apply sealants in joint devices in accordance with Section 07 90 05.

J. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

K. Place concrete continuously between predetermined expansion, control, and construction joints.

L. Do not interrupt successive placement; do not permit cold joints to occur.

M. Saw cut joints within 24 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.

N. Screed floors level, maintaining the following minimum F(F) Floor Flatness and F(L) Floor Levelness values when measured in accordance with ASTM E 1155/ASTM E 1155M.
   1. F(F): Specified Overall Value (SOV) of 35; Minimum Localized Value (MLV) of 24.

3.6 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. An independent testing agency, as specified in Section 01 40 00, will inspect finished slabs for conformance to specified tolerances.

B. Maximum Variation of Surface Flatness:
   1. Exposed Concrete Floors: 1/4 inch in 10 feet.
   2. Under Seamless Resilient Flooring: 1/4 inch in 10 feet.
   3. Under Carpeting: 1/4 inch in 10 feet.

C. Correct the slab surface if tolerances are less than specified.

D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.7 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
   1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.

D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
   2. Decorative Exposed Surfaces: Trowel as described in ACI 302.1R; use steel-reinforced plastic trowel blades instead of steel blades to avoid black-burnish marks; decorative exposed surfaces include surfaces to receive liquid hardeners, surfaces to be polished, and all other exposed slab surfaces.

3.8 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than 7 days.
   2. High early strength concrete: Not less than 4 days.

C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

D. Surfaces Not in Contact with Forms:
   1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
   2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.

a. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for 4 days.
b. Spraying: Spray water over floor slab areas and maintain wet.
c. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.

3. Final Curing: Begin after initial curing but before surface is dry.
   a. Moisture-Retaining Sheet: Lap strips not less than 3 inches and seal with waterproof tape or adhesive; secure at edges.
   b. Moisture-Retaining Cover: Seal in place with waterproof tape or adhesive.
   c. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.9 FIELD QUALITY CONTROL

A. Special Inspections will be performed by an independent inspection agency according to Section 01 45 33

B. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

C. Provide free access to concrete operations at project site and cooperate with appointed firm.

D. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

E. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

F. Compressive Strength Tests: ASTM C39/C39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.

G. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

H. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

I. Slab Testing: Ensure concrete slab moisture content is acceptable to receive floor coverings. Cooperate with manufacturer of specified flooring products to allow access for sampling and testing concrete for compliance with warranty requirements.

3.10 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.11 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Cabinet hardware.

C. Preparation for installing utilities.

1.2 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.

C. Section 12 36 00 - Countertops.

1.3 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

B. AWI (QCP) - Quality Certification Program; current edition at www.awiqcp.org.

C. AWMAC (GIS) - Guarantee and Inspection Services Program; current edition at www.awmac.com/gis.php.

D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.

E. BHMA A156.9 - American National Standard for Cabinet Hardware; 2010.

F. GSA CID A-A-1936 - Adhesive, Contact, Neoprene Rubber; Revision A, 1996.

G. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2009.

H. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

I. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

J. WI (CCP) - Certified Compliance Program (CCP); current edition at www.woodworkinstitute.com/certification.

K. WI (CSIP) - Certified Seismic Installation Program (CSIP); current edition at www.woodworkinstitute.com.

L. WI (MCP) - Monitored Compliance Program (MCP); current edition at www.woodworkinstitute.com/certification.

M. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
   2. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

C. Product Data: Provide data for hardware accessories.

D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.

E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
   2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

1.7 MOCK-UP

A. Provide mock-up of typical base cabinet, wall cabinet, and countertop, including hardware, finishes, and plumbing accessories.

B. See Section 01 40 00 - Quality Requirements for additional requirements.

C. Mock-up may not remain as part of the Work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.9 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Freemont Millwork, Klamath Falls, OR, www.fremontmillwork.com

B. Genothen, Tumwater, WA, www.genothen.com.

C. ISEC; Bothell, Washington. www.isecinc.com

D. McCarthy Manufacturing Inc, portland , OR.,

E. Northwest Millwork; Seattle, WA, www.northwestmillwork.com

F. Pacific Cabinets Inc, Ferdinand, ID, www.pacificcabinets.com

G. Price and Visser Millwork, Inc, Bellingham WA, www.priceandvisser.com

H. Westmark Products; Tacoma, WA, www.westmarkproducts.com.

I. Substitutions: See Section 01 60 00 - Product Requirements.

J. Single Source Responsibility: Provide and install this work from single fabricator.

2.2 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Wood Faced Cabinet:
1. Exposed Surfaces: HPVA HP-1 Grade A, White Oak, rift cut, random-matched.
2. Semi-Exposed Surfaces: HPVA HP-1 Grade B, White Oak, rift cut, random-matched.
3. Concealed Surfaces: HPVA HP-1 Grade C, White Oak, rift cut, random-matched.

C. Cabinets :
1. Finish - Exposed Exterior Surfaces: Wood.
2. Finish - Exposed Interior Surfaces: Wood.
   a. Finish: back of opaque doors: Wood
3. Finish - Semi-Exposed Surfaces: Wood.
4. Door and Drawer Front Edge Profiles: Square solid wood edge.
5. Door and Drawer Front Retention Profiles: Fixed panel.
6. Casework Construction Type: Type A - Frameless.
7. Interface Style for Cabinet and Door: Style 2 - Finish Inset; reveal overlay.
8. Grained Face Layout for Cabinet and Door Fronts: Flush panel.
   a. Custom Grade: Doors, drawer fronts and false fronts wood grain to run and match vertically within each cabinet unit.
   b. Premium Grade:
      1) Provide vertical run and match for doors, drawer fronts and false fronts within each cabinet unit.
      2) Provide well-matched doors, drawer fronts and false fronts across multiple cabinet faces in one elevation.
9. Cabinet Design Series: As indicated on drawings.
10. Adjustable Shelf Loading: 50 lbs. per sq. ft.
    a. Deflection: L/144.
11. Cabinet Style: Flush overlay.
12. Cabinet Doors and Drawer Fronts: Flush style.
13. Drawer Side Construction: Multiple-dovetailed.
14. Drawer Construction Technique: Dovetail joints.

2.3 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

B. Provide sustainably harvested wood, certified or labeled as specified in Section 01 60 00.

C. Provide wood harvested within a 500 mile radius of the project site.

D. Wood fabricated from timber recovered from riverbeds or otherwise abandoned is permitted, unless otherwise noted, provided it is clean and free of contamination; identify source; provide lumber re-graded by an inspection service accredited by the American Lumber Standard Committee, Inc.

E. Hardwood Edgebanding: Use solid hardwood edgebanding matching species, color, grain, and grade for exposed portions of cabinetry.

2.4 LAMINATE MATERIALS

A. Manufacturers:
   1. Wilsonart : www.wilsonart.com.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Provide specific types as indicated.

2.5 COUNTERTOPS

A. Countertops are specified in Section 12 36 00.

2.6 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Fasteners: Size and type to suit application.

C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

D. Concealed Joint Fasteners: Threaded steel.

E. Grommets: Standard painted metal grommets for cut-outs, in color to contrast with adjacent surface.

2.7 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, satin chrome finish, for nominal 1 inch spacing adjustments.

C. Drawer and Door Pulls: Integral panel 'cutout' pull, as indicated on drawings.

D. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with satin finish.

E. Catches: Magnetic, touch type.

F. Drawer Slides:
   1. Type: Extension types as scheduled.
   2. Static Load Capacity: Commercial grade.
   3. Mounting: Side mounted.
   4. Stops: Integral type.
   5. Features: Provide self closing/stay closed type.
   6. Manufacturers:
      a. Accuride International, Inc : www.accuride.com.
      b. Knape & Vogt Manufacturing Company : www.knapeandvogt.com.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

G. Hinges: European extended type, steel with satin finish.
   1. Manufacturers:

a. Hettich America, LP : www.hettich.com/sle.
b. Julius Blum, Inc : www.blum.com.
c. Substitutions: See Section 01 60 00 - Product Requirements.

2.8 SHOP TREATMENT OF WOOD MATERIALS

A. Provide UL (DIR) listed and approved identification on fire retardant treated material.

B. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.

2.9 SITE FINISHING MATERIALS

A. Finishing Materials: In compliance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

2.10 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.

E. Matching Wood Grain: Comply with requirements of quality standard for specified Grade and as follows:
1. Provide center matched panels at each elevation.
2. Provide sequence matching across each elevation.
3. Carry figure of cabinet fronts to toe kicks.

F. Mechanically fasten back splash to countertops as shown at 16 inches on center.

G. Provide cutouts for plumbing fixtures, inserts, outlet boxes, and fixtures and fittings. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

2.11 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. For opaque finishes, apply wood filler in exposed nail and screw indentations and sand smooth.

C. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.

D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
1. Transparent:
a. System - 6, Oil, Synthetic Penetrating (transparent only).
b. Sheen: Satin.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

C. Use fixture attachments in concealed locations for wall mounted components.

D. Use concealed joint fasteners to align and secure adjoining cabinet units and countertops.

E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

F. Secure cabinets and counter bases to floor using appropriate angles and anchorages.

G. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.3 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.4 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Board insulation at perimeter foundation wall, underside of floor slabs, and over roof deck.

B. Batt insulation and vapor retarder in exterior wall and roof construction.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.2 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 30 00 - Cast-in-Place Concrete: Dampproofing to concrete slabs and foundations.

C. Section 06 10 00 - Rough Carpentry: Supporting construction for batt insulation.

D. Section 06 10 00 - Rough Carpentry: Installation requirements for board insulation over steep slope roof sheathing or roof structure.

E. Section 07 21 19 - Foamed-In-Place Insulation: Plastic foam insulation other than boards.

F. Section 07 25 00 - Weather Barriers: Separate air barrier and vapor retarder materials.

G. Section 07 54 00 - Thermoplastic Membrane Roofing: Insulation specified as part of roofing system.

H. Section 09 21 16 - Gypsum Board Assemblies: Acoustic insulation inside walls and partitions.

1.3 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.

C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications ; 2011.

D. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2015a.

E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.

F. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.

G. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2014.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

I. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2012.

J. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2012.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.6 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

2.2 APPLICATIONS

A. Insulation Under Concrete Slabs: Extruded polystyrene board.

B. Insulation at Perimeter of Foundation: Expanded polystyrene board.

C. Insulation Inside Masonry Cavity Walls: Extruded polystyrene board.

D. Insulation in Wood Framed Walls: Batt insulation with separate vapor retarder.

E. Insulation in Wood Framed Ceiling Structure: Batt insulation with separate vapor retarder.

F. Insulation Over Roof Deck: Polyisocyanurate board.

G. Insulation in Acoustical Rated Walls: Batt insulation with no vapor retarder.

2.3 FOAM BOARD INSULATION MATERIALS

A. General:
1. Identification Labeling: An R-Value identification mark shall be applied by the manufacturer to each piece of building thermal envelope insulation 12” and greater in

width. The building thermal envelope insulation shall be installed such that the manufacturer's mark is readily observable upon inspection

B. Extruded Polystyrene Board Insulation: Extruded polystyrene board ; ASTM C578; with natural skin surfaces, and the following characteristics:
   1. Type: ASTM C578 , Type X.
   2. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   3. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   4. R-value; 1 inch of material at 72 degrees F: 5, minimum.
   5. Complies with fire resistance requirements shown on the drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
   6. Board Edges: Square.
   7. Water Absorption, Maximum: 0.3 percent, by volume.
   8. Manufacturers:
      a. Dow Chemical Company : www.dow.com.
      b. Owens Corning Corporation ; FOAMULAR Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com/sle.
   9. Substitutions: See Section 01 60 00 - Product Requirements.

C. Polyisocyanurate Board Insulation with Facers Both Sides: Rigid cellular foam, complying with ASTM C1289; Type I, aluminum foil both faces; Class 1, non-reinforced foam core.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Complies with fire resistance requirements shown on the drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
   4. Compressive Strength: 25 psi
   5. Board Size: 48 by 96 inch.
   6. Thermal Resistance: R-value of 38, minimum.
   7. Board Edges: Square.
   8. Manufacturers:
      a. Carlisle Coatings & Waterproofing, Inc ; R2+ Matte: www.carlisleccw.com.
      b. Dow Chemical Company: www.dow.com.
      c. GAF ; EnergyGuard Ultra Polyiso Insulation: www.gaf.com.
      d. Johns Manville ; R-Panel: www.jm.com.
   9. Substitutions: See Section 01 60 00 - Product Requirements.

2.4 BATT INSULATION MATERIALS

A. General:
   1. Identification Labeling: An R-Value identification mark shall be applied by the manufacturer to each piece of building thermal envelope insulation 12" and greater in width. The building thermal envelope insulation shall be installed such that the manufacturer's mark is readily observable upon inspection

B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Combustibility: Non-combustible, when tested in accordance with ASTM E136 .
   4. Formaldehyde Content: Zero.
   5. Facing: Unfaced.

6. Manufacturers:
   a. CertainTeed Corporation ; R38 High Performance Cathedral Ceiling Sustainable (Roof), R21 Sustainable (Exterior Walls): www.certainteed.com.
   b. Johns Manville : www.jm.com.
   c. Owens Corning Corporation ; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/sle.
   d. Owens Corning Corp: www.owenscorning.com.
7. Substitutions: See Section 01 60 00 - Product Requirements.

2.5 ACCESSORIES

A. Sheet Vapor Retarder: Specified in Section 07 25 00.

B. Tape: Polyethylene self-adhering type, mesh reinforced, 2 inch wide.

C. Tape joints of rigid insulation in accordance with roofing and insulation manufacturers' instructions.

D. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
   1. Length as required for thickness of insulation material and penetration of deck substrate .

E. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.

F. Wire Mesh: Galvanized steel, hexagonal wire mesh.

G. Protection Board for Below Grade Insulation: Cementitious, 1/4 inch thick.

H. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation .

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.2 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Adhere a 6 inch wide strip of polyethylene sheet over construction and control joints with double beads of adhesive each side of joint.
   1. Tape seal joints.
   2. Extend sheet full height of joint.

B. Apply adhesive to back of boards:
   1. Full bed 1/8 inch thick.

C. Install boards horizontally on foundation perimeter.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and to protrusions.

D. Extend boards over expansion joints, unbonded to foundation on one side of joint.

E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

F. Immediately following application of board insulation, place protective boards over exposed insulation surfaces.
   1. Apply adhesive in five continuous beads per board length.
   2. Install boards horizontally from base of foundation to top of insulation.
   3. Butt boards tightly, with joints staggered from insulation joints.

3.3 BOARD INSTALLATION AT EXTERIOR WALLS

A. Adhere a 6 inch wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
   1. Tape seal joints between sheets.
   2. Extend sheet full height of joint.

B. Apply adhesive to back of boards:
   1. Full bed 1/8 inch thick.

C. Install boards with board orientated as recommended by manufacturer on walls.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and to protrusions.

D. Extend boards over expansion joints, unbonded to wall on one side of joint.

E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

F. Place 6 inch wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window and door frames. Tape seal in place to ensure continuity of vapor retarder and air seal.

G. Tape insulation board joints.

3.4 BOARD INSTALLATION AT CAVITY WALLS

A. Secure impale fasteners to substrate at a frequency as follows:
   1. 6 per insulation board.

B. Adhere a 6 inch wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
   1. Tape seal joints between sheets.
   2. Extend sheet full height of joint.

C. Apply adhesive to back of boards:
   1. Full bed 1/8 inch thick.

D. Install boards to fit snugly between wall ties.

E. Install boards horizontally on walls.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and to protrusions.
   4. Place impale fastener locking discs.

F. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

G. Place 6 inch wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window, door, and other opening frames. Tape seal in place to ensure continuity of vapor retarder and air seal.

3.5 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.6 BOARD INSTALLATION OVER LOW SLOPE ROOF DECK

A. Installation of board insulation over low slope roof deck is specified in Section 07 54 00.

B. Board Installation Over Roof Deck, General:
   1. See applicable roofing specification section for specific board installation requirements.
   2. Ensure vapor retarder is clean and dry, continuous, and ready for application of roofing system.
   3. Fasten insulation to deck in accordance with roofing manufacturer's written instructions and applicable Factory Mutual requirements.
   4. Do not apply more insulation than can be covered with roofing in same day.

3.7 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

F. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches on center. Lap and seal sheet retarder joints over member face.

G. Tape seal tears or cuts in vapor retarder.

H. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

I. Coordinate work of this section with requirements for vapor retarder specified in Section 07 25 00.

J. Coordinate work of this section with construction of air barrier seal specified in Section 07 25 00.

3.8 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

3.9 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Foamed-in-place insulation.
   1. At junctions of dissimilar wall and roof materials.

1.2 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 06 10 00 - Rough Carpentry.

C. Section 07 25 00 - Weather-Resistive Barriers.

1.3 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

B. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2012.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

D. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

E. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

F. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements.

C. Certificates: Certify that products of this section meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than 10 years of documented experience.

B. Applicator Qualifications: Company specializing in performing work of the type specified, with minimum five years of documented experience.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame and smoke limitations.

1.8 MOCK-UP

A. Provide stand-alone mock-up, 10 feet long by 7 feet wide; include insulation wall construction in mock-up.

B. Locate as indicated on drawings.

C. Mock-up if approved may not remain as part of the Work.

1.9 FIELD CONDITIONS

A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

B. Do not apply foam when temperature is within 5 degrees F of dew point.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Foamed-In-Place Insulation:
1. BASF Corporation ; WALLTITE US Series Closed Cell: www.spf.basf.com.
2. Covestro, LLC ; EcoBay CC: www.covestro.com/sprayfoam.com.
3. Henry Company ; PERMAX 2.0: www.henry.com/sle.
4. Icynene Inc ; Icynene ProSeal Eco MD-R-210: www.icynene.com.
5. Johns Manville ; JM Corbond III Closed Cell Spray Polyurethane Foam: www.jm.com/sle.
6. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 MATERIALS

A. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
1. Regulatory Requirements: Conform to applicable code for flame and smoke limitations.
2. Aged Thermal Resistance: R-value of 5 (deg F hr sq ft)/Btu, minimum, when tested at 1 inch thickness in accordance with ASTM C518 after aging for 180 days at 41 degrees F.
3. Water Vapor Permeance: Vapor retarder; 2 perm, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
4. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
5. Air Permeance: 0.004 cfm/sq ft, maximum, when tested at intended thickness in accordance with ASTM E2178 or ASTM E283 at 1.5 psf.
6. Closed Cell Content: At least 90 percent.
7. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.

2.3 ACCESSORIES

A. Primer: As required by insulation manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify work within construction spaces or crevices is complete prior to insulation application.

B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation adhesion.

3.2 PREPARATION

A. Mask and protect adjacent surfaces from over spray or dusting.

B. Apply primer in accordance with manufacturer's instructions.

3.3 APPLICATION

A. Apply insulation in accordance with manufacturer's instructions.

B. Apply insulation by spray method, to a uniform monolithic density without voids.

C. Patch damaged areas.

D. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.

E. Trim excess away for applied trim or remove as required for continuous sealant bead.

3.4 FIELD QUALITY CONTROL

A. Field inspections and tests will be performed by an independent testing agency under provisions of Section 01 40 00 - Quality Requirements.

B. Inspection will include verification of insulation thickness and density.

3.5 PROTECTION

A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water-Resistive Barrier: Under exterior wall cladding, over sheathing or other substrate; not air tight or vapor retardant.

B. Vapor Retarders: Materials to make exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls water vapor resistant and air tight.

C. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Vapor retarder under concrete slabs on grade.

B. Section 05 40 00 - Cold-Formed Metal Framing: Water-resistive barrier under exterior cladding.

C. Section 06 10 00 - Rough Carpentry: Water-resistive barrier under exterior cladding.

D. Section 07 21 00 - Thermal Insulation: Rain screen thermal spacers and vapor retarder installed in conjunction with batt insulation.

E. Section 07 21 19 - Foamed-in-Place Insulation: Located where weather-resitive barriers cannot penetrate, and or transition through structural components, but are in conjunction with weather resitive barriers.

F. Section 07 54 00 - Thermoplastic Membrane Roofing: Vapor retarder installed as part of roofing system.

G. Section 07 62 00 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

H. Section 07 92 00 - Joint Sealants: Sealing building expansion joints.

1.3 DEFINITIONS

A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.

B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.

C. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.
   1. Water Vapor Permeance: For purposes of conversion, 57.2 ng/(Pa s sq m) = 1 perm.

D. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture resistant, to the degree specified, intended to be installed to shed water without sealed seams.

1.4 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test; 2014.

C. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2006a (Reapproved 2013).

D. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2013.

E. ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications; 2010.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

H. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2011.

I. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

J. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; ICC Evaluation Service, Inc; 2013.

K. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials; ICC Evaluation Service, Inc; 2011.

L. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; ICC Evaluation Service, Inc; 2015.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on material characteristics, performance criteria, and limitations.

C. Shop Drawings: Provide drawings of special joint conditions.

D. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.7 MOCK-UP

A. Install air barrier, vapor retarder, water-resistive barrier, and self-adheared membranes with associated system accessory transitions materials in mock-up specified in Section 01 30 00 - Administrative Requirements and on drawings.

1.8 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.1 WEATHER BARRIER ASSEMBLIES

A. Water-Resistive Barrier (WRB): Provide on exterior walls under exterior cladding and where indicated in other sections.
   1. Use multi-purpose water-resistive, sheet, self-adhesive air barrier unless otherwise indicated.

B. Air Barrier:
   1. On outside surface of sheathing of exterior walls use air barrier sheet, self-adhesive type.

C. Interior Vapor Retarder:
   1. On inside face of studs of exterior walls, under cladding, use mechanically fastened vapor retarder sheet.
   2. On bottom face of rafters, under cladding, use mechanically fastened vapor retarder sheet.
   3. On inside face of masonry and concrete walls use vapor retarder coating.
   4. On elevated floors over enclosed soffit space use vapor retarder sheet, mechanically fastened type.

2.2 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

A. Air Barrier Sheet, Self-Adhered:
   1. Air Permeance: 0.004 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
   2. Water Vapor Permeance: 10 perms, minimum, when tested in accordance with ASTM E96/E96M Procedure A (desiccant procedure).
   3. Water Penetration Resistance Around Nails: Pass, when tested in accordance with ASTM D1970/D1970M (modified).
   4. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for maximum of 150 days weather exposure.
   5. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less (Class A), when tested in accordance with ASTM E84.
   6. Water Resistance: Comply with applicable water-resistive requirements of ICC-ES AC38.
   7. Seam and Perimeter Tape: As recommended by sheet manufacturer.
   8. Products:
      a. Henry Company ; Blueskin VP160: www.henry.com/sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.3 VAPOR RETARDER MATERIALS (AIR BARRIER AND WATER-RESISTIVE)

A. Vapor Retarder Sheet : Multi-layer, fabric-, cord-, grid-, or aluminum-reinforced polyethylene or equivalent, complying with ASTM E1745, Class A; stated by manufacturer as suitable for application indicated. Single ply polyethylene is prohibited.
   1. Water Vapor Permeance: 0.3 perm, maximum, when tested in accordance with ASTM E96/E96M.
   2. Seam and Perimeter Tape: Polyethylene self-adhering type, mesh reinforced, 2 inches wide, compatible with sheet material.
   3. Products:
      a. Certainteed; MemBrain: www.certainteed.com.

2.4 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.

B. Flexible Flashing (SAM): Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.
   1. Composition: Modified bituminous sheet laminated to polyethylene sheet.
   2. Thickness: 35 mil (0.035 inch) , nominal; exception from ASTM D1970/D1970M.
   3. Products:
      a. Henry Company; Blueskin WB Flexible Flashing: www.henry.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

C. Liquid Flashing: One part, fast curing, non-sag, elastomeric, gun grade, trowelable liquid flashing.
   1. Products:
      a. Henry Company; Blueskin AirBloc LF: www.henry.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

D. Drainage Mat: Located behind all exterior cladding with less than 1/4 inch air space, between outside face of exterior rigid insulaiton and back face of exterior cladding.
   1. Fabric plane shall face to the exterior side.
      a. Products:
         1) MTI; Gravity Cavity: www.mtidry.com.
         2) Substitutions: See Section 01 60 00 - Product Requirements.

E. Vapor Retarder Tape: Coated polyester film with acrylic adhesive backing; pressure sensitive.
   1. Products:
      a. Fortifiber Building Systems Group ; Fortifiber Sheathing Tape: www.fortifiber.com/sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

F. Thinners and Cleaners: As recommended by material manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.2 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's instructions.

3.3 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.

C. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

D. Vapor Retarders: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

E. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.

F. Mechanically Fastened Sheets - Vapor Retarder On Interior:
   1. When insulation is to be installed in assembly, install vapor retarder over insulation.
   2. Anchor to wood framing using large-headed nails or staples at 24 inches on center along each framing member covered; cover fasteners with seam tape.
   3. Seal seams, laps, perimeter edges, penetrations, tears, and cuts with self-adhesive tape, making air tight seal.
   4. Locate laps at a framing member; at laps fasten one sheet to framing member then tape overlapping sheet to first sheet.
   5. Seal entire perimeter to structure, window and door frames, and other penetrations.
   6. Where conduit, pipes, wires, ducts, outlet boxes, and other items are installed in insulation cavity, pass vapor retarder sheet behind item but over insulation and maintain air tight seal.

G. Self-Adhesive Sheets:
   1. Prepare substrate in manner recommended by sheet manufacturer; fill and tape joints in substrate and between dissimilar materials.
   2. Lap sheets shingle-fashion to shed water and seal laps air tight.
   3. Once sheets are in place, press firmly into substrate with resilient hand roller; ensure that all laps are firmly adhered with no gaps or fishmouths.
   4. Use same material, or other material approved by sheet manufacturer for the purpose, to seal to adjacent construction and as flashing.
   5. At wide joints, provide extra flexible membrane allowing joint movement.

H. Coatings:
   1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
   2. Where exterior masonry veneer is to be installed, install masonry anchors before installing weather barrier over masonry; seal around anchors air tight.
   3. Mastic Coating: Install by trowel or roller to minimum thickness of 1/4 inch; use sheet seal to join to adjacent construction, seal air tight with sealant.

4. Use flashing to seal to adjacent construction and to bridge joints.

I. Openings and Penetrations in Exterior Weather Barriers:
1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with at least 4 inches wide; do not seal sill flange.
3. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Coordination of Tests and Inspections:
1. Allow access to air barrier work areas and staging.
2. Do not cover air barrier work until tested, inspected, and accepted.

C. Do not cover installed weather barriers until required inspections have been completed.

D. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

E. Take digital photographs of each portion of the installation prior to covering up.

3.5 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

B. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Adhered system with thermoplastic roofing membrane.

B. Insulation, tapered.

C. Vapor retarder.

D. Flashings.

E. Decorative ballast.

F. Cover board.

1.2 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood nailers and curbs.

B. Section 07 62 00 - Sheet Metal Flashing and Trim: Counterflashings .

1.3 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.

B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

C. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2015a.

D. ASTM C726 - Standard Specification for Mineral Wool Roof Insulation Board; 2012.

E. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.

F. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2014.

G. ASTM C1325 - Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units; 2014.

H. ASTM D448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction; 2012.

I. ASTM D4434/D4434M - Standard Specification for Poly(Vinyl Chloride) Sheet Roofing; 2012.

J. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

K. ASTM E108 Standard Test Methods for Fire Tests of Roof Coverings

L. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces; 2011.

M. FM (AG) - FM Approval Guide; current edition.

N. FM DS 1-28 - Wind Design; 2007.

O. ITS (DIR) - Directory of Listed Products; current edition.

P. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; Fifth Edition, with interim updates.

Q. SPRI RP-4 - Wind Design Standard for Ballasted Single-Ply Roofing Systems; 2008.

R. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

S. UL 790 Standard for Standard Test Methods for Fire Tests of Roof Covering

T. UL (FRD) - Fire Resistance Directory; current edition.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.

C. Sustainable Design Documentation: Test report showing solar reflectance index of membrane.

D. Specimen Warranty: For approval.

E. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, setting plan for tapered insulation, and ballast type, color and size.

F. Samples for Verification: Submit two samples 12 x 12 inches in size illustrating insulation.

G. Samples of Aggregate: Submit two one lb containers of aggregate ballast.

H. Manufacturer's Installation Instructions: Indicate membrane seaming precautions, special procedures, and perimeter conditions requiring special attention.

I. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

J. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.

K. Warranty:
   1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
   2. Submit installer's certification that installation complies with all warranty conditions for the waterproof membrane.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with 1.
   1. Maintain one copy on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years of documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section:
   1. With minimum 5 years documented experience.
   2. Approved by membrane manufacturer.

D. Single Source Responsibility for Vegetated Roof Assemblies Over Waterproofing: Provide and install products from single source.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.

B. Store products in weather protected environment, clear of ground and moisture.

C. Protect foam insulation from direct exposure to sunlight.

1.8 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather.

B. Do not apply roofing membrane when ambient temperature is below 40 degrees F or above the manufacturer's recommended temperature.

C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

1.9 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Material Warranty: Provide membrane manufacturer's warranty agreeing to replace material that shows manufacturing defects within 5 years after installation.

C. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
   1. Warranty Term: 30 years.
   2. For repair and replacement include costs of both material and labor in warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Polyvinyl Chloride (PVC) Membrane Materials:
   1. Sika Corporation – Roofing; Sarnafil PVC: usa.sarnafil.sika.com.
   2. Carlisle; Sure-Flex 80-Mil PVC FRS: www.carlislesyntec.com.
   3. Soprema; Senitel PVC: www.soprema.com.

B. Insulation:
   1. GAF : www.gaf.com/sle.
   2. Dow Chemical Co: www.dow.com.
   3. Owens Corning Corporation : www.ocbuildingspec.com/sle.
   4. ROXUL, Inc : www.roxul.com/sle.
   5. Versico, a division of Carlisle Construction Materials Inc ; SecurShield Insulation: www.versico.com/sle.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 ROOFING

A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, cover board and insulation.

B. Roofing Assembly Requirements:
   1. Solar Reflectance Index (SRI): Minimum of 64 based on three-year aged value; if three-year aged data is not available, minimum of 82 initial value.
      a. Calculate SRI in accordance with ASTM E1980.
      b. Field applied coating may not be used to achieve specified SRI.
   2. Roof Covering External Fire Resistance Classification: UL (FRD) Class A.
   3. Factory Mutual Classification: Class I and windstorm resistance of I-90, in accordance with FM DS 1-28.

C. Acceptable Insulation Types - Tapered Application: Any type that meets requirements and is approved by membrane manufacturer for application.
   1. Tapered polyisocyanurate board.

D. Supplementary Ballast: Within 0.5 feet of parapet, cover membrane with aggregate.

2.3 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

A. Membrane:
   1. Material: Polyvinyl chloride (PVC) complying with ASTM D4434/D4434M.
   2. Reinforcing: Internal fabric.
   3. Thickness: 0.080 inch, minimum.
   4. Sheet Width: Factory fabricated into largest sheets possible.
   5. Color: Gray, or White.

B. Seaming Materials: As recommended by membrane manufacturer.

C. Vapor Retarder: Material approved by roof manufacturer complying with requirements of fire rating classification; compatible with roofing and insulation materials.
   1. Fire-retardant adhesive.

D. Flexible Flashing Material: Same material as membrane.

E. Separation Sheet: Sheet polyethylene; 2 mil thick.

F. Water Pervious Fabric: Woven polyethylene, UV stabilized, open to moisture movement, black.

2.4 COVER BOARDS

A. Deck Sheathing and Cover Board: Glass mat faced gypsum panels, ASTM C1177/C1177M, fire resistant type, 1/4 inch thick.

1. Manufacturers:
   a. Georgia-Pacific DensDeck, DensDeck Prime, or DensDeck DuraGuard: www.densdeck.com.
   b. Substitutions: See Section 01 60 00 - Product Requirements.

2.5 INSULATION

A. Polyisocyanurate Board Insulation: Rigid cellular foam, complying with ASTM C1289, Type I, aluminum foil both faces; Class 1, non-reinforced foam core and with the following characteristics:
   1. Compressive Strength: 25 psi.
   2. Board Size: 48 by 96 inch.
   3. Tapered Board: Slope as indicated; minimum thickness 6 inch; fabricate of fewest layers possible.
   4. Thermal Resistance: R-value of 36.
   5. Board Edges: Square.
   6. Manufacturers:
      a. Dow Chemical Co: www.dow.com.
      b. GAF; EnergyGuard Ultra PolyIso Tapered Insulation: www.gaf.com/sle.
      c. James Manville, Product Durafoam, Energy3, Energy3.E www.jm.com
      d. Versico, a division of Carlisle Construction Materials, Inc ; SecurShield Insulation: www.versico.com/sle.
   7. Substitutions: See Section 01 60 00 - Product Requirements.

2.6 BALLAST MATERIALS

A. No.4 Aggregate: Sound, hard, washed Mexican beach pebble, ASTM D448 Size Classification 4,3, 24, 2, or 1.
   1. Stainless steel perforated ballast stop.

2.7 ACCESSORIES

A. Sheathing Adhesive: Non-combustible type, for adhering gypsum sheathing to metal deck.

B. Insulation Joint Tape: Glass fiber reinforced type as recommended by insulation manufacturer, compatible with roofing materials; 6 inches wide; self adhering.

C. Membrane Adhesive: As recommended by membrane manufacturer.

D. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.

E. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.

F. Insulation Adhesive: As recommended by insulation manufacturer.

G. Sealants: As recommended by membrane manufacturer.

H. Protective Membrane: Sacrificial layer below ballast.
   1. Minimum 45 mil PVC membrane, as recommended by membrane manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Perform work in accordance with 1 and manufacturer's instructions.

B. Do not apply roofing membrane during unsuitable weather.

C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.

D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

F. Coordinate the work with installation of associated counterflashings installed by other sections as the work of this section proceeds.

3.2 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and nailing strips are in place.

3.3 WOOD DECK PREPARATION

A. Verify flatness and tightness of joints of wood decking. Fill knot holes with latex filler.

B. Confirm dry deck by moisture meter with 12 percent moisture maximum.

C. Apply manufacturer's recommended vapor retarder or temporary roof before roof installation.
   1. Install air barriers and vapor retarders completely to ensure solid wood roof decking is fully-protected prior to the end of each work day, and prior to installation of remaining roofing components.

3.4 VAPOR RETARDER AND INSULATION - UNDER MEMBRANE

A. Apply vapor retarder to deck surface with adhesive in accordance with manufacturer's instructions.
   1. Extend vapor retarder under blocking to deck edge.
   2. Install flexible flashing from vapor retarder to air seal material of wall construction, lap and seal to provide continuity of the air barrier plane.

B. Ensure vapor retarder is clean and dry, continuous, and ready for application of insulation.

C. Attachment of Insulation:
   1. Embed insulation layers into full bed of adhesive in accordance with roofing and insulation manufacturers' instructions.

D. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer.

E. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

F. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

G. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.

H. At roof drains, use boards cut to slope to slope down to roof drains over a distance of 18 inches.

I. Do not apply more insulation than can be covered with membrane in same day.

3.5 MEMBRANE APPLICATION

A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

B. Shingle joints on sloped substrate in direction of drainage.

C. Fully Adhered Application: Apply adhesive to substrate at rate of 1.5 gal/square. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.

D. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.

E. At intersections with vertical surfaces:
   1. Extend membrane over cant strips and up a minimum of 8 inches onto vertical surfaces.
   2. Fully adhere flexible flashing over membrane and up to nailing strips.
   3. Secure flashing to nailing strips at 8 inches on center.
   4. Insert flashing into reglets and secure.

F. At gravel stops, extend membrane under gravel stop and to the outside face of the wall.

G. Around roof penetrations, seal flanges and flashings with flexible flashing.

H. Coordinate installation of roof drains and related flashings.

3.6 BALLAST INSTALLATION

A. Ensure installed protective sacrificial membrane over completed and inspected roof system is ready to receive ballast.

B. Install ballast. Evenly distribute aggregate ballast.

C. Protected Membrane Application: Set roof drain inlets at membrane level and top grating at top of insulation.

3.7 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field quality control and inspection.

B. Require site attendance of roofing and insulation material manufacturers daily during installation of the Work.

3.8 CLEANING

A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

B. Remove bituminous markings from finished surfaces.

C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.

D. Repair or replace defaced or damaged finishes caused by work of this section.

3.9 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Carpet tile, fully adhered.

B. Walk-off carpet tile, located at main entry vestibuiles.

C. Edge Strips (Wall Base).

D. Moisture Emission Testing.

1.2 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 01 74 19 - Construction Waste Management and Disposal: Reclamation/Recycling of new carpet tile scrap.

C. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

1.3 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2006 (Reapproved 2011).

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2014c.

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

D. CRI 104 - Standard for Installation of Commercial Carpet; 2015.

E. CRI (GLP) - Green Label Plus Testing Program - Certified Products; www.carpet-rug.org; current edition.

F. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Shop Drawings: Indicate layout of joints and direction of carpet pile.

D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

E. Submit two, 6 inch long samples of edge strip.

F. Concrete Testing Standard: Submit a copy of ASTM F710.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Extra Carpet Tiles: Quantity equal to 10 percent of total installed of each color and pattern installed.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum 10 years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum 5 years documented experience and approved by carpet tile manufacturer.

1.6 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Tile Carpeting:
1. Lees Carpets : www.leescarpets.com.
2. Tandus Centiva : www.tandus-centiva.com.
3. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 MATERIALS

A. Tile Carpeting , Type CPT-1: Tufted, manufactured in one color dye lot.
1. Product: Cartography manufactured by Tandus Centiva.
2. Tile Size: 24 by 24 inch, nominal.
3. Pattern: Ancient Parchment 15611.
4. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
5. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
6. VOC Content: Comply with Section 01 61 16.
7. Static Control Fiber: Dynex SD Solution Dyed.
8. Maximum Electrostatic Charge: 3 Kv. at 20 percent relative humidity.

B. Tile Carpeting , Type WOM: Tufted, manufactured in one color dye lot.
1. Product: Step Up II manufactured by Mohawk Group, Lee's Walk-Off.
2. Tile Size: 24 by 24 inch, nominal.
3. Color: 955 Cobalt.
4. Pattern: GT311.
5. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
6. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
7. VOC Content: Comply with Section 01 61 16.
8. Maximum Electrostatic Charge: 3 Kv. at 20 percent relative humidity.

2.3 ACCESSORIES

A. Edge Strips (Wall Base): Rubber, color as selected by Architect.

B. Adhesives:

1. Compatible with materials being adhered; maximum VOC content as specified in Section 01 61 16.

C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer ; releasable type.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet tile.

B. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and pH.
1. Test in accordance with ASTM F710.
2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

C. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.

C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

D. Vacuum clean substrate.

3.3 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install carpet tile in accordance with manufacturer's instructions and CRI 104 (Commercial).

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.

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 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Window shades and accessories.

1.2 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

B. Section 06 20 00 - Finish Carpentry: Substrate for window shade systems.

C. Section 09 21 16 - Gypsum Board Assemblies: Substrate for window shade systems.

1.3 REFERENCE STANDARDS

A. ASTM D4674 - Standard Practice for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Office Environments; 2002a (Reapproved 2010).

B. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

C. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2015.

D. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of all affected installers.

B. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening have been taken.
   2. Do not install shades until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, and mounting dimension requirements for each product and condition.

D. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.

E. Selection Samples: Include fabric samples in full range of available colors and patterns.

F. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

G. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

H. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

I. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than 10 years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this type with minimum 5 years of documented experience.
   1. Factory training and demonstrated experience.

1.7 MOCK-UP

A. Mock-Up: Provide full size mock-up of window shade complete with selected shade fabric including sample of seam when applicable.
   1. Obtain Architect's approval of light and privacy characteristics of fabric prior to fabrication.
   2. Full-sized mock-up may become part of the final installation.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.9 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
   1. Shade Hardware: One year.
   2. Electric Motors: One year.
   3. Electronic Control Equipment: One year.
   4. Fabric: One year.
   5. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manually Operated Roller Shades:
   1. MechoSystems; Manual UrbanShade / Mecho5: www.mechoshade.com.

2. Draper; FlexShade XD: www.draperinc.com.
3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.2 WINDOW SHADE APPLICATIONS

A. Shades at all window locations: Translucent shades.
1. Type: Roller shades.
2. Fabric: 0900 Series ThermoVeil.
3. Fabric Performance Requirements:
a. Openness Factor: 0-1%.
4. Color: As selected by Architect from manufacturer's full range of colors.
5. Mounting: Inside (between jambs).
6. Operation: Manual.

2.3 ROLLER SHADES

A. Roller Shades: Fabric roller shades complete with mounting brackets, roller tubes, hembars, hardware and accessories; fully factory-assembled.
1. Drop: Regular roll.
2. Size: As indicated on drawings.

B. Fabric: Non-flammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation ; PVC-free ; 100 percent recycled.
1. Translucent Shades: Soften the light and reveal only shadow-like outlines to the outside; substantial privacy; Openness Factor less than 1 percent.
2. Flammability: Pass NFPA 701 large and small tests.
3. Fungal Resistance: No growth when tested according to ASTM G21.

C. Roller Tube: As required for type of operation, extruded aluminum with end caps.
1. Dimensions: Manufacturer's standard, selected for suitability for installation conditions, span, and weight of shades.
2. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge.
3. Finish: Baked enamel; color from manufacturer's standards.

D. Hembars and Hembar Pockets: Wall thickness designed for weight requirements and adaptation to uneven surfaces, to maintain bottom of shade straight and flat.
1. Style: Full wrap fabric covered bottom bar, flat profile with closed ends.
2. Finish: Anodized.
3. Color: As selected from manufacturer's standard colors.

E. Manual Operation: Clutch operated continuous loop; beaded ball chain.

2.4 ACCESSORIES

A. Brackets and Mounting Hardware: As recommended by manufacturer for mounting configuration and span indicated.

B. Fasteners: Non-corrosive, and as recommended by shade manufacturer.

2.5 FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Fabricate shades to fit openings within specified tolerances.
   1. Vertical Dimensions: Fill openings from head to sill with 1/4 inch space between bottom bar and window sill.
   2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.
   3. Horizontal Dimensions - Outside Mounting: Cover window frames, trim, and casings completely.

C. Dimensional Tolerances: As recommended in writing by manufacturer.

D. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Start of installation shall be considered acceptance of substrates.

3.2 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Installation Tolerances:
   1. Inside Mounting: Maximum space between shade and jamb when closed of 1/16 inch.
   2. Maximum Offset From Level: 1/16 inch.

C. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.

D. Adjust level, projection and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.4 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

C. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

3.5 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.

D. Training: Train Owner's personnel on operation and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of 1 hour training by manufacturer's authorized personnel at location designated by the Owner.

3.6 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes pipe, fittings, and joining methods for sanitary waste, vent and storm drain piping.

1.02 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
   1. Soil, Waste, Vent, and Storm Drain Piping: 10-foot head of water.

1.03 ACTION SUBMITTALS

A. Provide materials list for pipe and fittings.

B. Provide catalog data for dielectric fittings.

1.04 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.05 FIELD CONDITIONS

A. Interruption of Existing Site Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
   1. Notify Architect and Owner no fewer than five business days in advance of proposed interruption of sanitary waste service.
   2. Do not proceed with interruption of sanitary waste service without Owner's written permission.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

2.02 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. CISPI, Hubless-Piping Couplings:
   1. Standards: ASTM C 1277 and CISPI 310.
   2. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.03 GALVANIZED-STEEL PIPE AND FITTINGS

A. Galvanized-Steel Pipe: ASTM A 53/A 53M, Type E, Standard Weight class. Include square-cut-grooved or threaded ends matching joining method.

B. Galvanized-Cast-Iron Drainage Fittings: ASME B16.12, threaded.

C. Steel Pipe Pressure Fittings:
1. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106/A 106M, Schedule 40, seamless steel pipe. Include ends matching joining method.
2. Malleable-Iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
3. Galvanized-Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, standard pattern.

D. Cast-Iron Flanges: ASME B16.1, Class 125.
1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

2.04 SPECIALTY PIPE FITTINGS

A. Transition Couplings:
1. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
2. Unshielded, Non-pressure Transition Couplings:
a. Standard: ASTM C 1173.
b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
c. End Connections: Same size as and compatible with pipes to be joined.
d. Sleeve Materials:
1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
3. Shielded, Non-pressure Transition Couplings:
a. Standard: ASTM C 1460.
b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
c. End Connections: Same size as and compatible with pipes to be joined.
4. Downspout Connectors:
a. Description: Black elastomeric or flexible PVC connector, capable of conforming to round or square downspout and transitioning to round storm drain piping.
b. Basis of Design: Fernco DSC-33.

PART 3 - EXECUTION

3.01 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved by Engineer.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.
   1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
   2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.
      a. Straight tees, elbows, and crosses may be used on vent lines.
   3. Do not change direction of flow more than 90 degrees.
   4. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Do not reduce size of waste piping in direction of flow.

K. Lay buried building waste piping beginning at low point of each system.
   1. Install true to grades and alignment indicated, with unbroken continuity of invert.
   2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
   3. Maintain swab in piping and pull past each joint as completed.

L. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:
   1. Sanitary Waste: 2 percent downward in direction of flow. for piping NPS 3 and smaller;
   2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

M. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

N. Install steel piping according to applicable plumbing code.

O. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

P. Plumbing Specialties:
   1. Install cleanouts at grade where shown on drawings. Provide a cleanout to exterior grade wherever sanitary or storm drain piping leaves the building.
   2. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping.

Q. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

R. Install sleeves for piping penetrations of walls, ceilings, and floors.

3.02 JOINT CONSTRUCTION

A. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

B. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1.
   1. Cut threads full and clean using sharp dies.
   2. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
      a. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
      b. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
      c. Do not use pipe sections that have cracked or open welds.

3.03 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:
   1. Install transition couplings at joints of piping with small differences in ODs.
   2. In Waste Drainage Piping: Non-pressure transition couplings. Shielded below grade. Unshielded above grade.
   3. Install downspout connectors at each transition from downspouts to storm drain piping. Install so that storm drain piping hub is covered.

3.04 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

B. Support vertical piping and tubing at base and at each floor.

3.05 CONNECTIONS

A. Connect waste and vent piping to the following:
   1. Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
   2. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

B. Make connections according to the following unless otherwise indicated:
   1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

3.06 FIELD QUALITY CONTROL

A. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test sanitary waste and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
   1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.
      a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
   2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.

a. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.
   a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
   b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
   c. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.
   a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg.
   b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
   c. Air pressure must remain constant without introducing additional air throughout period of inspection.
   d. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

C. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved.
   a. Expose work that was covered or concealed before it was tested.
2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials.
   a. Isolate test source and allow to stand for four hours.
   b. Leaks and loss in test pressure constitute defects that must be repaired.
3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
4. Prepare reports for tests and required corrective action.

3.07 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect sanitary waste and vent piping during construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.08 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. All sanitary waste, storm water, and underground vent piping shall be the following:
1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.

C. Aboveground, vent piping shall be any of the following:
1. Galvanized-steel pipe, drainage fittings, and threaded joints.
2. Cast iron pipe, drainage fittings, and joints.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Underground water piping and accessories

1.02 DESIGN REQUIREMENTS

A. Maximum working pressure: 125 psig

B. Maximum operating temperature: 210^{o}F

1.03 SUBMITTALS

A. Provide submittals for products listed in the Product Table below in accordance with Section 23 05 00 – General Mechanical Provisions. Submittal requirements indicated by column number designation as follows:
1. Materials List
2. Catalog Data
3. Product Data
4. Performance Data
5. Wiring Diagrams
6. Shop Drawings
7. Installation Instructions
8. Special Requirement listed herein.

PRODUCT TABLE	1	2	3	4	5	6	7	8
All products in this section		X	X					

1.04 QUALITY ASSURANCE

A. Entire installation shall conform to B31.9 Building Service Piping.

B. Mechanics shall be skilled in their work or trade. Welders on pressure vessels or piping shall show evidence of qualification in accordance with the ASME Code for Pressure Piping, Power Piping, building service piping, and the ASME Boiler and Pressure Vessel Code. Each welder shall utilize a stamp to identify all work performed by the welder as required. The Owner reserves the right to reject any personnel found unqualified in the performance of work for which they are employed.

C. Shop Drawings: For underground hydronic piping. Signed and sealed by a professional engineer.

1. Calculate requirements for expansion compensation for underground piping.

2. Show expansion compensators, offsets, and loops with appropriate materials to allow piping movement in the required locations. Show anchors and guides that restrain piping movement with calculated loads, and show concrete thrust block dimensions.

3. Show pipe sizes, locations, and elevations. Show piping in trench, conduit, and cased pipe with details showing clearances between piping, and show insulation thickness.

D.

PART 2 – PRODUCTS

2.01 UNDERGROUND HEATING WATER PIPING

A. Acceptable Manufacturer: Perma-Pipe, Inc, Rovanco Piping Systems, Rehau, Thermacor Process, or approved.

B. General: Prefabricated piping system consisting of carrier pipe, insulation, and outer jacket.

C. Carrier Piping (Option #1): ASTM A53, black, standard weight (Schedule 40)
1. Fittings: Up to 2 inches - ANSI B16.3, malleable-iron, 150 lb., black threaded. 2-l/2 inches and larger - ANSI B16.9, factory-made, wrought-steel, 150 lb., butt-welded fittings.

D. Carrier Piping (Option #2): ASTM B-88, Type L copper, hard drawn.
1. Fittings: ANSI B-16.22, wrought copper
2. Joints: 3/4 inch and below, lead free 95%-5% tin-antimony solder joints; 1 inch and above brazed, brazing filler metals, AWS A5.8, Classification BCuP-5. Brazing filler alloys, ASTM B260-52T, Sil-Fos (15% silver, 80% copper), flux, silver brazing flux, non-corrosive.

E. Insulation: Spray applied, two pound per cubic foot density, polyurethane foam, minimum 1-1/2" thickness. Closed cell content - 90-95 % in accordance with MIL-I-24172 and ASTM C-591. Completely fill annular space between carrier pipe and jacketing.

F. Outer Jacket: HDPE or Filament wound polyester resin/fiberglass reinforcement composite directly applied on the insulating foam, or high impact, seamless polyvinyl chloride Class 12454-B compound conforming to ASTM 1784, Type 1, Grade 1.

2.02 UNDERGROUND CHILLED WATER PIPING

A. General: Provide a complete prefabricated underground chilled water piping system

B. Acceptable Manufacturers: Perma-Pipe, Inc; Rovanco Piping Systems, Thermacor Process.

C. Piping: Carrier pipe shall be a high-density polyethylene resin compound with a Dimension Ratio (DR) rating of DR-11, working pressure rating (WPR) of 200 psi at 80°F.

D. Insulation: Polyurethane foam with a K factor of 0.14 or 0.16, density of 2 pcf, closed cell content of 90-95% completely filling the space between the carrier pipe and the outer jacket with a minimum thickness as indicated in Table 1. The carrier pipe shall be concentrically located within the jacket. All insulation shall be provided by the piping system supplier.

E. Jacket: The outer casing shall be high density polyethylene (HDPE) conforming to ASTM D1248 and D3350, Type III, Class C, Category 5, Grade P23/P34. Minimum jacket thickness shall be in accordance with Table 1. All jacket material provided by the piping system supplier.

Table 1:

Nominal Pipe Size in Inches	Minimum Insulation Thickness in Inches	Jacket Size in Inches	Jacket Thickness in Mils
3 and smaller	1.25	6.63	150
4	1.75	8.00	150

F. Joints: Shall be field insulated per the manufacturer's instructions with an HDPE sleeve and sealed with a heat shrink sleeve. The service pipe shall be thermal butt fusion welded. Weld pressures, temperatures, and time shall be in accordance with the manufacturer's recommendations.

G. Fittings: All fittings will conform to pipe type and may be insulated and jacketed with materials supplied by the system supplier as per manufacturer's standard procedures.

H. Expansion: Piping system supplier will be responsible for providing a complete system with carrier pipe, insulation, and jacket capable of expansion and contraction without affecting the integrity of the piping system.

I. End seals: Provide polyethylene end seals for all direct-buried ends of the insulated piping system according to the piping systems manufacturer's instructions.

J. Wall penetrations: Provide a Link-Seal system. Piping supplier shall provide an appropriate transition and fittings to accommodate penetration through walls with the use of a link seal.

K. Accessories: Provide all required accessories including wall sleeves, materials as required to join the piping system to other materials required to provide a complete system per the manufacturer's recommendation.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Piping, equipment, appurtenances and devices installed in professional manner in conformance with the Specifications and Drawings. Changes in direction made by appropriate use of fittings. Approved provisions made for expansion and flexibility in water piping. Arrange piping to drain to equipment, drain point, or as approved.

B. Piping Layout:
1. Give special attention to appearance of complete installation.
2. Make provision for expansion and contraction during normal operation.
3. Do not obstruct openings or passageways.
4. Run parallel to walls of building.
5. Keep free of contact with building construction or installed items.

C. Cutting: Cut pipe from measurements taken at the site, not from drawings.

D. Drainage: Arrange so that system can be completely drained. Provide ball valves with hose end connections as low points in piping system.

E. Prefabricated Piping Systems: Install as shown and in accordance with manufacturer's recommendations.

3.02 CLEANING

A. Keep inside of all pipe and fittings clean and free from dirt and debris.

B. Thoroughly blow all lines before testing or placing in service.

3.03 INSPECTION

A. No piping covered or concealed until it has been first tested, inspected and approved.

3.04 TESTING

A. General Details of Test:
1. Instruments, vessels, equipment, and accessories which cannot withstand the test pressure required of attached piping shall be isolated from the piping. Remove or

block and vent directly operated or self-contained regulators. Each part of a pipe system shall be tested for the time specified for the given class of test.

2. Piping and vessels shall be vented when draining them to prevent their collapse by vacuum.
3. The test crew shall seat valves under test by normal hand tightening or by normal use of operator furnished with valve. Over-tightening of a valve in an effort to make it hold will be cause for rejection of the valve.
4. The pipe system installer shall provide all necessary connections, vents and drains to test and drain the system completely.
5. No testing shall be done when the ambient space temperature is below 40^{o}F.
6. Allowance shall be made by the inspector for variations of pressure and volume due to temperature changes in determining satisfactory maintained test pressure.
7. The inspector shall check the test pressure at the beginning and end of each test before acceptance of the system.
8. Pipe systems shall be tested and accepted before insulation, paint, or other covering or coating is applied. The only exceptions are for those parts, including vessels, which have been painted, covered or coated and have had previous certification tests.

B. Hydronic Piping:

1. Hydrostatic Test - for Design Pressures are shown:
   a. Typical Services: Design Pressure
      1) Buried water supply and return 125 psig
   b. The final test pressure shall be 100% of the design pressure.
   c. An initial test pressure of 25 psig shall be applied and a visual inspection of the piping system conducted for leaks. The pressure shall then be raised to .75 times the design pressure and rechecked for leaks, after which the final test pressure shall be applied and a final inspection of the piping system performed.
   d. Clean domestic water shall be used as the test medium.
   e. Trapped air shall be removed.
   f. A test gauge with a minimum 4-1/2-inch diameter dial and a test pressure reading between 1/2 to 3/4 of full scale shall be used.
   g. The final test pressure shall be held for 4 hours then visually inspected for leaks. Pressure loss during the 4-hour test period may be cause for rejection of the system.

3.05 IDENTIFICATION

A. Install continuous plastic underground warning tapes during back filling of trenches for underground hydronic piping. Locate tapes 6 to 8 inches below finished grade, directly over piping.

END OF SECTION