

SECTION 07130

BENTONITE WATERPROOFING

PART 1 – GENERAL

1.01 QUALIFICATIONS

- A. Installer: Company specializing in performing the work of this Section with minimum five (5) years experience approved by manufacturer.

1.02 DELIVER, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to site under provisions of Section 01615.
- B. Maintain bentonite products dry. Protect with waterproof cover.
- C. Maintain minimum ambient storage temperatures of 40 degrees F for bentonite gel products.

1.03 ENVIRONMENTAL REQUIREMENTS

- A. Maintain conditions in accordance with manufacturer's instructions.

1.04 WARRANTY

- A. Provide five (5) year warranty under provisions of Section 01770.
- B. Warranty: Include coverage for waterproofing failing to resist penetration of water.
- C. For warranty repair work, be responsible for removing and replacing materials concealing waterproofing.

1.05 ALTERNATES

- A. See Section 01230 for bidding alternates affecting the Work of this Section.

1.06 COLORS

- A. Colors are specified in Colors/Materials Schedule.

1.07 SUSTAINABLE BUILDING REQUIREMENTS

- A. See Section 01011 for sustainable building requirements affecting the Work of this Section.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. CETCO “Voltex DS”, Panel system. Provide all accessories for a complete system.
- B. Substitutions: Under provisions of Section 01600.

2.02 ACCESSORIES

- A. Fasteners: Galvanized nails.
- B. Adhesive: Manufacturer’s recommended type.
- C. Polyethylene Sheet: 4 mil thick.
- D. Flexible Flashings and Sealant: Type recommended by manufacturer.
- E. Protection Board: Type recommended by manufacturer.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify substrates surfaces are smooth and durable; free of matter detrimental to application of waterproofing system.
- B. Verify items which penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

- A. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer’s instructions.
- B. Remove concrete fins, projections, and form ties.

- C. Fill holes, cracks, honeycombs, and voids with bentonite gel seal, minimum 1/8 inch thick, extending minimum 3 inches beyond defect.
- D. Seal construction joints and through wall projections with joint seal or joint packing.

3.03 APPLICATION ON VERTICAL SURFACES

- A. Apply bentonite panels in accordance with manufacturer's instructions.
- B. Apply single bentonite panels with masonry nails, starting at base of foundation.
- C. Fold and secure panels around corners with corrugations vertical. Secure unfolded panels with corrugations horizontal.
- D. Lap adjoining panels 1 ½ inches.
- E. Stagger vertical joints at mid-panel on succeeding courses.
- F. Cut panels parallel to corrugations to avoid bentonite loss.
- G. Place joint packing tubes continuous along junction of wall and footing and at termination of panels. Secure to prevent movement.
- H. Install flexible flashings and sealant at top of waterproofing panels at grade.
- I. Install waterstops at all pour joints in elevator pits, minimum 2 inch concrete cover.

3.04 APPLICATION ON HORIZONTAL SURFACES BELOW SLABS AT NON-HYDROSTATIC CONDITIONS

- A. Apply bentonite panels in accordance with manufacturer's instructions.
- B. Place polyethylene sheet over substrate; lap joints 4 inches.
- C. Apply single bentonite panels with adjoining edges abutted. Secure panels to prevent displacement. Stagger joints of adjoining panel rows.
- D. Cut panels parallel to corrugations to avoid bentonite loss.
- E. Do not extend bentonite panels over footings supporting slab edges.
- F. Place protective polyethylene sheet over installed panels; lap joints 4 inches.

- G. Trowel joint seal to beads 1 inch high around penetrations and ½ inch high around chair legs not place on pads. Cover beads with polyethylene collars, cut to size.

3.05 **JOINTS**

- A. Apply bentonite packing and sealer at construction joints.

3.06 **PROTECTION OF FINISHED WORK**

- A. Protect finished work under provision of Section 01600.
- B. Do not permit traffic over unprotected or uncovered waterproofing.
- C. Protect installed waterproofing from precipitation or ground water with temporary polyethylene sheeting. When backfilling begins, remove sheeting.
- D. Protect waterproofing from damage by adhering protection board over waterproofing surface. Scribe and cut boards around projection and interruptions.

END OF SECTION

SECTION 07140

MEMBRANE WATERPROOFING

PART 1 – GENERAL

1.01 MEMBRANE WATERPROOFING

- A. Membrane waterproofing shall be provided under concrete topping or with suitable wearing surface in above grade mechanical rooms and any habitually wet areas as specified in all other areas.

END OF SECTION

SECTION 07213

INSULATION

PART 1 – GENERAL

1.01 REFERENCES

- A. ASTM C665 – Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- B. ASTM E84 – Test Method for Surface Burning Characteristics of Building Materials.
- C. NFPA 255 – Test of Surface Burning Characteristics of Building Materials.
- D. UL 723 – Tests for Surface Burning Characteristics of Building Materials.

1.02 SUBMITTALS

- A. Submit under provisions of Section 01330.
- B. Product Data: Provide data on product characteristics, performance criteria, and limitations.
- C. Manufacturer’s Certificate: Certify that products meet or exceed specified requirements.

1.03 ALTERNATES

- A. See Section 01230 for bidding alternates affecting the Work of this Section.

1.04 COLORS

- A. Colors are specified in Colors/Materials Schedule.

1.05 SUSTAINABLE BUILDING REQUIREMENTS

- A. See Section 01011 for sustainable building requirements affecting the Work of this Section.

PART 2 – PRODUCTS

2.01 THERMAL BATT INSULATION MATERIALS

- A. Batt Insulation: ASTM C665; performed glass fiber batt; friction fit, unfaced, widths required for snug, friction fit between framing free of gaps or voids.
- B. Vapor Retarder (Polyethylene Film): Clear polyethylene film, 6 mil thick.
- C. Vapor Retarder (Foil Faced): Lamotite 2835M-FSK, 0.02 permeance (MVTR) per ASTM E96, BTU content per square foot when burned shall not exceed 200 BTU/sq. ft.
- D. Tape: Polyethylene self-adhering type, 2 inches wide, and foil faced, self-adhering, reinforced, 2 inches wide.
- E. Adhesive: Spray type, suitable for adhering polyethylene film and foil faced vapor barriers permanently to metal studs.
- F. Support Wire: 25 gauge, annealed steel wire.
- G. Staples: Coated, non-rusting steel.

2.02 SOUND BATT INSULATION MATERIALS

- A. Sound Batt Insulation: ASTM C665, 3 ½ inch thickness, preformed glass fiber batt, friction fit, unfaced, widths required for snug, friction fit between framing free of gaps or voids.
- B. 5/16" thick neoprene waffle pad, 40 durometer, 40 PSI nominal.

2.03 PERIMETER FOUNDATION INSULATION MATERIALS (RIGID INSULATION)

- A. Foundation Perimeter Insulation: Polystyrene insulation, extruded cellular type, square edges, ASTM C578 Type IV, 25 psi minimum compressive strength, Dow Chemical Co. "Styrofoam," Owens Corning "Foamular," or approved.

2.04 MINERAL WOOL INSULATION (FOR MISCELLANEOUS PACKING)

- A. ASTM C665, mineral fiber, unfaced.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify site conditions under provisions of Section 01310.
- B. Verify that substrate, adjacent materials, and insulation are dry and ready to receive insulation.

3.02 INSTALLATION

- A. Install insulation and vapor barrier in accordance with insulation manufacturer's instructions.
- B. Install in exterior walls, roof, and ceiling spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation.
- E. Install with factory applied vapor barrier membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.
- F. Staple or nail facing flanges in place at maximum 6 inches.
- G. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.
- H. Metal Framing: Place vapor barrier on warm side of insulation, lap and seal vapor barrier joints over member face.
- I. Use polyethylene film vapor barrier where framing is covered with finish surface. Use foil faced vapor barrier where framing is not covered with finish surface.
- J. Extend vapor barrier tight to full perimeter of adjacent window and doorframes and other items interrupting the plane of membrane. Tape seal in place.
- K. Attach exposed foil faced vapor barrier to wood studs with staples.
- L. Insulation shall not block the required ventilation spaces in roof framing above insulation. Confirm that ventilation air passageways have the required free area above the top of the insulation in each joist bay from roof eave to ridge or other vent. Correct any blockages.

3.03 SOUND BATT INSULATION INSTALLATION

- A. Install insulation in accordance with manufacturer's instructions.
- B. Install in sound wall cavity without gaps or voids, trim to fit.
- C. Extend insulation full height of wall and ceiling as indicated.
- D. Install materials and systems in proper relation with adjacent construction and coordinate with other work.
- E. Provide full thickness in one layer over entire area, tightly fitting around penetrations.

3.04 PERIMETER FOUNDATION INSULATION INSTALLATION

- A. Install insulation in accordance with manufacturer's instructions.
- B. Run insulation board in continuous, unbroken line, butt joints tight, leave no voids or gaps.

3.05 MINERAL WOOL INSULATION (FOR MISCELLANEOUS PACKING)

- A. Pack insulation between top plate/runner and roof deck/structure on non-load bearing walls full width of plate/runner.
- B. Pack insulation around all mechanical and electrical penetrations through walls, floors, ceilings, and roof structure.

END OF SECTION

SECTION 07270

FIRESTOPPING AND SMOKESEALS

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes: Provide fire stopping and smoke seals as indicated on drawings as well as the following areas, including:
 - 1. All openings in fire-rated floors and wall assemblies, both empty those accommodating penetrating items such as cables, conduits, pipes, ducts, etc.
 - 2. Openings at each floor level in shafts or stairwells.
- B. Responsibility: This Section contains requirements for firestopping and smoke barrier penetration seals around pipes, ducts, conduits, etc., in walls, partitions, ceilings, and floors. The trades for Work under Divisions 15 and 16 of this Contract shall be responsible for providing required sleeves and for sealing said penetrations in accordance with requirements of this Section.
- C. Substitutions: Substitute products will be considered only under terms and conditions specified in Section 01600.

1.02 REFERENCES

- A. ASTM E84 (American Society for Testing & Materials) – Test Method for Surface Burning Characteristics of Building Materials.
- B. ASTM E136 (American Society for Testing & Materials) – Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C.
- C. ANSI ANSI/UL 1479 (American National Standards Institute) – Fire Tests of Through-Penetration Firestops.
- D. UBC No. 43-6 (Uniform Building Code) – Fire Tests of Through-Penetration Fire Stops.
- E. NFPA 101 Code for Safety to Life From Fire in Buildings and Structure.

1.03 **DEFINITIONS**

- A. Fire Stopping and Smoke seals: Material or combination of materials and installation of them to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and gases. Included would be openings, gaps, and joints through walls, floors, and the wall/floor interface.

1.04 **SUBMITTALS**

- A. General: Make submittals in accordance with Section 01330.
- B. Certificates of Compliance: Submit manufacturer's certificates of compliance stating that the fire stopping and smoke seal material, or combination of materials meet the requirements specified and is recommended for the applications indicated. If requested, furnish complete test reports from Independent Laboratory.
- C. Product Data: Submit manufacturer's product data, including material composition, performance and limitation criteria, and installation procedures for each type of firestopping and smoke seal material required.
- D. Shop Drawings: Submit shop drawings showing each condition requiring penetration seals indicating proposed UL systems materials, installation details, including reinforcement, anchorage, and fastenings as required. Include a schedule showing each fire stop and smoke seal material.

1.05 **QUALITY ASSURANCE**

- A. Material Qualifications: Provide only materials tested and certified to conform with specified requirements. Flame spread rating must be a minimum of one (1) hour, but not less than the fire resistance rating of the assembly being penetrated.
- B. Codes and Standards: Firestop tests shall conform to UBC Standard No. 43-6. Smoke seal tests shall conform to ANSI-UL 1479 or UBC Standard No. 43-6.

- C. Un-Tested Penetrations: For mechanical and electrical penetrations that have characteristics (e.g., pipe material and diameter, pipe insulation type and thickness, type of wall that is penetrated) that have not been tested in accordance with UBC Standard 43-6 or ANSI/UL 1479 by any firestop manufacturer, provide a written certification from the proposed firestop manufacturer stating that the manufacturer's firestop material will meet the requirements for successfully passing the tests in UBC Standard 43-6 or ANSI/UL 1479.
 - 1. The certification shall also contain firestop installation procedures (e.g., sleeve material and size, space requirements, quantity of firestop material required).
 - 2. If required, submit certification to the local fire authority and obtain their approval before submitting to Architect for his review.
- D. Installer's Qualifications: Engage an experienced Installer who has been trained in installation of "Through-Penetration Firestop Systems" based on published UL tested assemblies.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with requirements specified in Section 01600.
- B. Deliver materials undamaged in manufacturer's unopened containers or packages identified with brand, type, grade, and UL label. Coordinate delivery with scheduled installation dated to minimize storage time at site. Leave seals unbroken and labels intact until time of use. Remove from job site rejected or damaged packages found unsuitable for use.
- C. Store materials in clean, dry, ventilated location. Protect from soiling, abuse, and moisture. Follow manufacturer's instructions.

1.07 PROJECT CONDITIONS

- A. General: Conform to manufacturer's printed instructions for installation and, when applicable, curing recommendations regarding temperature and humidity. Provide adequate ventilation if using solvent. Provide forced air ventilation during installation, if required by manufacturer. Keep flammable materials away from sparks or flame.

- B. Coordination with Other Trades: Coordinate annular space, sleeve and insulation requirements with work of Divisions 15 and 16. Fire Stopping or smoke seal material at penetrations of insulated pipe shall be applied after the insulation is installed. The material selected for use with insulated pipes shall have been tested in accordance with UBC 43-6 or ANSI/UL 1479 for that particular insulated pipe assembly.

1.08 SEQUENCING AND SCHEDULING

- A. General: It is the responsibility of the Contractor to identify all locations requiring firestopping and coordinate installation of the firestopping.

1.09 ALTERNATES

- A. See Section 01230 for bidding alternates affecting the Work of this Section.

1.10 COLORS

- A. Colors are specified in Colors/Materials Schedule.

1.11 SUSTAINABLE BUILDING REQUIREMENTS

- A. See Section 01011 for sustainable building requirements affecting the Work of this Section.

PART 2 – PRODUCTS

2.01 SLEEVES

- A. Sleeves for Metal Pipe, Conduit, Cable, and Ducts: Form continuous sleeves from 24-gauge galvanized steel; length of sleeve to extend through full thickness of partition.
- B. Sleeves for Plastic Pipe: ASTM E514, asbestos-free, prefabricated sleeves, compatible with firestopping system for plastic pipe.
- C. Sizes: Size sleeves to provide the annular space between sleeves and pipe (or duct, or conduit, etc.) as recommended by the firestopping material manufacturer, as required to comply with the Quality Assurance portion of this Section. Size sleeves based on outside diameter of insulation when it is to be continuous through the opening.

2.02 FIRESTOPPING AND SMOKESEALS

- A. Firestopping Materials: Asbestos free and capable of maintaining an effective barrier against flame and hot gases in compliance with the following:
 - 1. Flame Spread: Fire hazard rating 25 or less, ASTM E84.
 - 2. Smoke Development: Fire hazard rating 50 or less, ASTM E84.
 - 3. "F" and "T" Ratings: Firestopping materials shall be rated "F" and "T" in accordance with UBC Standard No. 43-6. "F" or "T" rating shall match the hour rating of assembly in which the firestopping materials is installed or use the next highest full hourly rating if the assembly has a fractional hourly rating.
 - 4. Combustibility: Non-combustible, ASTM E136.

- B. Smoke stop Material: Asbestos free and capable of maintaining the smoke resistance of the smoke barrier in compliance with NFPA 101 and complying with the following requirements:
 - 1. Flame Spread: Fire hazard rating 25 or less, ASTM E84.
 - 2. Smoke Development: Fire hazard rating 50 or less, ASTM E84.
 - 3. Leakage Tests: Smoke stop materials shall be rated "F" and "T" in accordance with ANSI/UL 1479 or UBC Standard No. 43-6.
 - 4. Combustibility: Non-combustible, ASTM E136.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. General: Examine the conditions and substrates upon which firestopping or smoke seal material is to be applied. Do not proceed with work until all unsatisfactory conditions have been corrected. Installation of firestopping shall constitute the Contractor's acceptance of surfaces and conditions of substrates. Proceed with installation only after penetrations of the substrate and supporting brackets have been installed.

3.02 SLEEVES

- A. General: Install sleeves through full thickness of walls and partitions. Where sleeves are installed prior to pouring of concrete, install through floors and extend 1 inch above finished floor level. Seal sleeves watertight to floor slabs.

3.03 PREPARATION

- A. General: Prior to application of firestopping or smoke seal material, clean the substrate of loose material, including dust, rust, grease other material which would preclude the successful application and retention of bond to the substrate. Do not apply fire stops or smoke seals to surfaces previously painted or treated with a sealer, curing compound, water repellent or other coating unless tests have been performed to ensure compatibility of materials. Remove coatings as required in compliance with firestopping and smoke seal manufacturer's instructions.
- B. Provide primers as required that conform to firestopping and smoke seal manufacturer's recommendations for various substrates and conditions.
- C. Mask where necessary to protect adjoining surfaces. Remove excess material and stains on surfaces as required.

3.04 INSTALLATION

- A. General: Provide firestopping and smoke seal material in the following locations:
 - 1. Mechanical and electrical penetrations (e.g., insulated and non-insulated pipe, tubing, wiring, raceways, cable, and conduit penetrations, cable trays, busways, and ductwork without fire or smoke-fire dampers) through floor slabs and through time rated partitions, ceilings, fire walls, and smoke walls.
 - 2. Unused openings in floor slabs and time rated partitions and walls.
 - 3. Other locations indicated, specified, or required by codes or local authorities.
- B. Installation: Install firestopping and smoke seal materials in accordance with the manufacturer's instruction and UL approval requirements. Ensure that anchoring devices, back-up materials, clips, sleeves, supports, and other materials used in the actual fire test are installed.

1. Dam bottom of vertical openings and one side of horizontal openings with temporary containment forms or, where required to achieve fire resistance ratings, provide permanent forms.
2. Do not allow materials to overflow or spill onto adjoining surfaces, or to migrate into voids of adjoining surfaces.
3. Firestopping or smoke sealing materials for filling voids in floors having openings of 4 inches or greater shall be installed to support the same load as the floor system, unless the area is protected by a permanent barrier preventing loading or traffic on the firestopped or smoke sealed area.
4. Tool or trowel exposed surfaces.

3.05 **CLEAN-UP**

- A. After completion of application of firestopping or smoke seal materials, remove debris, excess materials, broom clean exposed wall and floor areas. Neatly cut and trim materials as required.
- B. When finished work will be visible, remove temporary dams and clean adjacent surfaces in accordance with manufacturer's printed instructions. Remedy staining and discoloration in adjacent surfaces caused by Work under this Section.

3.06 **FIELD QUALITY CONTROL**

- A. General: Examine firestopped and smoke seal areas to ensure proper installation and full compliance with the Section. Correct deficiencies prior to concealing or enclosing the areas.
- B. Maintain accessibility to all areas of work until completion of inspection by the Building Official. Correct unacceptable firestops and smoke seals and provide additional inspection to verify with this specification at no additional cost.

END OF SECTION

SECTION 07400

WATER RESISTANT BUILDING BARRIER

PART 1 – GENERAL

1.01 REFERENCES

- A. NWCB – Northwest Wall and Ceiling Bureau
- B. ASTM – American Society of Testing Materials
- C. UL – Underwriters’ Laboratories
- D. WH – Warnock Hersey
- E. GA – Gypsum Association
- F. BM&WT – Building Materials and Wood Technology

1.02 DELIVERY, STORAGE AND PROTECTION

- A. Section 01600 – Product Requirements: Transport, Handle, Store and Protect Products
- B. Related Sections include the following:
 - 1. Division 1 Section “LEED Requirements” for additional LEED requirements.
 - 2. Division 7 Thermal and Moisture Protection

1.03 COORDINATION

- A. Coordinate installation with flashing installation
- B. Coordinate sequencing and installation of finish siding materials
- C. Coordinate installation sequencing where “Rain-Screen” system is being provided

D. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Building wrap
2. Asphalt Saturated Building Paper

1.04 QUALITY ASSURANCE

A. Fire-Test Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.05 PRE-INSTALLATION MEETING

A. Convene two (2) weeks before starting Work of this Section.

1.06 MOCK-UP

A. See Section 01230 Alternates.

1.07 ALTERNATES

A. See Section 01230 for bidding alternates affecting the hi-temp Work of this Section.

B. Membrane Flashing – Self adhesive type.

1. Grace Ultra

1.08 SUSTAINABLE BUILDING REQUIREMENTS

A. See Section 01011 for sustainable building requirements affecting the Work of this Section.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Moisture Barrier: Dupont Tyvek “Commercial Wrap”
- B. Membrane Flashing – self adhesive type.
 - 1. Grace Vycor Plus for vertical surfaces.
 - 2. Grace V40 for vertical surfaces.
 - 3. Grace VYCORners – prefabricated corners for use at windows, doors and other penetrations.
 - 4. Primer – Prem-A-Barrier WB primer.

2.02 ACCESSORIES

- A. Fasteners approved and recommended by manufacturer for metal frame construction.
- B. Seam tape, compatible with moisture barrier.

PART 3 – EXECUTION

3.01 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of product or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Cut material at penetrations, edges, and other obstructions of work, fit tightly against abutting construction, unless otherwise indicated.
 - 1. Securely attach to substrate by fastening with method recommended by manufacturer.
- C. Use stainless steel fasteners, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without damaging substrate.

- D. Coordinate moisture barrier installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints.
- F. Coordinate with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.02 **MOISTURE BARRIER INSTALLATION**

- A. Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.
- B. Install weather barrier prior to installation of windows and doors.
- C. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.
- D. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface with subsequent layers installed in a shingling manner to overlap lower layers. Maintain weather barrier plumb and level.
- E. Sill Plate Interface: Extend lower edge of weather barrier over sill plate interface 3-6 inches. Secure to foundation with elastomeric sealant as recommended by weather barrier manufacturer.
- F. Window and Door Openings: Extend weather barrier completely over openings.
- G. Overlap weather barrier
 - 1. Exterior corners: minimum 12 inches.
 - 2. Seams: minimum 6 inches.
- H. Weather Barrier Attachment:
 - 1. Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommend fasteners, space 12-18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.

- I. Apply flashing to weather barrier membrane prior to installing cladding anchors.
- J. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.
- K. Seal any tears or cuts as recommended by weather barrier manufacturer.

3.03 **MEMBRANE FLASHING AND ACCESSORIES INSTALLATION**

- A. Install in strict accordance with manufacturers' instructions and as indicated below. Prime all DensGlass, concrete and masonry surfaces prior to flashing installation.
- B. Cut flexible flashing minimum of 12 inches longer than width of sill rough opening.
- C. Cover horizontal sill by aligning flexible flashing edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.
- D. Fan flexible flashing at bottom corners into face of wall. Firmly press in place. Mechanically fasten fanned edges.
- E. Apply 9-inch wide strips of flashing at jambs. Align flashing with interior edge of jamb framing. Start flashing at head of opening and lap sill flashing down to the sill.
- F. Spray-apply primer to top 6 inches of jambs and exposed sheathing.
- G. Install flexible flashing at opening head using same installation procedures used at sill. Overlap jamb flashing a minimum of 2 inches.
- H. Coordinate flashing with window installation.
- I. On exterior, install back-rod in joint between frame and flashed rough framing. Apply sealant at jambs and head, leaving sill unsealed. Apply sealants in accordance with sealant manufacturer's instruction and ASTM C1193.
- J. Position weather barrier head flap across head flashing. Adhere using flashing over the 45-degree seams.
- K. Tape top of window in accordance with manufacturer recommendations.

- L. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer's instructions and ASTM C1193.

END OF SECTION

SECTION 07420

PRE-FINISHED ARCHITECTURAL SIDING (METAL PANEL SYSTEM)

PART 1 – GENERAL

1.01 REFERENCES

- A. American Society for Testing and Materials (ASTM) B117 Method of Salt Spray Testing.
- B. American Society for Testing and Materials (ASTM) D822 Practice for Operating Light and Exposure Apparatus (Carbon Arc Type) for Testing Paint.
- C. American Society for Testing and Materials (ASTM) D1735 Method for Water for Testing of Organic Coatings.
- D. Federal Test Method Standards (FSC 8010) 141 A/6152 Accelerated Weathering (Enclosed Arc Apparatus).
- E. Federal Test Method Standards (FSC 8010) 141 A/6160 Conducting Exterior Exposure Tests of Paints on Metals.
- F. National Coil Coaters Association (NCCA) II-6 Test Method for Measurement of Impact Resistance of Painted Aluminum Steel.
- G. National Coil Coaters Association (NCAA) II-12 Specification for Determination of Relative Pencil Hardness.
- H. National Coil Coaters Association (NCAA) II-16 Test Method for Determination of Film Adhesion by "Cross Hatch" Tape Test after Reverse Impact.

1.02 QUALITY ASSURANCE

- A. Panel manufacturer shall have a minimum of ten (10) years experience.
- B. When possible, field measurements should be taken prior to completion of shop manufacturing and assembly.
- C. Maximum deviation from vertical and horizontal alignment of erected panels 1/8 inch in 20 feet.

1.03 **SUBMITTALS**

- A. Submittal shall be in conformance with Section 01300.
- B. Samples:
 - 1. Panel Assembly: Two (2) samples of each type assembly 10" x 10".
 - 2. Two (2) samples of each color of finished selected 3" x 5".
- C. Submission Drawings: Indicate thickness and dimension of parts; fastening and anchoring methods; detail and location of joints; including joints necessary to accommodate thermal movement.
- D. Affidavit certifying material meets requirements specified.
- E. Two (2) copies of manufacturer's literature for panel material.
- F. Test reports on ASTM E84 from certified lab.

1.04 **DELIVER, STORAGE AND HANDLING**

- A. Protect finish and edges in accordance with panel manufacturer's recommendations.
- B. Store material in accordance with manufacturer's recommendations.

1.05 **ALTERNATES**

- A. See Section 01030 for bidding alternates affecting the Work of this Section.

1.06 **COLORS**

- A. Colors are specified in Colors/Materials Schedule.

1.07 **SUSTAINABLE BUILDING REQUIREMENTS**

- A. See Section 010111 for sustainable building requirements affecting the Work of this Section.

PART 2 – PRODUCTS

2.01 PANELS – LAMINATED PANEL SYSTEM

- A. Specification standard: “Envelope 2000” Pre-finished Architectural Siding System by Citadel Architectural Products: Panel shall consist of an exterior skin of 0.024 inch aluminum and an interior skin of 0.010 inch. Interior sides of exterior aluminum skins shall have an epoxy primer to prevent corrosion. Structural core shall be a 0.105 inch Thermoset Phenolic Resin. (Note: Installation shall match existing smooth panel details at adjacent drive-through canopies at casino.)
- B. Finish: Anodized.
- C. Attachment System: Rain Screen System (RS).
- D. Substitution: Under provisions of Section 01600.

2.02 ACCESSORIES

- A. Fasteners as supplied or recommended by panel manufacturer. Related materials to complete installation as recommended by panel manufacturer. Fastener sizes and locations shall be as required by manufacturer’s system.
- B. Weather seals shall be as recommended and supplied by the panel manufacturer.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Erect panels plumb, level, and true.
- B. Apply moisture barrier to all substrates per manufacturer’s instructions.
- C. Anchor panels securely in place in accordance with installer’s approved shop drawings.
- D. Conform to manufacturer’s instructions for installation of attachment systems.
- E. Surfaces to receive panels shall be even, smooth, sound, clean, dry and free from defects detrimental to panel installation.

- F. Weatherseal all joints as required using methods and materials as specified above.

END OF SECTION

SECTION 07460

SHEET METAL SIDING AND SOFFITS

PART 1 – GENERAL

1.01 REFERENCES

- A. AISI (American Iron and Steel Institute) – Stainless Steel – Uses in Architecture.
- B. ASTM A525 – Steel Sheet, Zinc Coated, (Galvanized) by the Hot-Dip Process.
- C. ASTM B32 – Solder Metal.
- D. ASTM B209 – Aluminum and Alloy Sheet and Plate.
- E. ASTM B370 – Copper sheet and Strip for Building Construction.
- F. ASTM B486 – Paste Solder.
- G. ASTM D226 – Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- H. ASTM D4586 – Asphalt Roof Cement, Asbestos-Free.
- I. CDA (Copper Development Association) – Contemporary Copper, A Handbook of Sheet Copper Fundamentals, Design, Details and Specifications.
- J. CDA – Copper Roofing – A Practical Handbook.
- K. FS O-F-506 – Flux, Soldering, Paste and Liquid.
- L. NRCA (National Roofing Contractors Association) – Roofing Manual.
- M. SMACNA – Architectural Sheet Metal Manual.

1.02 SUBMITTALS

- A. Submit under provisions of Section 01330.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations and installation details.

- C. Samples: Submit two (2) samples, illustrating typical material and finish.

1.03 **QUALIFICATIONS**

- A. Fabricator and Installer: Company specializing in sheet metal flashing and siding work with three (3) years experience.

1.04 **DELIVERY, STORAGE AND HANDLING**

- A. Deliver, store, protect, and handle products to site under provisions of Section 01600.
- B. Stack preformed material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials that may cause discoloration or staining.

1.05 **ALTERNATES**

- A. See Section 01230 for bidding alternates affecting the Work of this Section.

1.06 **COLORS**

- A. Colors are specified in Colors/Materials Schedule.

1.07 **SUSTAINABLE BUILDING REQUIREMENTS**

- A. See Section 01011 for sustainable building requirements affecting the Work of this Section.

PART 2 – PRODUCTS

2.01 **HORIZONTAL METAL SIDING AND EXTERIOR METAL SOFFIT MATERIAL**

- A. Specification standard: AEP Span, HR 36, 24 gauge.
- B. Finish: Duratech 5000 factory paint coating.
- C. Substitutions: Under provisions of Section 01600.

2.02 ACCESSORIES

- A. Fasteners: Stainless steel screws with soft neoprene washers. Stainless steel rivets.
- B. Sealant: Type specified in Section 07900.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Beginning of installation means acceptance of substrate.

3.02 INSTALLATION

- A. General: Comply with siding manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply. Center fasteners in elongated slots without binding siding to allow for thermal movement. Overlap joints to shed water away from direction of prevailing wind.
- B. Install metal siding and accessories according to manufacturer's installation instructions.
- C. Secure panels without warp or deflection.
- D. Isolate dissimilar metals by separating with rubber gaskets or elastomeric sealant. Use rubber washers where fasteners made from dissimilar metal penetrate siding. Isolate dissimilar metals behind siding by covering with polyethylene film.

3.03 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective siding materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to siding manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION

SECTION 07511

BUILT-UP ASPHALT ROOFING/MALARKEY

PART 1 – GENERAL

1.01 REFERENCES

- A. FM – Roof Assembly Classifications.
- B. FS HH-I-529 – Insulation board, Thermal (Mineral Aggregate).
- C. NRCA – Roofing and Waterproofing Manual.
- D. UL – Fire Hazard Classifications.

1.02 THERMAL AND MOISTURE PROTECTION

A. FLASHINGS

- 1. Provide flashing pans under all above grade showers.
- 2. Provide flashings for all openings in exterior walls.
- 3. Provide lead flashings for all roof drains, floor drains, scuppers.
- 4. Provide flashings and sleeves, 2" above floor, for all openings in laboratory and kitchen floors.
- 5. Roof flashings shall be lead coated copper.

B. MEMBRANE WATERPROOFING

- 1. Membrane waterproofing shall be provided under concrete topping or with suitable wearing surface in above grade mechanical rooms and any habitually wet areas.

C. ROOFS

- 1. Designers should provide a complete roof plan of each roof area and provide large-scale details clearly showing relationships between membranes, flashings, counter flashings, expansion joints, perimeter metal work, roof accessories, roof-top equipment, any interruptions of

the membrane, and all penetrations. Do not call for "typical details." If the manufacturer's specifications are used, do not use the term, "or approved equal."

2. The following guidelines should be incorporated into the design and specifications for new or replacement roofs:
 - a. New roofs should be built with a minimum pitch of 1/4 in/ft.
 - b. Replacement roofs should be built with a minimum pitch of 1/8 in/ft.
 - c. Flat built-up roofs should use Durby Bright Systems materials.
 - d. Coal tar pitch and modified coal tar pitch are not to be used on Pacific Lutheran University facilities.
 - e. Drains through decks should have a horizontal leg below the deck.
 - f. Use of a vapor retarder below the roof insulation should be considered where the indoor relative humidity during winter months is expected to exceed 45%. Controlled environments such as art galleries, animal rooms, libraries, some laboratory spaces, and natatoria would fall in such a category.
 - g. Spray foam roofing systems have not been entirely successful on campus. Their use should only be considered after discussing the extenuating circumstances with and to the satisfaction of *Construction Management*.
 - h. Single-ply roofing systems should be chosen with care. Only those materials that have a proven record of success will be specified for the Pacific Lutheran University campus.
 - i. Mechanically fastened systems are the preferred installation of single-ply type.
 - j. Fully adhered systems should be limited to roof heights twenty feet or less and only when mechanical fastening is impractical.
 - k. Inverted protected roofs (such as IRMA) are preferred, especially on roofs subjected to pedestrian traffic.

- l. Protection should be provided to single-ply membranes subject to mechanical damage from dropped tools, equipment, or mechanical equipment covers. Likewise, protection should be provided in areas subject to chemical attack from lubricants or exhaust fan emissions.
- m. Wood blocking is to be pressure treated.
- n. Specifications should call for flood testing where possible.
- o. Gutters, downspouts, and flashings should be sixteen (16) ounce lead coated copper.
- p. Roof designs will comply with the Washington State Energy Conservation Construction Codes. When computing the thermal transmittance, aged "R" values should be used.
- q. The designer should call for a guarantee by the contractor of at least two (2) years. The guarantee shall cover all elements of the project and stipulate that the contractor will be on the job within twenty-four (24) hours to make repairs to reported leaks. Likewise, a roof bond by the roofing, manufacturer shall be provided. In general ten (10) years should be the term of the bond; the designer is asked to consult with Construction Management, however, regarding the exact terms of the bond depending on the roof system selected.

1.03 **QUALITY ASSURANCE**

- A. Installer: A firm with not less than five (5) years of successful experience in installation of roofing systems similar to those required for project, and which is approved by manufacturer of primary roofing materials.
 - 1. Assign work closely associated with roofing, including (but not limited to) insulation, flashing and counter flashing, expansion joints, and joint sealers, to installer of roofing.

1.04 **SUBMITTALS**

- A. Product Data: Submit specifications, installation instructions, and general recommendations from manufacturers of sheet roofing system materials for types of roofing specified. Include data substantiating that material to comply with fire classification of UL Class A minimum.

1. Provide membrane materials, base flashing materials, insulation, vapor retarders, and protective coating.
 2. LEED Documentation:
 - a. Indicate location of manufacture, highlighting materials manufactured within a 500 mile radius.
 - b. Indicate reflectance qualities of roofing materials used, highlighting the Energy Star logo on the cut sheet and the emissivity value indicating that it is at least 0.9.
- B. Shop Drawings: Submit complete shop drawings showing roof configuration and sheet layout, details at perimeter, transitions to existing roofing and special conditions.
1. Indicate layout of tapered insulation cricket materials.
 2. Indicate layout of all mechanical fasteners.
 3. Submit manufacturer's standard details, modified standard details or special details as required by specified job conditions. Submit letter (prior to roofing installation) from manufacturer stating that all materials and details submitted by the installer meet the manufacturer's requirements to be warranted by the manufacturer for ten (10) years.
- C. Samples: Submit two (2) samples of all roofing materials and accessories. Roofing samples to be enclosed in plastic sheeting. 8 ½" x 11" format.
- D. Pre-Roofing Conference: submit pre-roofing conference records.
- E. UL Listing: Provide labeled materials that have been tested and listed by UL for application indicated with the following rating for roof slopes shown:
1. Class A rated materials/system at built-up asphalt bituminous roofing.
- F. Receipts of extra stock and maintenance items supplied to Owner with Owner representative's signature.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section 01600.
- B. Under provisions of Section 01600, store materials in weather protected environment clear of ground and moisture. Protect membrane material from direct sunlight exposure.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Weather: Proceed with roofing work when existing and forecasted weather conditions permit work to be performed in accordance with manufacturer's recommendations and warranty requirements. Provide temporary roof protection as required due to weather conditions during reroofing to provide weather-tight seal.

1.07 PRE-INSTALLATION CONFERENCE

- A. Pre-Installation Conference: Prior to installation of roofing and associated work, meet at project site with installer, roofing manufacturer, installers of related work, and other entities concerned with roofing performance, including (where applicable) test agencies, governing authorities, Architect and Owner. Record discussions and agreements and furnish copy to each participant. Provide at least 72 hours advance notice to participants prior to convening pre-installation conference.
- B. Review conditions of installation, installation procedure, and coordination required with related work.

1.08 WARRANTY

- A. Provide ten (10) year manufacturer's warranty under provisions of Section 01770. Warranty period to extend from date of final acceptance by Owner.
- B. Warranty: Include coverage of material and installation.

1.09 ALTERNATES

- A. See Section 01230 for bidding alternates affecting the Work of this Section.

1.10 COLORS

- A. Colors are specified in Section 01060.

1.11 SUSTAINABLE BUILDING REQUIREMENTS

- A. See Section 01011 for sustainable building requirements affecting the Work of this Section.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS/SYSTEM – BUILT-UP ASPHALT BITUMINOUS ROOFING

- A. Metal Deck with Insulation and Tapered Perlite Crickets:
 - 1. Specification Standard: Three-Ply Modified 624 RCap SBS (Base, Ply, Cap) “R3 BBN” as manufactured by Malarkey Roofing Products.

2.02 ROOFING MATERIALS

- A. All materials used in, or in conjunction with, the roofing system shall be manufactured by, or approved by one manufacturer.
- B. Provide all materials required for installation of approved system as listed by manufacturer in most current issue of manufacturer’s product reference and applications guide.
 - 1. Base Ply: As defined in the manufacturer’s above described systems.
 - 2. Roofing Felts: As defined in the manufacturer’s above described systems.
 - a. Fiberglass Felt: Fibrous glass mat laid in jackstraw pattern, reinforced with glass yarns, bonded with resinous binder and coated with weathering grade asphalt. Conform to ASTM D2178 Type IV.
 - 3. Cap Sheet: As defined in the manufacturers’ above described systems.
 - 4. Asphalt Bitumen: To comply with ASTM D312. Type as recommended by roofing manufacturer to roof slope and weather conditions.
 - 5. Nails and Mechanical Fasteners: Type as recommended by roofing manufacturer for specific application.

6. Roof Flashings: Type as recommended by roofing manufacturer to meet manufacturer's requirements for a ten (10) year warranty of roofing assembly. Manufacturer's standard details, modified standard details, or special details shall be utilized. Submit to Architect for review.

2.03 RIGID INSULATION

- A. Rigid Insulation: Polyisocyanurate Board Insulation, ASTM C1289, Type II, felt or glass-fiber mat facer on both sides, for mechanically fastened application in a Class A assembly.
- B. Fasteners: Type as recommended by roofing manufacturer for specific application.

2.04 SUBSTRATE BOARDS

- A. Substrate Board: ASTM C 1177/C 1177M, water resistant gypsum substrate ¼" – "Dens-Deck" by Georgia Pacific Corporation. Adhere with asphaltic adhesive.

2.05 CANTS

- A. Fiber Cant and Tapered Edge Strips: Perlite or wood fiberboards, approved by roofing manufacturer, preformed to 45° angle.

2.06 TAPERED INSULATION CRICKETS

- A. Tapered Insulation System: Factory tapered rigid mineral aggregate insulation board with a minimum slope of ¼ inch/ft to create positive drainage unless otherwise noted; approved for use with roofing by roofing manufacturer and by UL. Compression resistance: 35 psi, water absorption 1.2%; ASTM C209; weight: 0.9 lbs/sq. ft.
 1. Provide tapered cricket insulation to create positive drainage slope.
 2. Provide roofing membrane manufacturer's written approval of system layout and fastening.

2.07 VAPOR RETARDER

- A. Glass-Fiber Felts: ASTM D 2178, Type IV, asphalt-impregnated.

2.08 ACCESSORIES

- A. Sealants: As recommended by membrane manufacturer.

- B. Adhesives: As recommended by membrane manufacturer.
- C. Insulation Joint Tape: Manufacturer's standard glass fiber reinforced; 4 to 6 inch wide; self-adhering.
- D. Mechanical Fasteners for Tapered Insulation Crickets: Appropriate to purpose intended and approved by UL; length required for thickness of material; with metal washers; approved by roofing manufacturer.
- E. Cementitious Backing Board: ANSI A118.9 high density, glass fiber reinforced, ½ inch thick; 2 inch wide, coated glass fiber tape for joints and corners. Custom Building Products "Wonderboard" or approved.
- F. Miscellaneous: Provide all incidental materials, tools, equipment, and methods required for watertight installation of built-up roofing. Requirements include, but are not limited to, the following:
 - 1. Plastic Cement: Flashing cement made or recommended by the manufacturer of the forgone materials for the conditions of the application.
 - 2. Cant Strips: Manufacturer's standard composition type or as otherwise approved.
- G. All roof accessories to be installed per roofing manufacturers approved details.

2.09 **WOOD TREATMENT**

- A. Pressure Preservative Treatment: Where lumber is indicated as "Treated", or is specified herein to be treated, treat per AWPA LP-22. Kiln dry after treatment to a moisture content averaging 15%. Treat indicated items and the following:
 - 1. Wood cants, sleepers, nailers, curbs, blocking, stripping and similar members in connection with roofing, flashing, vapor barriers and waterproofing.

PART 3 – EXECUTION

3.01 INSPECTION

- A. Verify installation conditions as satisfactory to receive Work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory.
- B. Roofing Manufacturer's Technical Advisor shall field inspect and approve prepared roof surface prior to roofing application.
- C. Contractor shall verify that insulation and other systems have been installed complying with roofing manufacturer's recommended practices.
- D. Verify deck is clean and smooth, free of depressions, waves or projections, properly sloped to drains.
- E. Conduct moisture survey of areas to be re-roofed. Remove damp or wet substrate or roofing materials.
- F. Verify roof openings and penetrating elements through roof are solidly set, wood cant strips, curbs, wood nailing strips, and reglets are in place.
- G. Do not apply roofing materials to damp, frozen, dirty, dusty, or deck surfaces unacceptable to manufacturer.
- H. Verify deck surfaces are dry and free of snow or ice.
- I. Ensure flatness and verify tight joints of deck.
- J. Beginning installation means acceptance of substrate.

3.02 ON-SITE PREINSTALLATION MEETING

- A. Schedule Meeting: Notify Owner, roofing manufacturer's representative, and Architect of date and time.

3.03 NOTICE OF INTENTION TO START WORK

- A. Notify Architect at least two (2) working days before starting work.

3.04 PREPARATION

- A. Remove all loose materials by manual brooming or by vacuum. The surface to be roofed shall be clean, flat, smooth, dry and free of nails, gravel, slag, sharp objects, or any debris that may affect bond of asphalt to deck surface.
- B. Install flashing reglets and mechanically fasten rigid insulation. Apply sealant to top edge continuous.

3.05 RIGID AND TAPERED INSULATION APPLICATION

- A. Verify that surface to receive insulation is clean and dry.
- B. Place insulation in accordance with insulation manufacturer's current instructions. If multiple layers of insulation, then lay second layer of insulation perpendicular to the first with joints staggered evenly from first layer.
- C. Tapered Insulation Thickness: Varies.
- D. Lay tapered insulation boards to moderate contact without forcing joints. Cut insulation to fit neatly to perimeter blocking and around protrusions through roof.
- E. Lay tapered boards back from roof drains or positive drainage.
- F. Lay tapered boards to establish pitch to drains. Provide positive slope (minimum $\frac{1}{4}$ inch/ft from horizontal).
- G. Fasten insulation boards over roof surface. Boards must be fastened sufficiently to conform to the substrate surface geometry. Fasten insulation boards over roof surface to conform to UL Class rating. Mechanically fasten multiple layers of insulation to roof deck as recommended by roofing manufacturers to conform to UL Class rating and local code requirements.
- H. Do not use damaged or wet insulation boards. Apply no more insulation than can be covered by roof membrane and made watertight before any precipitation occurs.
- I. Install insulation boards to maintain an even top surface of insulation. Manufacturing tolerance^{4s} of insulation boards allows some minor deviation in thickness. Layout boards to place boards of similar deviation adjacent to one another. Low spots, created by varying board thicknesses, are not acceptable.

- K. Tape joints of insulation in accordance with insulation manufacturer's instructions.
- L. Install cant strips to internal corners by mechanical fasteners.
- M. Install wood; fire and preservative treated places; curbs at penetrations; fasten as per manufacturer's recommendations.

3.06 **MEMBRANE INSTALLATION**

- A. Install roofing in accordance with roofing manufacturer's current installation instructions. Begin application at the lowest elevation and continue to the highest elevation of each individual roof, with the seam overlapped in the direction of the roof slope.
- B. Roll out roofing. Minimize wrinkles. Broom out each layer of roofing felt following installation with a 36 inch wide broom to remove all bubbles and/or wrinkles. Minimize walking on roofing felts between installation of felts.
- C. Install flashings. Seal watertight to membrane.
- D. Install mineral surfaced modified bitumen cap sheet. Broom to ensure complete adhesion.
- E. Do not expose materials vulnerable to water or sun damage in quantities or greater than can be weatherproofed during same day.
- F. Install additional ply of roofing felt around roof drains and at edge of crickets.

3.07 **PROTECTION**

- A. Protect finished installation under provisions of Section 01500.
- B. After installation, close off area to prevent unauthorized traffic.

3.08 FIELD QUALITY CONTROL

- A. Inspection will be performed by firm appointed in accordance with Section 01450 for compliance to the Work of this Section.
- B. Manufacturer's technical representative shall provide final inspection report to Architect. This inspection will verify acceptance of installation by manufacturer for issuance of manufacturer's warranty. If any deficiencies are found to effect final acceptance by manufacturer, then the Contractor shall make any repairs, changes required for final acceptance by manufacturer at his own expense with no cost to Owner.

3.09 CLEANING

- A. Remove trash, debris, equipment and parts from job site.
- B. Repair damage and remove stains caused by Work of this Section.

3.10 MAINTENANCE/EXTRA STOCK

- A. Instruct Owner's representative in periodic maintenance of roofing. Provide maintenance manuals, warranties, and information required for future maintenance.
- B. Maintenance Equipment: Provide complete set of materials to Owner for maintenance of roofing. Include all adhesives and miscellaneous items required to repair minor leaks. Obtain receipt from Owner upon delivery and submit to Architect.

END OF SECTION

SECTION 07512

ROOFS

PART 1 – GENERAL

1.01 ROOFS

- A. The designer should provide a complete roof plan of each roof area and provide large-scale details clearly indicating relationships between membranes, flashings, counter flashings, expansion joints, all metal work, roof accessories, roof-top equipment, any interruptions of the membranes or flashings, and all penetrations and use of sealants. Call out specific manufacturer's standard details by number, when designing around that manufacturer's system.
- B. The designer should specify the generic roofing material and application system (i.e. solid mopped, ballast, adhered or mechanically fastened), best meeting that specific building's requirements. An experienced and financially responsible manufacturer of that generic roofing system should be chosen as the basis of specifications/details. All detailing and specification items should conform to the requirements of that commercial system, except that the designer may exceed the manufacturer's requirements when in the Owner's best interests.
- C. The following statement, under "Products" may be used as a guide: "These specifications are based on the published specifications for two-ply modified bitumen roofing (MBR) by Manville Roofing Systems Division. Products of the following other manufacturers using the asphalt-adhered modified bitumen roofing system will be acceptable, provided the specifications and detailing proposed for use, equal or exceed the quality specified:
 - 1. GAF Building Materials Corporation
 - 2. Soprema Roofing & Waterproofing, Inc.
- D. The designer must decide whether any alternates are appropriate or in the Owner's best interests. Alternate/s must meet the base bid specifications, and be listed by manufacturer and material and application method. Do not use the term, "or approved equal."

- E. The following guidelines should be incorporated into the design and specifications for new or replacement roofs:
1. All new roof structures should be designed with a minimum slope of 1/4 in/ft.
 2. Replacement roof systems should result in minimum finished roof slopes of 1/8 in/ft.
 3. Coal tar pitch and modified coal tar products may not be used on Pacific Lutheran University facilities.
 4. Drains through decks should have an insulated horizontal leg below the deck.
 5. Use of a vapor retarder below the roof insulation should be considered where the indoor relative humidity during winter months is expected to exceed 45%. Controlled environments such as art galleries, animal rooms, libraries, some laboratory spaces, and natatoriums would meet these criteria.
 6. Use of an air barrier is highly recommended over non-monolithic decks such as concrete/wood plank, steel, etc. A properly installed air barrier prevents excessive wind uplift forces acting on the roofing system, and is required with some roofing systems on certain height buildings.
 7. Spray-applied polyurethane foam roofing systems (PUF) may only be considered after discussing the extenuating circumstances with and gaining full approval from Construction Management.
 8. Special care must be taken when investigating each building's specific roofing needs. Generic roofing type and installation method must be selected to meet those specific, identified needs.
 9. Designer is responsible for conducting structural analysis on all building areas to receive roofing. Roofing systems must be selected to ensure the structural integrity of each roof support system, including all snow and other code requirements.
 10. Concrete pavers and splash blocks used on roofs must be specifically made for rooftop use, and of high-density concrete.

11. All rooftop traffic patterns must be identified and the roofing system protected from abuse with the roofing system manufacturer's required walkway materials and installation methods.
12. Areas where the roof could be damaged by chemical attack should be protected as recommended by each roofing system manufacturer.
13. Where flood testing of completed roofing systems is appropriate, the Owner's designated representative must be notified in advance for coordination.
14. All newly added wood blocking must be pressure treated. Specify the type of treatment compatible with each generic roofing material.
15. In roof replacement, all existing wood blocking and other edge securement materials must be checked for anchorage. These must receive additional fastening/modification where required, to provide adequate anchorage, as demanded by the roof system's manufacturer.
16. All aesthetically sensitive roofing systems and their appurtenant accessories should be designed to complement the building's design, architectural and historical significance. Special precautions and approvals are required on National Registry buildings.
17. Gutters, down spouts, and all other exposed metal work should be specified for durability and resistance to corrosion, as well as to match existing building metal work. Sixteen/twenty-ounce copper, lead-coated copper, and Kynar-coated 24 gauge galvanized steel 316 stainless steel are recommended, depending on each building's specific requirements.
18. Roof designs must comply with the applicable codes and with all other applicable Pacific Lutheran University, federal, state, and local codes and ordinances. Thermal calculations must include the use of aged "R values."
19. The designer should demand a contractor warranty of at least two (2) years. The warranty shall cover all materials (insulation, roof membrane, flashings, sheet metal, sealants, and any other roof components used), and workmanship to maintain the roofing system and flashings watertight and weathertight, effective from the date of substantial completion. Contractor must be on site within twenty-four (24) hours to make necessary leakage repairs.

20. Likewise, the roofing system manufacturer must provide a 15-year minimum roofing system watertight warranty. A separate, extended membrane weathering warranty (normally for 20 years) should be required, where available.

END OF SECTION

SECTION 07513

APP-MODIFIED BITUMEN ROOFING/DERBIGUM

(Alternate Bid)

PART 1 – GENERAL

1.01 SECTION INCLUDES:

- A. Supply and installation of Modified Bituminous Roofing.

1.02 SYSTEM DESCRIPTION

- A. White Energy star Modified Bitumen Membrane: Provide a multiple ply modified bitumen roof membrane system, complying with the physical properties as specified in Part Two of these specifications.
 - 1. System Specification: Derbigum Specification #111B-SU.

1.03 SUBMITTALS

- A. Manufacturer's product data for all materials.
- B. Manufacturer's printed installation instructions.
- C. Manufacturer's manual for roof maintenance and repairs.
- D. Material Manufacturer's approved applicator certificate/letter.

1.04 QUALITY ASSURANCE

- A. Comply with International Building Code, 2003 edition, with Seattle amendments.
- B. Comply with Underwriter's Laboratory, Inc. (UL): Class A Fire Hazard Classification.
- C. Pre-Installation Conference: General Contractor shall schedule a Pre-Installation conference 48 hours prior to commencing roofing work. Following parties are required to attend. Roofing Contractor's Foreman, General Contractor's Superintendent, Roofing Manufacturer Representative along with the Air Conditioning, Planter and Decking subcontractors to discuss and define each party's responsibilities.

- D. Mechanical and Electrical Contractors shall coordinate their work with the Roofing Contractor. Flashing, counterflashing and through-roof penetration flashing shall be performed by Roofing Contractor in accordance with Roofing Manufacture's recommendations.

1.05 **STORAGE AND HANDLING**

- A. Deliver materials to job-site in unopened packages with legible labels.
- B. Store materials in weather protected environment, clear of ground and moisture, in accordance with roofing manufacturer's instructions.

1.06 **ENVIRONMENTAL REQUIREMENTS**

- A. Do not apply roofing membrane during inclement weather.
- B. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during the same day.

1.07 **WARRANTY**

- A. Contractor shall provide a two (2) year warranty, for labor and materials necessary to maintain roof and flashing in a watertight condition for warranty period.
- B. Manufacturer shall provide a fifteen (15) year NDL guarantee covering all materials and workmanship.

1.08 **SUSTAINABLE BUILDING REQUIREMENTS**

See Section 01011 for sustainable building requirements affecting the Work of this Section.

PART 2 – PRODUCTS

- A. Base Ply: Derbibase, fiberglass reinforced, APP modified bitumen membrane.
- B. Top Ply: DerbiBrite ASTM D 6223-02, APP Modified Membrane with a White Energy Star surfacing.

2.01 **MANUFACTURERS**

- A. Roofing materials shall be as manufactured by the following: Performance Roof Systems, Inc.

2.02 ROOF INSULATION

- A. Polyisocyanurate Roof Insulation – Flat and Tapered Derbi-board as shown on the drawings.
- B. Cover Board Insulation – 3/8 inch Securock.

2.03 FASTENERS

- A. Mechanically fasten base layers Roof Insulation with Perlok Screws and Plates length as required to penetrate the Steel Deck a minimum of 3/4 inches.
- B. Install Ribbons of Oly-Bond 500 low rise foam adhesive for adhering tapered rigid insulation.

2.04 MEMBRANE MATERIALS

- A. Base Sheet: Derbi-base 80 mil APP Modified Bitumen Sheet ASTM D 6223 Type I.
- B. Roof Membrane: Derbi-brite 140 mil APP Modified Bitumen Sheet ASTM D 6223.
- C. Membrane Adhesive: Permastic Cold Application Adhesive with a maximum VOC Content of 184 grams/liter.

2.05 BITUMINOUS MATERIALS

- A. Cold Adhesive: Cold application adhesive maximum solvent content 15%, minimum solid content 82%, Maximum VOC content 84 grams/liter.
- B. Mastic Sealant: Cold Application Trowel Grade Adhesive Maximum solvent content 7%, non-hardening, nonskinning, nondrying.
- C. Liquid Flashing: Derbi-flash as provided by Performance Roof Systems, Inc.
- D. Caulking Sealant: All sealant shall comply with F.S. TTS 0023c. and should consist of a single component, high performance, elastomeric compound as manufactured by one of the following or equal.
 - 1. Sonolastic NP 1 by Sonneborn Building Products, Minneapolis, MN

2.06 FASTENERS

- A. Flashing nails shall be minimum 1” threaded ring shank nail or case hardened nails, with tin or integral caps for masonry walls.

2.07 **CANT STRIPS**

- A. Cant and Tapered Edge Strips: Non-flammable Perlite Insulation or salt preserved wood cant cut to 45 degree angle, meeting ASTM D728 and F.S. LL-I-535.

2.08 **PROTECTION PADS**

- A. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to the following:
 - 1. Derbicolor GP 180 mil thick

2.09 **ACCESSORIES**

- A. Cementitious Backing Board: ANSI A118.9 high density, glass fiber reinforced, ½ inch thick; 2 inches wide, coated glass fiber tape for joints and corners. Custom Building Products “Wonderboard” or approved.

PART 3 – EXECUTION

3.01 **EXAMINATION**

- A. Verify that all penetrations have been completed and that Roof Drains and scuppers have been installed and are at the proper height and location.

3.02 **PROTECTION**

- A. Protect building surfaces against damage from roofing work.
- B. Where traffic must continue over finished roof installation, protect membrane with an additional layer of membrane adhered to surface with Permastic Cold Adhesive.
- C. Traffic shall be limited to trades working on roof areas after surfaced roof membrane has been installed.

3.03 **GENERAL APPLICATION REQUIREMENTS**

- A. Cant Strips: Non-flammable Perlite or Fiberglass 4 inch by 4 inch.

- B. Drain and Vent Leads: Roof drain lead flashing and vent pipe lead flashing shall be minimum 4 lb. lead flashing.

3.04 **QUALITY ASSURANCE**

- A. Applicator – Roof Manufacturer Licensed Applicator:
 - 1. Applicators Office: Within 60 miles of Project.
 - 2. Applicators Experience: Continuously applied modified Bitumen system in the State of Washington for a minimum of five (5) years and currently approved by Roof System Manufacturer to install a guaranteed roof.
- B. Installers – Roofing Contractors Personnel:
 - 1. Completely familiar with the specified requirements and respective Architectural Details along with the methods needed for proper performance of the Work in this Section. (Copy of specification must be on site and accessible at all times.)
 - 2. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts.
- C. Quality Control:
 - 1. At the Owner's option and expense, a Quality Control Representative may be employed. Coordinated all work through the quality control representative.

3.05 **INSULATION**

- A. Install Base layer of Derbiboard Polyisocyanurate Roof Insulation over entire deck. Mechanically attach Derbiboard using 1 Perlok fastener per every two (2) square feet of insulation. Stagger joints of insulation and offset side laps a minimum of 18" from the top layer to the bottom layer. Install insulation with boards set perpendicular to slope of deck and with ends of boards staggered from the adjacent row.
- B. Install tapered Derbiboard Polyisocyanurate Rigid Insulation where shown on drawings. Adhere Insulation in Ribbons of Oly-Bond 500 low rise foam adhesive in accordance with manufacturers' instructions.

3.06 **APPLICATION MODIFIED BITUMINOUS SHEET ROOFING SYSTEM**

A. **BASE PLY**

1. Install Base Sheet by shingling from low point of roof apply one 18 inch wide piece of Derbibase in a uniform layer of Permastic cold adhesive, then over that apply one full 39 inch ply of Derbibase set in Permastic.
2. Apply Interply free of air pockets, wrinkles, fish-mouths or tears. Extend Base Sheet up cant strips and seal top edge prior to application of flashing sheet.

B. **ROOF MEMBRANE INSTALLATION**

1. Install Derbibrite membrane starting at the low point on the roof to the high point. Set in Permastic cold adhesive to interply then heat weld side and end laps and roll laps with a 20 lb. Steel roller in accordance with manufacturers' instructions.

C. **FLASHINGS AND ACCESSORIES**

1. Apply Derbibrite flashing as recommended by the Performance Roof Systems flashings shall be installed per details P-1 through P-20.

3.07 **MANUFACTURERS GUARANTEE**

- A. Provide manufacturers fifteen (15) year non-prorated, Roofing Guarantee including flashing endorsement, covering both material and workmanship. Guarantee shall be an NDL guarantee with a no dollar limit penal sum.

3.08 **MANUFACTURER'S FIELD SERVICES**

- A. Provide manufacturer's inspection of completed roofing and related flashing.

END OF SECTION

SECTION 07515

ASPHALT SHINGLES

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Roofing System Bid Option 1A – Asphalt shingle roofing and underlayment
- B. Roofing System Bid Option 1B – Asphalt shingle roofing and underlayment

1.02 REFERENCES

- A. All references shall be the latest adopted edition.
- B. ASTM D3018 – Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules
- C. ASTM D3161 – Standard Test Method for Wind-Resistance of Asphalt Shingles
- D. ASTM D3909 – Standard Specification for Asphalt Roll Roofing (Glass Felt) Surfaced With Mineral Granules
- E. ASTM D4586 – Standard Specification for Asphalt Roof Cement, Asbestos-Free
- F. ASTM D4601 – Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing
- G. ASTM E108 – Standard Test Methods for Fire Tests of Roof Coverings
- H. IBC – International Building Code
- I. NRCA – The NRCA Steep Roofing Manual; National Roofing Contractors Association
- J. SMACNA (ASMM) – Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association, Inc.

1.03 SUBMITTALS

- A. Product Data: Provide manufacturer's product data indicating material characteristics.

- B. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern; for color selection.

1.04 **QUALITY ASSURANCE**

- A. Perform Work in accordance with the recommendations of NRCA Steep Roofing Manual and shingle manufacturer's instructions.

1.05 **ENVIRONMENTAL REQUIREMENTS**

- A. Do not install shingles when surface, or ambient air temperatures are below 45 degrees F.

1.06 **EXTRA MATERIALS**

- A. Provide 4 bundles of extra shingles of each color selected.

1.07 **GUARANTEE/WARRANTY**

- A. Contractor Guarantee: Asphalt shingle work is subject to a three year guarantee by the Contractor (separate from any product warranty by shingle manufacturer). Upon notification by the Owner, the Contractor agrees to return to the site to investigate and correct any leaks, defects or failures connected with the work of this Section at no cost to the Owner within a three year period.
- B. Manufacturer's Warranty: Asphalt shingle manufacturer's standard 50 year warranty; including 20 year algae block warranty and 110 miles per hour wind warranty.

PART 2 – PRODUCTS

2.01 **ASPHALT COMPOSITION SHINGLES**

- A. Asphalt Composition Shingles: SBS modified laminated shingles, SBS rubber modified asphalt coating on a composite polyester/glass fiber mat, mineral surfaced with 3-M Algae Block Copper Roofing Granule System, self sealing, conform to the following:
 1. Manufacturer/Product: Malarkey *Legacy*
 2. Approximate Weight: 275 lbs. per square
 3. Dimensions: 13 ¼" x 40" (±1/8")

4. Exposure: 5 5/8"
 5. Granule Adhesion: 0.5 gram loss
 6. Fire Rating: Class A
 7. Manufacturer's Warranty: 50 year shingle warranty including:
 - a. 20-year algae block warranty
 - b. 110 mph wind warranty
 8. Standards: Meet/exceed the following:
 - a. UL 2218 Class 4 Impact Resistance
 - b. ASTM D 3462
 - c. ASTM D 3018 Type I
 - d. ASTM D 3161 Type I
 - e. ASTM E 108 Class A
 9. Color: To be selected by Owner from full range of Manufacturer's colors.
- B. Hip & Ridge Shingles: Provide hip and ridge shingles matching composition and color of asphalt composition shingle.

2.02 SHEET MATERIALS

- A. Underlayment: Waterproof shingle underlayment, SBS modified asphalt saturated fiberglass mat conforming to ASTM D4601 97a, Type I, Malarkey *Right Start UDL-Underlayment* or approved.
1. Nails: Use only plastic cap roofing nails to attach underlayment, staples shall not be used.
- B. Mineral Surfaced Roll Roofing: SBS Asphalt- coated glass felt, mineral granule surfaced, complying with ASTM D3909, Malarkey #350 *Premium SBS Fiberglassor* approved.

- C. Ice & Water Membrane: Fiberglass mat impregnated and heavily coated with an SBS modified asphalt, 60 mils thick, self-adhering back with release paper, Malarkey #170 *Arctic Seal Eave & Valley Guard* or approved.

2.03 **ACCESSORIES**

- A. Roofing Nails: Hot-dipped galvanized, 3/8" diameter head, 11 to 12 gauge, length as required to fully penetrate roof sheathing, barbed shank roofing nail manufactured in America or Canada, approved by shingle manufacturer.
- B. Hand Sealing Mastic: Henry #209 *Elastomastic* in 11 ounce cartridges.
- C. Lap Cement: Fibrated cutback asphalt type, recommended for use in application of underlayment, free of toxic solvents, approved by shingle manufacturer.
- D. Ridge Vent: 11 inch wide corrugated plastic ridge vent, *Model X-5 Ridge Vent* manufactured by Cor-A-Vent, Inc.
- E. Butyl Sealant: Single component, TT-S-001657, Type I, Tremco *Butyl Sealant* or equivalent.

2.04 **METAL FLASHINGS**

- A. Sheet Metal Flashings: Specified in Section 07620.

END OF SECTION

SECTION 07517

PREFORMED ROOF PANELS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Roofing System Bid Options 2A & 2B – Structural Engineering For Code Conformance.
- B. Roofing System Bid Option 2A – Metal Roofing System and Related Flashings/Trim and Underlayment/ Air Barrier.
- C. Roofing System Bid Option 2B – Metal Roofing System And Related Flashings/Trim, Contractor Designed Substructure, Rigid Foam Roof Insulation Under Metal Roofing and Underlayment/ Air Barrier.

1.02 PERFORMANCE REQUIREMENTS

- A. Metal Roofing System Performance Requirements:
 - 1. Environmental Requirements:
 - a. Provide for expansion and contraction of system components due to changes in ambient temperature and solar heat gain. Accommodate movement due to temperature change without buckling, undue stress on structural elements, reduction of performance, or other damaging effects.
 - 1) Anticipated ambient temperature range: Minus 5 degrees to plus 160 degrees F.
 - 2. Structural Design: Provide structural engineering design for the preformed metal panel systems and the substructure and their connection to the building structure.
 - a. Engage the services of a qualified professional Structural Engineer, experienced in design of metal wall panel and roofing systems and currently registered in the State of Washington, to provide the structural engineering design.
 - b. Design in conformance with the following:

- 1) Dead & Live Loads: Conform to Code requirements.
 - 2) Design Wind Speed: 85 mph.
 - 3) International Building Code and State of Washington Building Code WAC 51-50.
 - 4) IBC Chapter 16 – Section 1609 and tested in accordance with UL 580 and ASTM E1592.
 - 5) Include the design of substructure support framing system, clips and fasteners required to connect panels to building roof and wall structure and provide support/connection as recommended by the metal panel manufacturer.
3. Include design calculations for drag load resistance on roofing panels.
 4. Work Of Other Trades: Review and coordinate work of other trades that interface with or pass through the metal panel systems.
 - a. Make whatever provisions are necessary to the design, layout and fabrication of the metal panel systems to accommodate work by others.
 5. Metal Roofing System Requirements:
 - a. Air Infiltration: 0.022 cfm per lineal foot when tested in accordance with ASTM E1680 at static test pressure differential of 12 psf.
 - c. Water Penetration: No leakage when tested in accordance with ASTM E1646 at static test pressure differential of 15 psf.
 - d. Underwriters Laboratories UL 90 rated.
 - e. Fire Classification: Class B in conformance with IBC Section 1505.
- B. Air Barrier Performance Requirements:
1. Provide an air barrier over the re-roof areas and installed to prevent air leakage/transfer between the interior and exterior environments beyond the leakage rate specified herein.

2. The installed Air Barrier shall conform to the following requirements:
 - a. Continuous System: The air barrier must be continuous, with all joints and penetrations sealed airtight.
 - b. Air Permeability: The air barrier shall have an air permeability not to exceed 0.004 cubic feet per minute per square foot under a pressure differential of 0.3" w.g. (1.57 psf or 75 Pa) when tested in accordance with ASTM E2178.
 - c. Vapor Permeable: The air barrier shall be vapor permeable with a water vapor transmission rate of not less than 50 perms when tested in accordance with ASTM E96 Method B.
 - d. Structural Integrity: The System shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the building exterior envelope without damage or displacement, and shall transfer this load to the structure.
 - 1) The System shall not displace adjacent materials under full load.
3. Provide materials and installation methods to bridge across and provide an airtight and watertight connection/seal conforming to the Performance Requirements specified above at the following locations:
 - a. Between roof air barrier and future wall air barrier(s).
 - b. Between the roof air barrier and any penetrations (such as piping, conduit, electrical boxes, ducts, structural members and similar).
 - c. Penetrations of air barrier at screws, bolts and similar conditions.
4. The installed air barrier shall have an air leakage rate not exceeding 0.2 cfm per square foot of roof area when tested in accordance with ASTM E779.

C. Roof Insulation Thermal R-Value:

1. Provide roof insulation with thermal R-value conforming to the State of Washington Energy Code. Provide energy calculations for the existing building conforming to the Energy Code requirements; provide any other information required by the Building Official.

1.03 REFERENCES

- A. All references shall be latest adopted edition.
- B. ASTM A792 – Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process, General Requirements.
- C. ASTM C518 – Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- D. ASTM D226 – Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- E. ATSM D2244 – Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
- F. ASTM D4214 – Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.
- G. ASTM E1592 – Standard Test Method for Structural Performance of Sheet Metal Roof and Sliding Systems by Uniform Static Air Pressure Difference.
- H. ASTM E1646 – Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
- I. ASTM E1680 – Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.
- J. Roofing Materials and Systems Directory; Underwriters Laboratories Inc. (UL)
- K. UL 580 – Tests for Uplift Resistance of Roof Assemblies; Underwriters Laboratories Inc.
- L. IBC – International Building Code
- M. State of Washington Energy Code

1.04 SUBMITTALS

- A. Product Data: Manufacturer's written technical information, including performance data, details, and installation recommendations, which demonstrate that metal panel assembly components comply with contract documents; include product data for accessories.

- B. Shop Drawings – Preformed Metal Panels: Submit shop drawings approved by metal panel manufacturer that comply with Drawings and Specifications and manufacturer's design details.
 - 1. Show plan view and arrangement of panels.
 - 2. Detail all perimeter and joint flashings.
 - 3. Show spacing/layout of fastener clips.
 - 4. Detail ridge cap, rake edge, eave edge, valley, roof/wall transition, roof slope change, fastener clips, interfaces with roof mounted accessories, etc.
 - 5. Describe all proposed details that deviate from what is shown on the drawings.
 - 6. Shop drawings shall be reviewed and approved in writing by metal panel manufacturer's technical department prior to submission to architect.

- C. Shop Drawings – Substructure For Metal Wall Panel System: Submit shop drawings of substructure system prepared under the supervision of Professional Engineer.
 - 1. Include an elevation of each exterior wall showing layout and spacing of substructure.
 - 2. Detail each different mounting condition.
 - 3. Show each different connection to building structure.
 - 4. Show connection between metal wall panels and substructure.

- D. Structural Calculations – Substructure And Preformed Metal Panels: Provide stamped and signed structural calculations prepared for this project by structural engineer currently licensed in the State of Washington, calculations shall address all applicable loads identified in the IBC.

- E. Test Data And Approvals: Provide copies of applicable test data and approvals confirming compliance with requirements of this Section.
- F. Samples for Verification of Coated Finishes: Submit two 4" x 6" samples cut from actual coated metal material for each finish type, texture, and color.
- G. Installer Approval: Submit letter of installer approval from metal panel system manufacturer.

1.05 **QUALITY ASSURANCE**

- A. Metal panels shall be factory roll formed, site formed panels are not acceptable.
- B. Metal Panel Systems – Approvals & Testing:
 - 1. Tested in accordance with UL 580 and ASTM E1592.
- C. Manufacturer Qualifications: A company with a minimum of 10 years successful experience in the design, fabrication, and installation of metal panel systems comparable in size and nature to those required for this project.
- D. Installer Qualifications: installer shall have a minimum of 5 years successful experience under the current business name in the installation of metal panel systems comparable in size and nature to those required for this project (upon request provide listing of all projects completed within the last 3 years along with names and phone numbers of owners and general contractors).
 - 1. Installer shall be approved by the Metal Panel Manufacturer.
- E. Field Measurements: Measure in-place construction on which metal roofing system will be installed if possible, before fabrication of panels. If not feasible, fabricate material to allow in-field trimming of panels to assure proper fit.
- F.
 - 1. Coordinate field measurements and shop drawings with shop fabrication to minimize field adjustments, splicing, and mechanical joints.

1.06 DESIGN RESPONSIBILITY

- A. Metal Roofing System Design Responsibility: The metal roofing manufacturer is responsible for providing the technical design of a total metal roofing system, with all associated materials, flashings, connections, details, etc. required to achieve a metal roofing installation that remains leak free for at least the duration of the warranty. Technical design by manufacturer shall be based upon and accommodate the configuration, layout and design elements of the metal roofing shown on the Contract Drawings.
1. The shop drawings approved by the metal roofing manufacturer are the Roofing System technical design drawings for use in construction. Roofing contractors bidding this roofing work shall base their bid on the requirements of the manufacturer's specific roofing system and details as it will appear on the shop drawings.
 - a. Coordinate the fabrication and installation of sheet metal flashings and components which form a part of the roofing system with Section 07620 so that the completed roofing and flashing system is leak-free and conform to the design requirements of the metal roofing manufacturer.
 2. Metal Roofing Manufacturer shall provide and/or approve all materials used in the application of the metal roofing system.
 3. Metal Roofing Manufacturer shall approve installation methods used in the application of the metal roofing system.
 4. Metal Roofing Manufacturer shall provide clear instruction to the installer on:
 - a. Environmental requirements for storage and installation.
 - b. Approved installation requirements of the metal roof materials.
 - c. Installation sequence.
 - d. Proper assembly of the materials into a metal roofing system designed to provide a watertight roofing assembly.

1.07 DELIVERY, STORAGE & HANDLING

- A. Deliver, store and handle products as recommended by manufacturer to prevent damage or discoloration.
 - 1. Protect against damage and discoloration.
 - 2. Handle panels with non-marring slings.
 - 3. Do not bend panels.
 - 4. Store panels above ground, with one end elevated for drainage.
 - 5. Protect panels against standing water and condensation between adjacent surfaces.
 - 6. If panels become wet, immediately separate sheets, wipe dry with clean cloth, and keep sheets separate for air-drying.
 - 7. Do not allow panels with strippable film to be exposed to direct sunlight. Remove film prior to installation.

1.08 WARRANTY

- A. Contractor's Warranty: Warrant metal roofing system installation, including panels, flashings, sealants, fasteners and accessories against defective materials and/or workmanship, to remain watertight and weatherproof with normal usage for three (3) years following Project Substantial Completion date.
- B. Manufacturer's Watertight Warranty: Manufacturer shall warrant metal roofing system installation against failure and leaks for a period of twenty (20) years; no exclusions/limitations for wind speed.
- C. Coating Warranty: Warrant coated finish for a period of 20 years against cracking, peeling, blistering, delamination, and chalking in excess of 8 units when tested per ASTM D4214, and free of fade or color change in excess of 5 DE Units when tested per ASTM D2244, without reducing or otherwise limiting any other rights to correction which the Owner may have under the contract documents.
- D. Manufacturer shall also warrant for twenty (20) years that metal will not fail structurally, perforate, rupture or leak due to corrosion.

PART 2 – PRODUCTS

2.01 METAL ROOFING SYSTEM – (Roofing System Bid Options 2A & 2B)

- A. Manufacturer/Product – Basis of Design: Specification and design are based on AEP Span *Span Lok hp* metal roofing system. Other manufacturers may be acceptable, subject to their ability to provide products conforming the basis of design and the requirements of this Specification.

- B. Factory Pre-Finished Sheet Metal: Steel sheet with minimum yield of 40,000 psi conforming to ASTM A792 coated with AZ50 zinc-aluminum alloy (Zincalume or Galvalume).
 - 1. Factory Finish
 - a. Finish Coating (Weather Side): Premium fluoropolymer coating with minimum of 70% *Kynar 500* or *Hylar 5000* base resin, factory-applied, oven baked and applied under controlled conditions; 20 year warranty.
 - b. Underside/Basckside Finish: Manufacturer’s standard corrosion-inhibiting wash coat.
 - 2. Underlayment/Air Barrier: Self-adhering, reinforced SBS modified rubberized asphalt sheet with high melting point asphalt suitable for use under metal roofing.
 - a. Manufacturer/Product: *Protecto Wrap Jiffy Seal Ice & Water Guard* or equivalent high temperature product designed for use under metal roofing.
 - 3. Sheet Metal Flashing, Closures, and Trim: Provide as required to match existing flashing profiles and appearance and as required by metal roofing system manufacturer to achieve watertight installation; comply with sheet metal fabrication standards specified in Section 07620.
 - a. Fabricate from 24 gauge factory finished steel sheet with same coating, finish and color as adjacent roofing panel.
 - 4. Sealants and Gaskets: Provide metal roofing system manufacturer’s recommended silicon sealant.
 - 5. Roof Penetrations: Provide metal roofing system manufacturer’s recommended flashing system.

2.02 RIGID ROOF INSULATION – (Roofing System Bid Option 2B)

- A. Rigid Insulation: Rigid board insulation consisting of a glass-fiber reinforced polyisocyanurate foam core laminated between facers. Conform to ASTM C1289 and the following:
1. Board Edges: Square
 2. Facers: Dimensionally stable coated glass facers suitable for obtaining good adhesion for direct application of specified self-adhering underlayment/air barrier.
 3. Code Compliance: Meets the requirements of IBC Chapter 26 Plastics, Section 2603.5.3 “Potential Heat” per NFPA 259 and Section 2603.8 “Special Approval” for use without a thermal barrier covering.
 4. Compressive Strength Per ASTM D1621: 20 psi minimum
 5. Density Per ASTM D1622: 2 pcf
 6. Water Absorption Per ASTM C209: <1%
 7. Thermal Value Test Standard: Long-term thermal resistance values determined in accordance with ASTM C1289.
 8. R-Value: Conform to requirements of State Energy Code.
- B. Accessories
1. Spray Foam Sealant (For Gap Filler): Spray polyurethane foam sealant in a canister; Dow *Enerfoam* or Dow *Great Stuff Pro*.

2.03 FABRICATION

- A. Coordinate and confirm field dimensions and conditions prior to fabrication.
- B. Factory form metal panels in continuous one-piece lengths; site formed panels are not allowed.
1. Fabricate panels to profiles and configuration required by metal panel manufacturer and as shown on the Drawings for watertight assembly.

- C. Shop fabricate flashing and trim in prefinished sheet metal matching roofing and wall panels in longest lengths practical to profiles and configuration required by manufacturer and as shown on the Drawings.
 - 1. Conform to fabrication requirements specified in Section 07620.
 - 2. Gauge: 24 gauge minimum; increase thickness where recommended by manufacturer or where field conditions require additional stiffness to avoid waviness or visible deflection.

PART 3 – EXECUTION

3.01 COORDINATION

- A. Review, coordinate and accommodate work of other trades that interface with, affect or are affected by the work of this Section so as to facilitate the execution of the overall Work of this project in a coordinated and efficient manner.
- B. Schedule the installation of metal roofing with removal of the existing roofing and installation of the air barrier, roof insulation to coincide with dry weather; do not allow existing plywood roof deck or insulation to be left exposed to the weather or to become wet.
- C. Coordinate installation of metal roofing in the proper sequence with work of Sections 02223, 07620 and 07623.
- D. Coordinate installation of underlayment with installation of sheet metal eave and rake flashings.
- E. Coordinate and accommodate openings and penetrations required by other trades.

3.02 EXAMINATION

- A. Verify that existing roof deck is acceptable to receive work of this Section.
- B. Conform that structural elements, to which the metal panels and substructure will be attached, are adequate to provide secure attachment of the metal panels.
- C. Do not start work until unsatisfactory conditions have been corrected.

- D. Start of installation indicated acceptance of the substrate, existing roof structure, and site conditions.

3.03 REMOVAL OF EXISTING ROOFING

- A. Removal of existing roofing is specified in Section 02223.

3.04 INSTALLATION – UNDERLAYMENT/AIR BARRIER (Roofing System Bid Options 2A & 2B)

- A. Install underlayment/air barrier sheet over entire roof area in a continuous unbroken sheet in accordance with manufacturer's instructions to achieve the performance requirements specified in this Section.
- B. Seams: Lap and continuously seal sheet edges for air/watertight installation; hand roll seams for good adhesive bond.
- C. Penetrations: Connect air barrier to duct, pipe and conduit penetrations through roof deck as well as intersecting walls/parapets using sealant, tie wraps and termination bars to achieve an airtight connection.
 - 1. Round Pipe/Conduit/Duct Penetrations: Cut out a large square air barrier material large enough wrap up onto pipe penetration and form a "boot". Seal to penetrating item and install continuous butyl tape; install a tie wrap on round pipes, conduits and ducts to hold air barrier securely in place.
 - 2. Seal air barrier sheet vapor-tight to penetrating ducts and intersecting walls and parapets with continuous butyl tape; install continuous termination bar and fasten securely to substrate using the appropriate fasteners spaced at 8" maximum on center to hold air barrier securely in place.
- D. Connection to Gutter Liner: Provide airtight connection between the air barrier and the gutter liner installed in the existing built-gutters.
 - 1. A sheet metal or other type of transition flashing that is compatible with both the gutter liner and the air barrier shall be employed to make this connection; consult with both manufacturer's to achieve connection transition that is acceptable to both.
- E. Roof Perimeter: Provide 6 inches of extra air barrier material at the perimeter of the roof to allow connection to the wall air barrier installed by others at a future date.

1. Conceal extra air barrier material under flashings in a manner that allows it to be accessed later when the wall air barrier is installed by others at a future date.

3.05 INSTALLATION – SUBSTRUCTURE FOR METAL ROOFING SYSTEM – (Roofing System Bid Option 2B)

- A. Install substructure securely to building structural members in accordance with engineered shop drawings.
- B. Substructure shall be installed aligned to form a single flat plane suitable for installation of metal roofing panels.

3.06 INSTALLATION – RIGID ROOF INSULATION – (Roofing System Bid Options 2B)

- A. Schedule installation of rigid insulation to occur at the same time as the installation of metal roofing panels; do not leave insulation exposed to the weather.
- B. Install rigid insulation panels in 2 layers with edges staggered and butted tight as recommended by manufacturer.
 1. Cut panels for tight fit to penetrations and adjacent vertical interruptions.
- C. Secure panels to deck as required to prevent blowoff until metal roofing panels are installed.
- D. Fill any gaps or open areas around penetrations or between panels with spray foam sealant.

3.07 INSTALLATION – METAL ROOFING SYSTEM – (Roofing System Bid Options 2A & 2B)

- A. Install metal roofing system straight and square with building lines in accordance with manufacturer's recommended installation instructions and approved shop drawing to achieve a watertight installation.
 1. Field Seaming: Field seam with electric seaming tool in accordance with manufacturer's instructions.
- B. Install metal roofing panels in single, continuous length from eave to ridge.
- C. Install roofing panels using concealed fastener clips inserted in panel seams.

- D. Fasten clips/panels to structure as required by structural design to comply with specified Performance Requirements, allowing for expansion and contraction due to temperature variations and building movement.
- E. Install sealants, closures and flashing/trim as the work progresses to ensure airtight and watertight performance of the completed installation.

3.08 **CLEANING AND PROTECTION**

- A. Remove protective coverings from prefinished metal surfaces after each panel is installed.
- B. Remove all loose fasteners, metal scraps and debris and sweep clean.
- C. Replace any panels or flashing/trim that has damage to the paint coating that voids the manufacturer's warranty or where damage is visible.
- D. Clean finished surfaces using techniques and materials recommended by panel manufacturer. Protect cleaned surfaces until project completion.
- E. Prevent traffic across metal roofing after installation is complete.

END OF SECTION

SECTION 07620

SHEET METAL GUTTERS, DOWNSPOUTS, FLASHING, AND TRIM

PART 1 – GENERAL

1.01 REFERENCES

- A. AISI (American Iron and Steel Institute) – Stainless Steel – Uses in Architecture.
- B. ASTM A525 – Steel Sheet, Zinc Coated, (Galvanized) by the Hot-Dip Process.
- C. ASTM B32 – Solder Metal.
- D. ASTM B209 – Aluminum and Alloy Sheet and Plate.
- E. ASTM B370 – Copper Sheet and Strip for Building Construction.
- F. ASTM B486 – Paste Solder.
- G. ASTM D226 – Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- H. ASTM D4586 – Asphalt Roof Cement, Asbestos-Free.
- I. CDA (Copper Development Association) – Contemporary Copper, A Handbook of Sheet Copper Fundamentals, Design, Details and Specifications.
- J. CDA – Copper Roofing – A Practical Handbook.
- K. FS O-F-506 – Flux, soldering, Paste and Liquid.
- L. NRCA (National Roofing Contractors Association) – Roofing Manual.
- M. SMACNA – Architectural Sheet Metal Manual.

1.02 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

- C. Samples: Submit two (2) samples, illustrating typical material and finish.

1.03 **QUALIFICATIONS**

- A. Fabricator and Installer: Company specializing in sheet metal flashing work with three (3) years experience.

1.04 **DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, protect, and handle products to site under provisions of Section 01600.
- B. Stack preformed material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials that may cause discoloration or staining.

1.05 **ALTERNATES**

- A. See Section 01030 for bidding alternates affecting the Work of this Section.

1.06 **COLORS**

- A. Colors are specified in Colors/Materials Schedule.

1.07 **SUSTAINABLE BUILDING REQUIREMENTS**

- A. See Section 01011 for sustainable building requirements affecting Work of this Section.

PART 2 – PRODUCTS

2.01 **MATERIALS**

- A. Pre-finished (Painted) Sheet Material: Steel conforming to ASTM A446 minimum yield of 40,000 psi, 24 gauge thickness minimum or as noted elsewhere. Pre-finished factory paint coating to match sheet metal siding where visible and/or adjacent to siding.
- B. Aluminum Sheet: ASTM B 209, Alloy 3003, 3004, 3105, or 5005, Temper suitable for forming and structural performance required, but not less than H14, clear anodized finish.

- C. Gutters: 304L Stainless steel sheet material, 20 Gauge. Shape as indicated on drawings.

2.02 COMPONENTS

- A. Gutters: Stainless steel sheet material.
- B. Downspouts:
 - 1. Square, metal, smooth, non-corrugated pre-finished (painted) sheet material – 20 gauge.
 - 2. Square anodized aluminum tubes at canopies. (Match aluminum storefront finish).
- C. End Caps, Downspout Outlets, Support Brackets, Joint Fasteners: Profiled to suit gutters and downspouts. Same material as gutters.
- D. Gutter Outlet Tubes: Same material as gutter, sized to fit into downspouts.
- E. Eave Flashing Over Gutter and Rake Flashing: Same material as gutter.
- F. Flashing: Flashing and trim to match adjacent metal wall panels or storefront. Stainless steel flashing to be used for all concealed flashing locations. Trim panels with 5" or greater vertical face to be 22 gauge.

2.03 ACCESSORIES

- A. Fasteners: 410 Stainless steel screws with soft EPDM washers. Stainless steel rivets.
- B. Slip Sheet: Rosin sized building paper.
- C. Protective Backing Paint: Bituminous.
- D. Sealant: Type specified in Section 07900.
- E. Plastic Cement: ASTM D4586, Type I.
- F. Reglets: Surface mounted steel manufactured by Fry Reglet.
- G. Downspout Supports: Straps.

2.04 **FABRICATION**

- A. Form flashings and gutters of profiles and size required. Weld all corners, joints, etc. for a watertight fabrication – no sealant joints are allowed.
- B. Field measure site conditions prior to fabricating work.
- C. Fabricate with required connection pieces.
- D. Form sections square, true, and accurate in size, in maximum possible lengths and free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
- E. Hem exposed edges of metal.
- F. Seal metal joints watertight (other than gutters).
- G. Fabricate gutter and downspout accessories; weld watertight.
- H. Fabricate corners from one piece with minimum 18 to 24 inch long legs.

2.05 **FINISH**

- A. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mils.

2.06 **FLASHINGS**

- A. Provide flashing pans under all above grade showers.
- B. Provide flashings for all openings in exterior walls.
- C. Provide lead flashings for all roof drains, floor drains, scuppers.
- D. Provide flashings and sleeves, 2" above floor, for all openings in laboratory and kitchen floors.
- E. Roof flashings shall be lead coated copper.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, reglets in place, and nailing strips located.
- C. Verify roofing termination and base flashings are in place, sealed, and secure.
- D. Beginning of installation means acceptance of substrate.

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Install surface-mounted reglets true to lines and levels. Seal top of reglets with sealant.

3.03 INSTALLATION

- A. Install gutters, downspouts, flashings, and accessories in accordance with manufacturer's instructions and SMACNA manual. Coordinate installation of flashings with roofing section 07612.
- B. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
- C. Apply plastic cement compound between metal flashings and felt flashings.
- D. Fit flashing tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- E. Join lengths with formed seams of joint type allowing flush alignment of adjacent lengths, sealed watertight and allowing for thermal movement. Flash and seal gutters to downspouts and accessories.
- F. Slope gutters 1/16 inch per foot towards downspouts for positive drainage.
- G. Locate gutter expansion joints and unrestrained gutter terminations indicated to allow for thermal movement. Fix gutter at inside corners and outlet tubes.
- H. Secure flashings in place using concealed fasteners and cleats.

- I. Secure gutters in place using concealed fasteners.
- J. Connect downspouts to storm sewer system. Seal connection watertight.

END OF SECTION

SECTION 07625

SHEET METAL FLASHING

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Roofing System Bid Option 1A – Sheet Metal Flashings
- B. Roofing System Bid Option 1B – Sheet Metal Flashings
- C. Roofing System Bid Option 2A – Sheet Metal Flashings
- D. Roofing System Bid Option 2B – Sheet Metal Flashings

1.02 REFERENCES

- A. All references shall be the latest adopted edition, or as noted.
- B. ANSI/ASTM B32 – Solder Metal.
- C. ASTM A666 – Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- D. ASTM A653 – Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- E. ASTM D4586 – Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- F. ASTM B749 – Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.
- G. NRCA (National Roofing Contractors Association), current edition.
- H. SMACNA (Sheet Metal and Air Conditioning Contractors' National Association) Architectural Sheet Metal Manual, Fifth Edition.

1.03 SUBMITTALS

- A. Product Data: Submit product data for the following:
 - 1. Pre-Finished Galvanized Steel Sheet
 - 2. Galvanized Steel Wire Mesh
 - 3. Fasteners
 - 4. Sealant
- B. Submit shop drawings for review prior to fabrication, include the following:
 - 1. Roof details showing each condition keyed to the roof plan.
 - 2. Profile and dimensions of each sheet metal item, gauge, type/finish of sheet metal, fastener type, location and spacing.
 - 3. Corner and end details for each different flashing type.
 - 4. Fastener material, type and size for each condition.
 - 5. Sealant details showing joint configuration, sealant types and location for each condition.
- C. Color Samples for Prefinished Sheet Metal: Submit two 3" x 4" color samples of prefinished sheet metal color selected (actual paint finish on sheet metal).
- D. Fastener Samples: Submit samples of each different type of fastener proposed for use, key the fasteners to the fasteners noted in the shop drawings.

1.04 QUALITY ASSURANCE

- A. Fabricator/Installer Qualifications:
 - 1. Minimum of 5 years experience in fabrication and installation of architectural sheet metal similar in material, design, and scope to this project with a record of successful in-service performance;
 - 2. Installer shall employ only skilled, journeyman sheet metal workers to install the work of this section.

3. Provide list of at least 10 recently completed projects with addresses within 30 miles of this project upon request.
- B. Workmanship shall be of the best quality; installed work shall be straight and true with neat corners and terminations, free of any visual defects; installation shall be fabricated and installed to inherently shed water without reliance on sealant and be permanently watertight.

1.05 **WARRANTY/GUARANTEE**

- A. 20 Year Pre-finished Sheet Steel Warranty: Warrant coated finish against cracking, peeling, blistering, chalk in excess of 8 units, and fade in excess of 5 NBS points, for a period of 20 years, without reducing or otherwise limiting any other rights to correction which the owner may have under the contract documents. Manufacturer shall also warrant that metal will not fail structurally, perforate, rupture or leak due to corrosion.
- B. 3 Year Installer's Guarantee: The Contractor shall guaranty the sheet metal installation for a period of 3 years against defects in installed materials and workmanship including a 3 year watertight guaranty. Correct any flashing or sheet metal item that is defective, improperly installed or leaking for a period of 3 years at no cost to the Owner.

PART 2 – PRODUCTS

2.01 **MATERIALS**

- A. Pre-Finished Galvanized Steel Sheet: Conform to ASTM A924/A792 with minimum yield of 40,000 psi and AZ50 (*Zincalume* or *Galvalume*) protective coating, or, conform to ASTM A653 with minimum yield of 43,500 psi and ASTM A924 G-90 galvanized protective coating.
1. Finish Coating shall be a premium fluoropolymer coating with minimum of 70% *Kynar 500* or *Hylar 5000* base resin, factory-applied, oven baked and applied under controlled condition; 1 mil dry film thickness minimum (exclusive of primer); 20 year warranty.
 2. Color: As selected by Owner from full range of manufacturer's standard colors.
 3. Protective film: Provide strippable plastic film, applied to finish of coil stock before forming, or plastic interleaf, applied to panel after forming.

- 4. Manufacturers:
 - a. AEP-Span
 - b. Fabral

- B. Factory Pre-Primed Galvanized Steel: Steel conforming to ASTM A446 or ASTM A792, minimum yield 43,500 psi, with protective coatings conforming to ASTM 525 G90 or ASTM A792 AZ50, pre-primed under controlled condition at the factory with epoxy primer suitable for proper adhesion.

- C. Stainless Steel: Type 304, mill finish, conform to ASTM A666.

- D. Lead Sheet: ASTM B749; 4 lb./sq./ft. hard tempered lead.

- E. Solder: Conform to ANSI/ASTM B32.

2.02 ACCESSORIES

- A. Fasteners: All fasteners shall be manufactured in the United States or Canada.
 - 1. Pre-Finished Galvanized Sheet Metal:
 - a. Exposed Condition – Wood or Sheet Metal Substrate: Type 304 stainless steel screws with self-sealing neoprene head.

 - b. Exposed Condition – Masonry/Concrete Substrate: ¼" diameter Rawl Zamac Nailin expansion anchor with mushroom style head, and body formed of Zamac 7 alloy, Type 304 stainless steel nail; 1-1/2" minimum embedment; seal head with sealant.
 - 1) Powder/power driven fasteners are not permitted.

 - c. Concealed Condition: Hot dipped galvanized nails or screws or expansion anchors as appropriate for the substrate.
 - 1) Powder/power driven fasteners are not permitted.

 - 2. Continuous Cleats (Concealed): Hot dipped galvanized screws, nails or expansion anchors as appropriate for the substrate.
 - a. Powder/power driven fasteners are not permitted.

- B. Tape For Separation Between Dissimilar Metals: 10 mil PVC adhesive backed tape.
- C. Sealant: Provide sealant and accessories specified in Section 07900.
- D. Plastic Cement: Asphalt cutback mastic conforming to ASTM D 4586 Type II.

2.03 FABRICATION

- A. General
 1. Field measure and verify site conditions prior to fabrication, accommodate field conditions.
 2. Match profile and appearance of existing flashing except where revisions are required to accommodate new roofing work or provide watertight integrity.
 3. Fabricate in accordance with SMACNA (Architectural Sheet Metal Manual), NRCA and as required by roofing manufacturer (where conflicts exist, the most restrictive requirement shall apply).
 4. Form sections true to shape, accurate in size, square, and free from distortion or defects.
 5. Furnish in minimum 10' lengths.
 6. Hem all exposed edges ½ inch on underside.
 7. Lap joints shall be fabricated to allow 4 inches minimum overlap.
 8. Shop fabricate all items including corners, end terminations and special conditions for neat appearance, field bending and fabrication is not acceptable.
 9. End conditions, corners, transitions, terminations, and changes in the plane or direction of flashings, copings and other sheet metal fabrications shall be custom fit and fabricated to accommodate field conditions and to provide a weatherlapped, watertight assembly and transition. Workmanship and custom fabrications shall conform to similar conditions found in SMACNA Manual and to good sheet metal fabrication practice and shall not rely solely on sealant for their watertight integrity.
 10. Protect pre-finished metal from scratches or damage during fabrication.

- B. Fabricate flashing as follows (select those flashing types applicable to this project)
- C. Rake Edge Flashing: Fabricate from 24 gauge pre-finished galvanized steel sheet.
 - 1. Fabricate so that bottom edge of flashing has a tight spring lock fit against fascia.
- D. Eave Flashing: Fabricate from pre-finished galvanized steel sheet, 24 gauge or as shown on Drawings.
 - 1. Lay out and fabricate for 6 inch lap joints.
 - 2. Shop fabricate outside corners for neat appearance.
- E. Apron Flashing: Fabricate from minimum 24 gauge pre-finished galvanized steel sheet.
 - 1. Lay out and fabricate for 6 inch lap joints.
 - 2. Provide continuous 22 gauge cleat to lock into hem on bottom edge.
- F. Counterflashing & Reglet: Fabricate from pre-finished galvanized steel sheet, 24 gauge or as shown on Drawings.
 - 1. Lay out and fabricate for 6 inch lap joints.
 - 2. Reglet/Receiver Corners: Shop fabricate watertight with neat appearance, bend at corner and extend past corner at least 12 inches. Cut out interior of counter flashing pocket to allow insertion of continuous bent counter flashing into pocket.
 - 3. Counter Flashing Corners: Fabricate watertight with neat appearance, bend at corner and extend past corner at least 12 inches.
 - 4. Fabricate so that joints in reglet/receiver and counterflashing do not align, separate by at least 18 inches.
- G. Cap Flashing (Coping): Fabricate to match configuration shown on the Drawings and SMACNA Figure 3-4 from pre-finished galvanized steel sheet.
 - 1. Provide continuous 22 gauge cleat to lock into hem on exposed outside face.

2. Fasten concealed inside face with screw fasteners.
 3. Gauge:
 - a. Coping widths up to 18" – 22 gauge;
 - b. Coping widths over 18" – 20 gauge.
 4. Seams:
 - a. Horizontal Application: 1 inch minimum standing seams.
 - b. Sloped Application: Shingle lap 4 inches minimum.
 5. Outside Corners: Bend outside vertical face to form corner, overlap top and seal watertight.
 6. Inside Corners: Provide 12 inch wide backup metal to support and align ends/corners of flashing; miter cut flashing neatly with hairline crack.
- H. Pipe Flashing – Plumbing Vents: Fabricate to match SMACNA Figure 4-14B from 4 lb./sq./ft. hard tempered lead sheet with soldered joints.
1. Fabricate to fit angle of roof slope.
 2. Fabricate to accommodate each different pipe size, do not use flashing designed for larger pipe on smaller diameter pipe.
 3. Provide fabricated lead cap.
- I. Step Flashing: Fabricate to match configuration shown in SMACNA, Figure 4-7A from 24 gauge pre-finished galvanized steel sheet matching color of roof shingles.
1. Length: Fabricate flashing length to allow each flashing piece to extend under the step flashing above 4 inches minimum plus the exposure of the shingle (5-5/8" shingle exposure requires 9-5/8" long step flashing).
 2. Width: Fabricate to allow flashing to extend under roofing 6 inches and up wall 6 inches.
- J. Cricket Flashing: Fabricate from 24 gauge stainless steel sheet.
1. Extend up under roofing 12 inches minimum.

2. Extend up at least 6 inches below bottom of wall cladding or counterflashing.
3. Overlap, rivet and solder seams for permanently watertight connection.

PART 3 – EXECUTION

3.01 COORDINATION

- A. Review, coordinate and accommodate work of other trades that interface with, affect or are affected by the work of this Section so as to facilitate the execution of the overall Work of this project in a coordinated and efficient manner.
- B. Coordinate installation of eave flashing prior to installation of ice and water membrane, underlayment and shingles.
- C. Coordinate installation of sheet metal flashings with Sections 07311 asphalt shingles for proper sequence and for watertight assembly.

3.02 PREPARATION

- A. Installer shall:
 1. Field verify that existing conditions and substrate layout complies with shop drawing layout.
 2. Resolve any variations and potential problems.
 3. Not start work until unsatisfactory conditions have been corrected.
 4. Start of installation indicates acceptance of substrate and conditions.\

3.03 INSTALLATION – GENERAL

- A. Installation shall conform to this Section, the roofing manufacturer's requirements, SMACNA Architectural Sheet Metal Manual and NRCA Roofing Manual (where conflicts exist, the most restrictive requirement shall apply).
- B. Protect pre-finished metal from scratches or damage during fabrication.
- C. Separate dissimilar metals with 2 wraps/layers of PVC tape.

3.04 INSTALLATION – FLASHING

- A. Install flashings to achieve a weathertight, leak-free installation.
- B. Install flashings straight and true with neat appearance.
- C. Lap Joints: Lap 4 inches minimum, 6 inches where noted, and seal with two heavy beads of butyl sealant just prior to making lap;
 - 1. Clean metal surfaces to be sealed thoroughly with solvent just prior to sealant application;
 - 2. Trim off back of hem to allow tight interface and proper fit.
 - 3. Flashing shall fit tight to each other, free of any gaps or misfit.
- D. Fasten flashings to substrate securely using specified fasteners sized to hold flashings securely and as recommended by manufacturer for substrate and condition.
 - 1. Powder/power actuated fasteners are not permitted.
 - 2. Fasteners shall be concealed; seal fasteners are not permitted.
- E. Rake Edge Flashing: Install over roofing underlayment and seal watertight with continuous troweling of asphalt mastic.
 - 1. Install continuous cleat straight and true and fasten securely @ 8" o.c. maximum.
 - 2. Weatherlap joints 4 inches and seal watertight, cut off back of hem to allow proper fit.
 - 3. Installation shall be completely watertight and free of any looseness or movement.
- F. Eave Flashing:
 - 1. Lap joints 6 inches and seal watertight, cut off back of hem to allow proper fit.
 - 2. Flashing shall fit tightly together at joints, free of any gap.

3. Installation shall be completely watertight and free of any looseness of movement.

G. Apron Flashing:

1. Install continuous cleat to interlock and secure lower edge of flashing.
2. Install flashing with bottom edge interlocked in continuous cleat.
3. Lap joints 6 inches and seal watertight, cut off back of hem to allow proper fit.
4. Offset joints from joints in counterflashing/surface reglet by at least 18 inches.

H. Counterflashing/Reglet:

1. Lap joints 6 inches minimum, cut off back of counter flashing pocket to allow proper fit;
2. Offset counterflashing joints from joints in reglet below by at least 18 inches;

I. Cap Flashing (Coping):

1. Install continuous cleat on exterior side of wall straight and true and fasten securely @ 8" o.c. maximum;
2. Cut off back of hem at joints between sections to allow proper fit.
3. Seams:
 - a. Horizontal Application: Bend back each end of standing seams at 45 degree angle to lock sections together and reduce visibility.
 - b. Sloped Application: Shingle lap seams 4 inches minimum and seal watertight with 2 beads of sealant.
4. Secure interior (concealed) side with exposed fasteners spaced at no more than 32 inches apart and within 6 inches of ends.
5. Installation shall be completely watertight and free of any looseness or movement.

- J. Pipe Flashings – Plumbing Vent: Install flashing on each plumbing and conduit/pipe penetration through roof.
1. Coordinate installation with Section 07311 and conform with requirements of roofing manufacturer.
 2. Set base flashing flange in continuous thick bed of asphalt plastic cement.
 3. Install cap on top of plumbing vents; where conduit/pipe extend higher than top of flashing seal top of flashing watertight, install worm drive clamp and tighten securely.
- K. Step Flashing: Install step flashing interlaced with each shingle at juncture with rake wall.
1. Install one step flashing under each shingle course.
 2. Installation shall be completely watertight.
 3. Provide special diverter step flashing at bottom of roof slope to divert water away from wall and into gutter.
- M. Cricket Flashing: Install on uphill side of curbs and walls that interrupt the slope of roof.
1. Securely fasten to roof in concealed location.
 2. Installation shall be completely watertight.

3.05 **INSTALLATION – SEALANT**

- A. Install sealant as specified in Section 07900.
1. Exposed Sealant joints: Clean and prime surfaces to be sealed in accordance with sealant manufacturer's instructions. Install backer rod in accordance with sealant manufacturer's installation requirements to achieve the proper sealant performance. Install silicon sealant so that width, shape, bonding width and width to depth ratios conform to sealant manufacturer's joint design recommendations based on the amount of movement (expansion/contraction) anticipated at each joint condition to achieve a permanently watertight joint.

2. Concealed (Lap) Sealant Joints: Clean and prime surfaces to be sealed in accordance with sealant manufacturer's instructions. Install two continuous beads of butyl sealant (primary and secondary) at each lap joint to achieve a watertight connection.
3. Exposed Fastener Heads: Where fastener heads are exposed to the weather and not self-sealing type, install sealant over fastener head and seal to metal surface watertight.

END OF SECTION

SECTION 07900

JOINT SEALERS

PART 1 – GENERAL

1.01 REFERENCES

- A. ASTM C790 – Use of Latex Sealing Compounds.
- B. ASTM C804 – Use of Solvent-Release Type Sealants.
- C. ASTM C834 – Latex Sealing Compounds.
- D. ASTM C920 – Elastomeric Joint Sealants.
- E. ASTM D1056 – Flexible Cellular Materials – Sponge or Expanded Rubber.
- F. ASTM D1565 – Flexible Cellular Materials – Vinyl Chloride Polymers and Copolymers (Open-Cell Foam).
- G. SWRI (Sealant, Waterproofing and Restoration Institute) – Sealant and Caulking Guide Specification.
- H. FS TT-S-001657 – Sealing Compound, Single Component, Butyl Rubber Based, solvent Release Type.
- I. FS TT-S000227 – Sealing Compound: Elastomeric Type, Multi-Component.
- J. FS TT-S-00230 – Sealing Compound: Elastomeric Type, Single Component.
- K. FS TT-S-001543 – Sealing Compound, Silicone Rubber Base.

1.02 SUBMITTALS

- A. Submit under provisions of Section 01330.
- B. Data: Proved data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability. Colors will be selected by Architect from manufacturer's full line of available colors.

1.03 **QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum five (5) years documented experience.
- B. Applicator: Company specializing in performing the Work of this Section with minimum five (5) years experience approved by manufacturer.

1.04 **ENVIRONMENTAL REQUIREMENTS**

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.05 **WARRANTY**

- A. Provide one (1) year warranty under provisions of Section 01770.
- B. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal and exhibit loss of adhesion or cohesion, or do not cure.

1.06 **ALTERNATES**

- A. See Section 01230 for bidding alternates affecting the Work of this Section.

1.07 **COLORS**

- A. Colors are specified in Colors/Materials Schedule.

1.08 **SUSTAINABLE BUILDING REQUIREMENTS**

- A. See Section 01011 for sustainable building requirements affecting the Work of this Section.

PART 2 – PRODUCTS

2.01 **MATERIALS**

- A. Sealants:
 - 1. Sealant Type 1 (Single Component Urethane):
Pecora Dynatrol 1-XL
Sonneborn Sonolastic NP-1
Tremco Dynonic

2. Sealant Type 2 (Acrylic Latex):
Pecora AC20 + Silicone
Sonneborn Sonolac
Tremco Tremflex 834
3. Sealant Type 3 (Butyl):
Tremco Butyl Sealant
4. Sealant Type 4 (Epoxy Urethane):
Tremco Dymeric 240 Sealant Type 5 (Self-Leveling Urethane):
Sonolastic SL2
Pecora Urexpan NR-200
Tremco THC 900
5. Sealant Type 5 (Paintable Urethane Acrylic):
OSI Pro Series H2U Acrylic Urethane
Benjamin Moore Moorlastic Urethane Acrylic Sealant 465
6. Sealant Type 6 (Single Component Silicone):
Pecora 890 Silicone
Tremco Spectrem 3
Dow Corning 790/791
7. Sealant Type 7 (Mildew-Resistant Silicone Sealant):
Sonneborn OmniPlus
Tremco Trensil 200
Dow Corning 786
8. Sealant Type 8 (Polyurethane)
Tremco Vulkem 921
9. Sealant Type 9 (Acoustical Sealant)
Acoustical Sealant by US Gypsum Co.
Tremco Acoustical Sealant
10. Sealant Type 10 (Fire Stop Sealant)
Fire Barrier 2000 by 3M
Non Sag Firestop Caulk
(Part #AA-529/569/542/492) by Nelson
CP 606 by Hilti

B. Sealant Color: As selected by Architect.

2.02 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: ASTM D1056; round, foam rod; oversized 30 to 50 percent larger than joint width. Polyethylene foam rod, closed-cell or as recommended by sealant manufacturer. Diameter 1/3 greater than width of joint where it is to be installed.
 - 1. Polystyrene foam not acceptable.
- C. Bond Breaker: Pressure sensitive polyethylene tape/plastic tape recommended by sealant manufacturer, applied to sealant contact surfaces where bond to substrate or backer rod must be avoided for proper performance of sealant.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces and joint openings are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that might impair adhesion of sealant.
- B. Clean joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with ASTM C804 for solvent release and ASTM C790 for latex base sealants.
- D. Verify that joint backing and release tapes are compatible with sealant.
- E. Protect elements surrounding the Work of this Section from damage or disfiguration.

3.03 **PRIMER APPLICATION**

- A. General: Install primer wherever recommended by sealant manufacturer for conditions/materials being sealed to achieve manufacturer's published joint performance criteria including applicable federal specifications.

3.04 **INSTALLATION**

- A. Install sealant in accordance with manufactures' instructions.
- B. Measure joint dimensions and size materials to achieve required width/depth ratios. Minimum joint width for exterior joints not indicated otherwise shall be (1/4)(1/2) inches.
- C. Install joint backing to achieve a neck dimension no greater than 1/3 of the joint width.
- D. Install bond breaker where joint backing is not used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Tool joints concave, unless noted otherwise.
- H. Remove improperly applied sealant and replace with new.

3.05 **CLEANING**

- A. Clean work under provisions of Section 01770.
- B. Clean adjacent soiled surfaces.

3.06 **PROTECTION OF FINISHED WORK**

- A. Protect sealants until cured.
- B. Repair or replace defaced or disfigured finishes caused by Work of this Section.

3.07 SCHEDULE

SEALANT

<u>Location</u>	<u>Type (from Paragraph 2.01A)</u>
A. Interior horizontal slab On grade joints	5 Match concrete slab color
B. Interior hollow metal door and window frames to wall	2
C. Exterior hollow metal door and window frames to wall	(9)(7)(1) Match adjacent wall color at door frames, Match window frame color
D. Exterior wall louvers to wall	(9)(7)(1) Match adjacent wall color
E. Wainscot and backsplash to wall	2
F. Painted Wall to Ceramic Tile Wall Surface	2
G. Concrete and Masonry Control/Expansion Joints	4 Match adjacent wall color if painted, match grout color if unpainted
H. Exterior Door Thresholds	3 Match threshold color
I. Miscellaneous interior joints and conditions not specifically identified in this schedule	2 Or type determined by Architect as most suitable for condition. Match adjacent surface color or as directed by Architect
J. Miscellaneous exterior joints and conditions not specifically identified in this schedule	(7)(1) Or type determined by Architect as most suitable for condition. Match adjacent surface color or as directed by Architect

K.	Exterior joints in metal and EIFS surfaces	7	Match adjacent surface color
L.	Exterior joints in siding to be painted	6	
M.	Fixtures and backsplash to wall/tile in wet areas	8	White or clear color as selected by Architect
N.	Expansion joints in ceramic tile floors	1	Match grout color
O.	Acoustic joints and connections	10	
P.	Fire resistive joints and connections	11	

END OF SECTION