

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Roof curbs and cants.
 - 2. Blocking, nailers, and shims.
 - 3. Wood furring.
 - 4. Preservative treatment of wood.

- B. Related Sections:
 - 1. Section 06 16 00 – Sheathing.

1.2 REFERENCES

- A. American Institute of Timber Construction (AITC).
- B. American Lumber Standard Committee, Incorporated (ALSC): Softwood Lumber Standards PS 20.
- C. American National Standards Institute/American Wood Council (ANSI/AWC): National Design Specification for Wood Construction (NDS).
- D. ASTM International (Formerly American Society for Testing and Materials (ASTM):
 - 1. ASTM E1190 – Standard Test Methods for Strength of Power-Activated Fasteners Installed in Structural Members.
 - 2. ASTM F1667 – Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- E. American Wood Protection Association (AWPA):
 - 1. AWPA T1 – Use Category System: Processing and Treatment Standard.
 - 2. AWPA U1 – Use Category System: User Specification for Treated Wood.
- F. Forest Stewardship Council (FSC): FSC STD-01-001 – FSC Principles and Criteria (P&C) for Forest Stewardship.
- G. International Code Council (ICC): Evaluation Service Report (ESR).
- H. Underwriter Laboratories (UL).
- I. U.S. Code of Federal Regulations (CFR): 40 CFR, Part 59, Subpart D – National Volatile Organic Compound Emission Standards for Architectural Coatings.
- J. West Coast Lumber Inspection Bureau (WCLIB).

1.3 SUBMITTALS

- A. Submit in accordance with Sections 01 33 00 – Submittal Procedures and 01 33 23 – Shop Drawings, Product Data, and Samples.
- B. Product Data:
 - 1. Product data for products and materials indicated.
 - 2. Manufacturer's technical bulletins and installation/application instructions.
 - 3. Products:
 - a. Wood preservatives.
 - b. Fire-retardant coatings.
 - c. Proprietary connection devices.
 - 4. For adhesives, include printed statement of VOC content (in g/L less water).
 - 5. For composite-wood products, include documentation indicating that product contains no urea formaldehyde.
 - 6. Chain-of-custody (COC) certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that vendor that invoices FSC-certified wood products to project contractors and sub-contractors is certified for chain of custody by an FSC-accredited certification body. Include copy of vendor invoice identifying all wood products and all FSC products on a line-item basis, the value of each line item, and the vendor's COC number.
 - 7. For paints and coatings, include printed statement of VOC content (in g/L).

1.4 DESIGN AND SECURITY REQUIREMENTS

- A. Exposed wood and plastic used in all other locations is subject to requirements of applicable codes, and the approval of the CDCR Representative and the State Fire Marshal.

1.5 COORDINATION

- A. Coordinate the design, construction, and installation of rough carpentry with the requirements of the Work of other Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Handle, stack, and store lumber off the ground in such a manner that it will be protected from damage and prevented from absorbing moisture. Protect with waterproof covering that provides adequate air circulation. Secure covering to prevent blow-off and prevent damage.
- B. Do not store seasoned materials in wet or damp locations.
- C. Protect fire-retardant materials against high humidity and moisture during storage and erection.
- D. Deliver fasteners in bags or boxes, properly tagged for identification.
- E. Store fasteners and attachment devices off the ground in a dry location, protected from dirt, damage, and the elements.

PART 2 PRODUCTS

ROUGH CARPENTRY

2.1 MATERIALS

- A. Forest Certification: Provide members produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001.
- B. Lumber: Douglas Fir; S4S; WCLIB grade marked or by an agency certified by WCLIB; each mill shipment must be accompanied by a WCLIB certificate of inspection; size must be in accordance with PS 20; free of boxed heart; maximum 19 percent moisture content at time of installation; of the following minimum grades.
 - 1. Studs: No. 1 Grade.
 - 2. Structural Joists and Planks (2 to 4 inches thick x 5 inches and wider): No. 1 Grade.
 - 3. Beams and Stringer, Posts and Timbers (5 x 5 inches and larger): Select Structural Grade.
 - 4. Miscellaneous Light Framing (2 to 4 inches thick x 2 to 4 inches wide): Construction Grade.
 - 5. Blocking: No. 2 Grade.
 - 6. Grounds: Straight and free from loose knots and knot holes.
 - 7. Load Carrying Members, other than listed above: Minimum of No. 2 Grade.
- C. Each piece of fire-retardant lumber must be labeled to show compliance with the UL requirement specified and must be grade stamped with the applicable AWWA quality mark indicating the preservative and retention.

2.2 FASTENERS

- A. Provide all nails, screws, bolts, washers, lag screws, joist hangers, tie straps, clips, and similar items as required to the complete Work.
- B. Nails: Use types and sizes as indicated on Drawings, or where not indicated, in accordance with CBC Chapter 23 – Nailing Schedule.
- C. Anchors:
 - 1. Toggle bolt type for anchorage to hollow masonry.
 - 2. Concrete Wedge Anchors for anchorage to solid masonry or concrete.
 - 3. Bolt, or ballistic fastener with approval by the CDCR Representative, for anchorages to steel.
- D. Concrete Wedge Anchors:
 - 1. Wedge-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
 - 2. Post-Installed Anchors: Proprietary type, designed for intended uses, and ICC ESR evaluated.
 - 3. Acceptable Manufacturers, as listed below, and meeting the criteria and requirements specified herein, will be acceptable:
 - a. ITW Ramset/Red Head.
 - b. Simpson.
 - c. Hilti Co.
 - d. For manufacturers not listed, comply with substitution requirements in Section 01 25 00 – Substitution Procedures.
- E. Fastener Finishes:

1. Fasteners in contact with pressure treated products must be hot-dipped galvanized.
 2. Fasteners exposed to moisture, high humidity, or to the exterior must be hot-dipped galvanized or cadmium-plated, unless otherwise indicated or specified.
 3. Nails and screws must be corrosion resistant for exterior or damp areas.
 4. Finish nails and screws must be bright finished for other interior Work.
 5. Machine bolts and washers must be corrosion-resistant.
- F. Adhesives: Epoxy for structural bonding rough carpentry.
1. VOC Content for Multipurpose Construction Adhesives: 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Acceptable Manufacturers/Products, as listed below, and meeting the criteria and requirements specified herein, will be acceptable:
 - a. BASF Construction Chemicals; MasterWeld 440.
 - b. For manufacturers/products not listed, comply with substitution requirements in Section 01 25 00 – Substitution Procedures.

2.3 WOOD TREATMENTS

- A. Wood must be treated with appropriate fire-retardant or preservative as necessary in accordance with exposure, wood species, and applicable codes.
- B. VOC Concentrations of Interior Paints and Coatings: Provide products that comply with the following limits for VOC concentrations not to exceed when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Fire-Retardant Coatings: VOC content for coating category for which coating is formulated.
 2. Wood Preservatives: 350 g/L.
 3. Flat Paints, Coatings, and Primers: 50 g/L.
 4. Non-Flat Paints, Coatings, and Primers: 150 g/L.
 5. Floor Coatings: 100 g/L.
 6. Shellacs, Clear: 730 g/L.
 7. Shellacs, Pigmented: 550 g/L.
 8. Primers, Sealers, and Undercoaters: 200 g/L.
 9. Clear Wood Finishes, Varnishes: 350 g/L.
 10. Clear Wood Finishes, Lacquers: 550 g/L.
 11. Stains: 250 g/L.
- C. Chemical Components of Field-Applied Interior Paints and Coatings: Provide products that comply with the following chemical restrictions:
1. Aromatic Compounds: Paints and coatings must not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
 2. Restricted Components: Paints and coatings must not contain any of the following:
 - a. Acrolein.
 - b. Acrylonitrile.
 - c. Antimony.
 - d. Benzene.
 - e. Butyl benzyl phthalate.
 - f. Cadmium.

- g. Di (2-ethylhexyl) phthalate.
 - h. Di-n-butyl phthalate.
 - i. Di-n-octyl phthalate.
 - j. 1,2-dichlorobenzene.
 - k. Diethyl phthalate.
 - l. Dimethyl phthalate.
 - m. Ethylbenzene.
 - n. Formaldehyde.
 - o. Hexavalent chromium.
 - p. Isophorone.
 - q. Lead.
 - r. Mercury.
 - s. Methyl ethyl ketone.
 - t. Methyl isobutyl ketone.
 - u. Methylene chloride.
 - v. Naphthalene.
 - w. Toluene (methylbenzene).
 - x. 1,1,1-trichloroethane.
 - y. Vinyl chloride.
- D. Where used for exposed locations, treatment materials must be types guaranteed to not adversely affect durability and appearance of applied finishes.
- E. Treatment materials having a highly persistent, noticeable residual odor will not be permitted.
- F. After treatment, kiln or air dry lumber and plywood to a moisture content of 19 percent or less.
- G. Preservative Treatment:
- 1. Items requiring preservative treatment:
 - a. Wood used in conjunction with roofing, flashing, vapor barriers, and waterproofing.
 - b. Wood in contact with masonry or concrete.
 - c. Wood subject to insect attack.
 - d. Wood in contact with ground or water.
 - e. Additional locations required by codes, the CDCR Representative, or accepted standard construction practice.
 - 2. Pressure treat items after fabrication where possible. Use surface applied treatment for items cut after pressure treatment.
 - 3. Do not mill or trim pressure treated items beyond limits recommended by treatment manufacturer.
 - 4. Surface-Applied Wood Preservative (Type A):
 - a. Nonaqueous solution containing not less than 5 percent pentachlorophenol, commercially prepared and formulated to repel water and inhibit decay.
 - b. Suitable for application by either brush or dip methods.
 - c. Integral coloring to allow visual inspection of treated members.
 - 5. Pressure-Treated Wood Preservative (Type B):
 - a. Required for lumber and plywood where indicated or specified and not otherwise required to be fire-retardant pressure-treated (Type C).
 - b. Provide for lumber and plywood in contact with concrete, masonry, or grout.

- c. Concealed Locations: Any process acceptable in accordance with AWP Standard T1 and meeting specified requirements.
 - d. Exposed Locations: Treated members must be milled smooth within limits permitted by process manufacturer.
- H. Fire-Retardant Treated Wood (Type C):
 - 1. Items requiring fire-retardant pressure treatment:
 - a. Wood used in Type I and II buildings.
 - b. Exposed wood.
 - c. Wood used in fire-rated assemblies.
 - d. Wood requiring reduced flame/fuel/smoke ratings.
 - e. Communications backboards.
 - f. Electrical mounting boards.
 - g. Additional locations required by codes, the CDCR, the Drawings, or accepted standard construction practice.
 - 2. Fire-Retardant Pressure Treatment; Quality Standards:
 - a. Processes must meet requirements of CBC Section 2303.2 "Fire-Retardant Treated Wood," and requirements specified herein.
 - b. UL listed and labeled in accordance with UL Fire Resistance Products, Systems and Designs, Product iQ Category Control Number (CCN) "Lumber, Treated (BPVV)."
 - c. Treated lumber must be UL classified FR-S.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready for installation of rough carpentry. Notify the CDCR Representative, in writing, of any conditions requiring corrective action.
- B. If unsatisfactory conditions exist, do not commence the installation until such conditions have been corrected. Beginning of installation means acceptance of existing conditions.

3.2 NAILING

- A. Predrill undersize holes as necessary to prevent splitting.
- B. Drive nails straight and free from bends.
- C. At multiple or grouped nailing, set alternate nails at slightly different angles to improve strength.
- D. For trim or similar members, side-stagger alternate nails to prevent warp and twist.
- E. Where concealed, set nail heads flush to avoid interference with installation of materials to be applied next.
- F. Where exposed, set nail heads recessed for proper putty stopping.

3.3 FRAMING

- A. Construct and secure rough carpentry as indicated.
- B. Construction details, connections, and fastenings not otherwise indicated must be in accordance with the requirements of CBC.
- C. Provide solid backing and blocking as indicated and required.
- D. Set members level and plumb, in correct position.
- E. Place horizontal members with crown side up.
- F. Cut and prepare ends and surfaces to effect full bearing, and as otherwise necessary for proper fit.
- G. Cut notches without overcutting inside corners.
- H. Plates and sills on concrete or masonry: Bed plates and sills of exterior walls in Portland cement mortar to obtain continuous level bearing; bolt down after mortar sets. Bed plates for interior partitions when indicated or necessary for level bearing.
- I. Studs: Space as indicated; frame corners with not less than three studs. Set on single sole plate, cap with double top plate lapped at corners, lapped no less than 4 feet at splices.
- J. Roof Curb and Nailer Members: Wood members are only permitted in wood-framed roof structures. Metal curb and nailers are required for all steel and concrete roof deck structures. Coordinate all roof curb and nailer members with roofing specifications and Drawings. Notify CDCR Representative where conflicts are found between specifications and Drawings.
 - 1. Curb roof openings, except where prefabricated curbs are provided.
 - 2. Construct curb members of single pieces.
 - 3. Form corners by alternating lapping side members.
 - 4. Coordinate curb installation with other Sections whose Work affects or is affected by the Work of this Section.

3.4 FIELD-APPLIED WOOD TREATMENT

- A. Surface Applied Preservative (Type A):
 - 1. Treat members after cutting, shaping, and bolting.
 - 2. Application:
 - a. Apply in accordance with manufacturer's instructions.
 - b. Dip members for 15 minutes, or saturate by brushing on two complete coats at 10 minute intervals.
 - c. Air-dry two hours before setting treated members into place.
- B. Fire-Retardant Pressure Treatment (Type C):
 - 1. After cutting, shaping, and boring, retreat surfaces using materials and methods in accordance with manufacturer's instructions.

3.5 TESTING AND INSPECTION

- A. Testing and inspection must be in accordance with CBC Chapter 17A and the Project's TIOP.
- B. CDCR Representative will provide the following inspections:
 - 1. Inspect wood structural elements and assemblies to ensure conformance with the Contract Documents.
 - 2. Inspect timber connectors to ensure conformance with the Contract Documents.

3.6 DEFECTIVE WORK

- A. When complete, rough carpentry must be free from unnecessary cuts, holes, and other damage and defects.
- B. Rough carpentry not conforming to required lines, details, dimensions, tolerances, finishes, strength, or other specified requirements must be considered defective. Notify the CDCR Representative upon discovery of these conditions.
- C. Required repair or replacement of defective rough carpentry will be determined by the CDCR Representative.
- D. Do not patch, fill, touch-up, repair, or replace rough carpentry except upon express direction of CDCR Representative for each individual area.
- E. Defective rough carpentry must be repaired or replaced as recommended by the CDCR Representative at no additional expense to the CDCR.

3.7 PROTECTION

- A. Protect rough carpentry from damage from subsequent construction operations.

END OF SECTION

SECTION 06 16 43

GYPSUM SHEATHING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Gypsum sheathing on steel studs in exterior walls as shown on Drawings.
 - 2. Air/Water-Infiltration Barrier.
 - 3. Self-Adhered Air/Water Barrier (Waterproofing Type 6) applied to sheathing used behind metal wall panel.
 - 4. Liquid applied Air/Water Barrier (Waterproofing Type 6 Alternate) applied to sheathing used behind metal wall panel.
- B. Related Sections:
 - 1. Section 07 60 00 – Flashing and Sheet Metal.

1.2 REFERENCES

- A. ASTM C11 – Standard Terminology Related to Gypsum and Related Building Materials and Systems.
- B. ASTM C79 – Standard Specification for Gypsum Sheathing Board.
- C. ASTM C954 – Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in to 0.112 in in Thickness.
- D. ASTM C1280 – Standard Specification for Application of Gypsum Sheathing.
- E. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
- G. ASTM E1677 – Standard Specification for an Air Retarder (AR) Material or System for Low-Rise Framed Building Walls.
- H. GA-253 – Application of Gypsum Sheathing.
- I. GA-505 – Gypsum Board Terminology.

1.3 DEFINITIONS

- A. Gypsum Board Construction Terminology Standard: Refer to ASTM C11 and GA 505 for definitions of terms for gypsum board construction not otherwise defined in this Section or other referenced standards.

1.4 SUBMITTALS

- A. Product data for each type of product specified.

1.5 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain gypsum sheathing from one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver gypsum sheathing board and related materials in original packages bearing brand name and identification of manufacturer.
- B. Store gypsum sheathing board so that it is protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum sheathing boards flat on leveled supports off the ground under protective covering.
- C. Handle gypsum sheathing board to prevent damage to edges, ends, and surfaces.

1.7 SEQUENCING AND SCHEDULING

- A. Sequence installation of gypsum sheathing board with installation of exterior cladding to comply with requirements indicated below:
 - 1. Do not leave gypsum sheathing board exposed to weather after its application for more than one month:
Protect cutouts, corners and joints in the sheathing by filling them with a flexible sealant at the time sheathing is applied.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Sheathing Board: Gypsum sheathing with core complying with ASTM C79 and faced with fiberglass mat surface front and back.
 - 1. Thickness: 1/2 inch unless otherwise indicated.
 - 2. Provide 5/8 inch Type X where indicated.

2.2 MANUFACTURERS

- 1. Georgia Pacific; Dens-Glass Gold
- 2. For manufacturers/products not listed, comply with substitution requirements in Section 01 25 00.

2.3 ACCESSORIES

GYPSUM SHEATHING

- A. Fasteners: Type S steel drill screws, 1-inch long, with corrosion-resistant finish in form of cadmium plating or proprietary coating, and as follows:
 - 1. For attachment of sheathing to steel framing from 0.033 to 0.112 of an inch in thickness, provide steel drill screws complying with ASTM C954.
- B. Air/Water-Infiltration Barrier (Polyolefin):
 - 1. Polyolefin Air retarder complying with ASTM E1677; made from polyolefins; either cross-laminated films, woven strands, or spunbonded fibers; coated or uncoated; with or without perforations to transmit water vapor but not liquid water; and as follows:
 - Minimum Thickness: 3 mils.
 - Minimum Water-Vapor Transmission: 10 perms when tested according to ASTM E96, Procedure A.
 - Maximum Flame Spread: 25 per ASTM E84.
 - Minimum Allowable Exposure Time: 3 months.
 - Manufacturers:
 - 1) DuPont Company – Fibers Department; Tyvek.
 - 2) Raven Industries, Inc.; Rufco-Wrap.
 - 3) Reemay, Inc.; Typar.
- C. Self-Adhered Air/Water Barrier (Waterproofing Type 6): 36 mils of self-adhesive rubberized asphalt integrally bonded to 4 mils of cross-laminated, high-density polyethylene film to provide a min. 40 mil thick membrane. Membrane must be interleaved with disposable silicone-coated release paper until installed.
 - 1. Product: W.R. Grace; “Perm-A-Barrier Wall Membrane.”
 - Primer for Fiberglass Faced Sheathing: Grace; “Perm-A-Barrier WB Primer.”
- D. Liquid Applied Air/Water Barrier (Waterproofing Type 6 Alternate): Two part, self-curing, synthetic rubber based material free of solvents, isocyanates and bitumen.
 - 1. Product: W.R. Grace; “Perm-A-Barrier[®] Liquid.”
 - 2. Transition Tape: 36 mil of self-adhesive rubberized asphalt integrally bonded to 4 mil of cross-laminated, high-density polyethylene film to provide a minimum 40 mil thick membrane. Membrane must be interleaved with disposable silicone-coated release paper until installed. Grace; “Perm-A-Barrier Wall Membrane.”
 - 3. Flexible Membrane Wall Flashing: 32 mil of self-adhesive rubberized asphalt integrally bonded to 8 mil of cross-laminated, high-density polyethylene film to provide a minimum 40 mil thick membrane. Membrane must be interleaved with disposable silicone-coated release paper until installed. Grace; “Perm-A-Barrier Wall Flashing.”
- E. Sealants: As specified in Section 07 92 00 – Joint Sealant.

PART 3 EXECUTION

3.1 INSTALLATION

- A. General: Except as otherwise indicated, comply with manufacturer’s instructions, GA-252, and the following for the installation of gypsum sheathing.

GYPSUM SHEATHING

1. Cut boards at penetrations, edges and other obstructions of the Work; fit tight against abutting work, except provide 3/8 inch setback where non-loadbearing Work abuts structural elements at head and jambs.
 2. Coordinate installation of sheathing with installation of flashing and joint sealants so that these combined materials are installed in the sequence and manner which prevents exterior moisture from passing through completed exterior wall assembly to the interior.
 3. Apply fasteners so that screw heads bear tightly against face of gypsum sheathing boards but do not cut into face paper.
 4. Do not bridge building expansion joints with gypsum sheathing; cut and space edges to match spacing of structural support elements.
- B. Install sheathing in accordance with manufacturer's instructions and applicable instructions in GA-253 and ASTM C1280.
1. Install exterior sheathing with gold side out.
 2. Use maximum lengths possible to minimize number of joints.
 3. Attach exterior sheathing to metal framing with screws spaced 8 inches o.c. at perimeter where there are framing supports; and 8 inches o.c. along intermediate framing in field. A greater number of fasteners may be specified to obtain specific values and is allowed up to 4-inch o.c. spacing.
 4. Drive fasteners to bear tight against and flush with surface of sheathing. Do not countersink.
 5. Locate fasteners minimum 3/8 inch from edges and ends of sheathing panels, tight against and flush with surface of sheathing.

3.2 AIR/WATER-INFILTRATION BARRIER APPLICATION

- A. Air/Water-Infiltration Barrier (Polyolefin): Cover wall sheathing with building wrap as indicated.
1. Comply with manufacturer's written instructions.
 2. Cover upstanding flashing with 4-inch (100-mm) overlap.
 3. Seal seams, edges, and penetrations with tape.
 4. Extend into jambs of openings and seal corners with tape.
- B. Self-Adhered Air/Water Barrier: Comply with manufacturer's instructions for application to fiberglass faced sheathing.
1. Precut pieces of air & vapor barrier into easily-handled lengths.
 2. Remove silicone-coated release paper and position membrane carefully before placing length horizontally against the surface.
 3. Begin installation at the base of the wall placing top edge of membrane immediately below any masonry reinforcement or ties protruding from substrate.
 4. When properly positioned, place against surface by pressing firmly into place. Roll membrane with extension-handled countertop roller immediately after placement.
 5. Overlap horizontally-adjacent pieces 2 inches and roll seams.
 6. Subsequent sheets of membrane applied above must be positioned immediately below masonry reinforcement or ties. Bottom edge must be slit to fit around reinforcing wires or ties, and membrane must overlap the membrane sheet below by 2 inches (50 mm). Roll firmly into place.
 7. Continue the membrane into all openings in the wall, such as doors, windows, etc., and terminate at points that will prevent visibility from interior.

GYPSUM SHEATHING

8. Coordinate the installation of air & vapor barrier with roof installer to ensure continuity of membrane with rooftop air & vapor membrane.
 9. At end of each working day seal top edge of air & vapor barrier to substrate with termination mastic.
 10. Do not allow the rubberized asphalt surface of the air & vapor barrier membrane to come in contact with polysulfide sealants, creosote, uncured coal tar products or EPDM.
 11. Do not expose air & vapor barrier membrane to sunlight for more than thirty days prior to enclosure.
 12. Inspect installation prior to enclosing and repair punctures, damaged areas and inadequately lapped seams with a patch of the membrane sized to extend 6 inches in all directions from the perimeter of the affected area.
- C. Liquid Applied Air/Water Barrier: Comply with manufacturer's instructions for application to fiberglass faced sheathing.
1. Application of Fluid Applied Membrane:
 - Spray or trowel apply a continuous uniform film at minimum of 60 mils wet film thickness using multiple, overlapping passes.
 - When spraying use a cross-hatching technique (alternating horizontal and vertical passes) to ensure even thickness and coverage.
 - When spraying use high pressure, multi-component, airless spray equipment approved by material manufacturer.
 - Carry membrane into any openings a minimum of 2 inches.
 2. Application of Transition Membrane:
 - After allowing the Fluid Applied Membrane to cure to tack-free, apply transition membrane with a minimum overlap of 3 inches onto each surface at all beams, columns and joints as indicated in detail drawings.
 - Tie in to window and door frames, spandrel panels, roof and floor intersections and changes in substrate.
 - Use pre-cut, easily handled lengths for each location.
 - Remove silicone-coated release paper and position membrane flashing carefully before placing it against the surface.
 - When properly positioned, place against surface by pressing firmly into place by hand roller.
 - Overlap adjacent pieces 2 inches and roll all seams with a hand roller.
 - Seal top edge of flashing with termination mastic.
 3. Application of Flexible Membrane Wall Flashing:
 - Precut pieces of flashing to easily handled lengths for each location.
 - Remove silicone-coated release paper and position flashing carefully before placing it against the surface.
 - When properly positioned, place against surface by pressing firmly into place by hand roller. Fully adhere flashing to substrate to prevent water from migrating under flashing.
 - Overlap adjacent pieces 2 inches and roll all seams with a hand roller.
 - Trim bottom edge 1/2 inch back from exposed face of the wall. Flashing must not be permanently exposed to sunlight.
 - At heads, sills and all flashing terminations, turn up ends a minimum of 2 inches and make careful folds to form an end dam, with the seams sealed.
 - Seal top edge of flashing with termination mastic.

GYPSUM SHEATHING

Do not allow the rubberized asphalt surface of the flashing membrane to come in contact with poly-sulfide sealants, creosote, uncured coal tar products or EPDM.

3.3 CLEANING

- A. Clean any stains on materials that would be exposed in the completed work using procedures as recommended by manufacturer.

3.4 PROTECTION

- A. Remove any masking materials after installation.
- B. Protect air/water barriers from the effects of sunlight.
- C. Schedule work to ensure that the air/water barrier is covered as soon as possible after installation. Protect air/water barriers from damage during subsequent operations. Comply with manufacturer's recommendations for application of temporary UV protection such as dark plastic sheet or tarpaulins.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Blanket insulation for framed construction.
 - 2. Related accessories.
- B. Related Sections:
 - 1. Section 07 22 00 – Roof and Deck Insulation.

1.2 REFERENCES

- A. ASTM C272 – Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions.
- B. ASTM C553 – Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- C. ASTM C578 – Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
- D. ASTM C665 – Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- E. ASTM C1320 – Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
- F. ASTM D2103 – Polyethylene Film and Sheeting.
- G. ASTM D4397 – Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.
- H. ASTM D5116 – Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products.
- I. ASTM E84 – Test Method for Surface Burning Characteristics of Building Materials.
- J. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.

1.3 SUBMITTALS

- A. Product Data:
 - 1. Product Data: For each type of product indicated.
 - 2. For adhesives used at Project site, include printed statement of VOC content.

3. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content, the manufacturer, and the source of the recycled content data.
 4. For glass-fiber products, include printed statement of VOC content and ASTM D 5116 emission test results.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
- C. Research/Evaluation Reports: For foam-plastic insulation from ICC-ES.
- 1.4 QUALITY ASSURANCE
- A. For Fire-Rated Assemblies, insulation shall be tested in accordance with ASTM E84. Flame-spread rating of insulation materials must not exceed 25, smoke density must not exceed 450.
 - B. Materials used in fire-rated assemblies must bear the U.L. or other approved testing laboratory classification marking.
- 1.5 DELIVERY, HANDLING, AND STORAGE
- A. Deliver and store insulation in the manufacturer's original packaging, clearly identified with manufacturer's name, and name, type, and thickness of insulation.
 - B. Store insulation indoors, protected from moisture and other sources of damage.
 - C. Follow additional requirements of the manufacturer.
 - D. Delivery, handling and storage must be in accordance with Section 01 65 00 – Product Delivery Requirements.
- 1.6 PROJECT CONDITIONS
- A. Do not install insulation of types specified herein in lieu of materials specified in Section 07 84 00 – Firestopping or Section 07 84 43 – Joint Firestopping.
 - B. Do not install insulation until building is sufficiently enclosed or protected against absorption of moisture by the insulation, and do not install insulation unless supporting framing and surrounding construction is complete and in a thoroughly dry condition.

PART 2 PRODUCTS

2.1 SUSTAINABILITY REQUIREMENTS

- A. Indoor Air Quality: Provide glass-fiber blanket insulation complying with either of the following:
 1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.

THERMAL INSULATION

2. Low Emitting: Insulation tested according to ASTM D5116 and shown to emit less than 0.05-ppm formaldehyde.
- B. Recycled Content: Provide blankets with recycled content such that postconsumer recycled content plus one-half of pre-consumer recycled content constitutes a minimum of 10 percent by weight.

2.2 BLANKET INSULATION

- A. Faced Blanket Insulation: Composed of glass or other mineral fiber with formaldehyde-free binders.
 1. Fire-Rated Assemblies: FSK-25 (Fiber-Scrim-Kraft) facer laminated to glass or other mineral fiber insulation as dictated by tested fire-resistant assembly.
 - a. ASTM C665, Type III (blanket with reflective facing), Class A (Flame Spread 25 or less), Category 1 (facing is a vapor retarder).
 - b. Permeability: ASTM E96, 0.05 perms.
 - c. Acceptable Manufacturers/Products:
 - 1) Johns Manville; Formaldehyde-Free FSK-25 Batts.
 - 2) Knauf; EcoBatt Insulation with FSK-25 Facer.
 - 3) CertainTeed; SI CertaPro Thermal FSK-25 Faced Batts.
 2. Non-Fire-Rated Assemblies: Kraft faced glass fiber insulation,
 - a. ASTM C665, Type II (blanket with non-reflective facing), Class C (facing not rated), Category 1 (facing is a vapor retarder).
 - b. Permeability: ASTM E96, 1.0 perms.
 - c. Acceptable Manufacturers/Products:
 - 1) Johns Manville; Formaldehyde-Free Kraft-Faced Batts.
 - 2) Knauf; EcoBatt Insulation with Kraft Facer.
 - 3) CertainTeed; SI CertaPro Thermal Kraft Faced Batts.
- B. Unfaced Blanket Insulation: ASTM C665; Type 1 (blanket without facings); glass fiber or other mineral fiber as dictated by tested fire-resistant assembly.
 1. Acceptable Manufacturers/Products:
 - a. Knauf EcoBatt Unfaced Insulation.
 - b. Johns Manville; Formaldehyde-free Fiber Glass Insulation.
 - c. CertainTeed; Sustainable Batt Insulation.
- C. Width: As required to fit framing.

2.3 INSTALLATION MATERIALS

- A. Adhesive for Bonding Insulation:
 1. Type recommended by insulation manufacturer, compatible with insulation and substrate, with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates, and complying with requirements for fire performance characteristics of insulation with which used.
 2. VOC Content: Not more than 80 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Mechanical Fasteners:

THERMAL INSULATION

1. Type recommended by insulation manufacturer and capable of securely and rigidly fastening insulation in place.
 2. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
 - a. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - b. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch diameter; length to suit depth of insulation.
 - c. Acceptable Manufacturers/Products:
 - 1) AGM Industries, Inc.
 - 2) Gemco.
 3. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
 - a. Angle: Formed from 0.030-inch-thick, perforated, galvanized carbon-steel sheet with each leg 2 inches square.
 - b. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105-inch diameter; length to suit depth of insulation.
 - c. Acceptable Manufacturers/Products:
 - 1) AGM Industries, Inc.
 - 2) Gemco.
 4. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.
 - a. Acceptable Manufacturers/Products:
 - 1) AGM Industries, Inc.
 - 2) Gemco.
- C. Vapor Retarder Sheet at Walk-In Units: Polyethylene Vapor Retarders: ASTM D 4397, 10 mil thick sheet.
1. Permeability: ASTM E96, 0.1 perms maximum.
- D. Slip Sheet at Walk-In Units: ASTM D 4397, 6 mil thick polyethylene sheet.
- E. Vapor Retarder Sheet at Framed Construction: Reinforced-polyethylene sheet with outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nonwoven grid of nylon cord or polyester scrim and weighing not less than 20 lb/1000 sq. ft.
1. Permeability: ASTM E96, 0.1 perms maximum.
 2. Fire-Rated Assemblies: At Class B or Class C Fire-Rated Assemblies provide sheet with Surface-Burning Characteristics including maximum flame-spread and smoke-developed indexes of 75 and 200, respectively, per ASTM E 84.
- F. Vapor Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder sheet.
- G. String Wire: 18 gauge galvanized.

PART 3 EXECUTION

3.1 EXAMINATION

THERMAL INSULATION

- A. Verify that surfaces to receive thermal insulation are satisfactory for their installation.
- B. Verify that substrate, adjacent materials, and insulation are dry.
- C. If unsatisfactory conditions exist, do not commence installation until such conditions have been corrected. Beginning installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Blanket Insulation:

- 1. Install insulation where indicated, as specified, and in accordance with ASTM C 1320 and the manufacturer's printed instructions; fasten in place with manufacturer recommended fastening method.
- 2. Install with factory applied membrane facing toward building interior unless otherwise indicated. At unfaced blankets, install vapor retarder sheet after installing blankets. Ensure tight fit and continuous seal.
- 3. Install snugly between framing members, with ends snugly fitted between units and against adjacent construction. Batts must not be compressed in their installed positions.
- 4. Carefully cut and fit insulation around pipes, conduit, and other obstructions and penetrations.
- 5. Securely fasten insulation to eliminate any voids and prevent displacement under normal conditions of use in building.
- 6. Where door and window frames occur in framing, cut additional strips of insulation and hand-pack as necessary to thoroughly fill voids in and around such frames.
- 7. Do not fill indicated air spaces with insulation.
- 8. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
- 9. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- 10. For wood-framed construction, install faced blankets with stapling flanges by lapping blanket flange over flange of adjacent blanket. Maintain continuity of vapor retarder once finish material is installed.
- 11. Vapor-Retarder: Tape joints and ruptures in vapor-retarder facings and sheets, and seal each continuous area of insulation to ensure airtight installation.

END OF SECTION

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 07 22 00

ROOF AND DECK INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Insulation materials.
- B. Related Sections:
 - 1. Section 05 30 00 – Metal Decking.
 - 2. Section 07 21 00 – Thermal Insulation.
 - 3. Section 07 54 19 – Polyvinyl-Chloride Roofing.

1.2 REFERENCES

- A. ASTM C1280 – Application of Gypsum Sheathing Board.
- B. ASTM C578 – Rigid, Cellular Polystyrene Thermal Insulation.
- C. UL – Underwriters Laboratories: Fire Hazard Classifications; Fire Resistance Directory; Assemblies.

1.3 SYSTEM DESCRIPTION

- A. Roof Insulation System: Rigid board system consisting of gypsum sheathing, vapor barrier, and insulation; approved by roofing manufacturer, meeting requirements of CCR Title 24, specified requirements, and Reference Standards.

1.4 SUBMITTALS

- A. Submit under provisions of Sections 01 33 00 Submittal Procedures and 01 33 23 Shop Drawing, Product Data, and Samples.
- B. Product Data: Provide data on product characteristics, performance criteria, limitations.
- C. Manufacturer's Installation Instructions:
 - 1. Indicate special environmental conditions required for installation.
 - 2. Indicate adhesive recommendations.
 - 3. Indicate fastener recommendations and attachment rate.
 - 4. Indicate installation techniques.
- D. Manufacturer's Certificate:
 - 1. Certify that products meet or exceed specified requirements.
 - 2. Certify that insulation is approved by manufacturer for use with specified roofing membrane materials.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with 5 years' documented experience.
- B. Applicator: Company specializing in performing the work of this section with 2 years' documented experience and approved by manufacturer.

1.6 REGULATORY REQUIREMENTS

- A. Conform to CCR Title 24 for roof assembly fire hazard requirements.
- B. Underwriters Laboratories, Inc. (UL): Conform to requirements of indicated UL Assembly.

1.7 MOCK-UP

- A. Provide mock-up of materials of this Section and roofing materials of Section 07 54 19 – Polyvinyl-Chloride Roofing in accordance with Section 01 45 00 – Quality Control.
- B. Location and Size of Mock-Up: As directed by the CDCR Representative.
- C. Approved mock-up may remain as part of the Work.

1.8 PRE-INSTALLATION CONFERENCE

- A. Convene one week prior to commencing work of this Section in accordance with Section 01 31 19 – Project Meetings.
- B. Review installation procedures and coordination required with related Work.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01 65 00 – Product Delivery Requirements.
- B. Deliver products in manufacturer's original containers, dry, undamaged, seals and labels intact.
- C. Do not deliver foam-plastic insulation materials to Project site before installation time.
- D. Store products in weather protected environment, clear of ground and moisture.
- E. Protect against ignition at all times.
- F. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
- G. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.10 PROJECT CONDITIONS

- A. Do not install adhesives when temperature or weather conditions are detrimental to successful installation, or are not in compliance with manufacturers' recommendations.

PART 2 PRODUCTS

2.1 INSULATION MATERIALS

- A. General: Flame-spread rating must not exceed 25 and smoke density must not exceed 450, in conformance with CBC requirements.
- B. Insulation: ASTM C578 Type IV; Polystyrene, extruded cellular type, conforming to the following:
 - 1. Thermal Resistance: 5.0 per inch of thickness, 75 degrees F., 180-day aged value.
 - 2. Long-Term Thermal Resistance: 5.4 per inch of thickness, 40 degrees F., aged value.
 - 3. Thickness: Thickness required to achieve minimum R-30 value unless other wise shown or noted.
 - 4. Layers: Two, minimum.
 - 5. Board Size: Manufacturer's standard board size.
 - 6. Compressive Strength: Minimum 25 PSI.
 - 7. Flexural Strength: Minimum 75 PSI.
 - 8. Water Absorption: Maximum 0.10 percent by volume.
 - 9. Edges: Square edges.
- C. Tapered Insulation: ASTM C578, Type IV, factory tapered extruded polystyrene, conforming to the following, and as indicated on the Drawings:
 - 1. Thermal Resistance: 5.0 per inch of thickness, 75 degrees F., 180-day aged value.
 - 2. Long-Term Thermal Resistance: 5.4 per inch of thickness, 40 degrees F., aged value.
 - 3. Thickness: Maximum 7 inches per layer.
 - 4. Board Size: Manufacturer's standard board size, tapered at specified slope.
 - 5. Compressive Strength: Minimum 25 PSI.
 - 6. Water Absorption: Maximum 0.10 percent by volume.

2.2 MANUFACTURERS/PRODUCTS

- A. Acceptable Manufacturers/Products, as listed below, and meeting the criteria and requirements specified herein, will be acceptable:
 - 1. DuPont; STYROFOAM Brand SM Extruded.
 - 2. Owens Corning Insulating Systems, LLC.; FOAMULAR Thermapink Extruded.
 - 3. Kingspan; GreenGuard XPS Board CM.
 - 4. For manufacturers not listed, comply with substitution requirements in Section 01 25 00 – Substitution Procedures.

2.3 FASTENERS, ASPHALT GLAZE COAT, AND/OR ADHESIVES

- A. Appropriate for each component, purpose intended, and approved by UL, FM, and in accordance with manufacturer's installation instructions.

PART 3 EXECUTION

ROOF AND DECK INSULATION

3.1 INSTALLATION

- A. Installation of materials specified in this Section is specified in Section 07 54 19 – Polyvinyl-Chloride Roofing.

END OF SECTION

SECTION 07 54 19

POLYVINYL-CHLORIDE (PVC) ROOFING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roofing membrane.
2. Membrane base flashings.
3. PVC laminated sheet metal flashings.
4. Accessory products and attachment components.
5. Cover board, over roof insulation.
6. Installation of roof insulation materials specified in Section 07 22 00 – Roof and Deck Insulation.
7. Vapor retarder.
8. Substrate (thermal barrier) board, at metal and concrete roof decks.

B. Related Sections:

1. Section 01 22 00 – Unit Prices.
2. Section 01 25 00 – Substitution Procedures.
3. Section 05 30 00 – Metal Decking.
4. Section 06 10 00 – Rough Carpentry.
5. Section 06 16 00 – Sheathing.
6. Section 07 22 00 – Roof and Deck Insulation.
7. Section 07 60 00 – Flashing and Sheet Metal.
8. Section 07 92 00 – Joint Sealants.

1.2 REFERENCES

- A. American National Standards Institute/Single Ply Roofing Institute (ANSI/SPRI):
1. ANSI/SPRI IA-1 – Standard Field Test Procedure for Determining the Uplift Resistance of Insulation and Insulation Adhesives over Various Substrate.
 2. ANSI/SPRI RP-4-02 – Wind Design Standard for Ballasted Single-Ply Roofing Systems.
 3. ANSI/SPRI/ES-1-03 – Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.
- B. American Society of Civil Engineers (ASCE): ASCE 7 – Minimum Design Loads for Buildings and Other Structures.
- C. ASTM International (formerly American Society for Testing and Materials) (ASTM):
1. ASTM C1177 – Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 2. ASTM C1278 – Standard Specification for Fiber-Reinforced Gypsum Panel.
 3. ASTM C1549 – Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
 4. ASTM D570 – Standard Test Method for Water Absorption of Plastics.

POLYVINYL-CHLORIDE (PVC) ROOFING

5. ASTM D751 – Standard Test Methods for Coated Fabrics.
 6. ASTM D1004 – Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
 7. ASTM D1079 – Standard Terminology Relating to Roofing, Waterproofing, and Bituminous Materials.
 8. ASTM D1204 – Standard Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature.
 9. ASTM D2136 – Standard Test Method for Coated Fabrics – Low-Temperature Bend Test.
 10. ASTM D2565 – Standard Practice for Operating Xenon-Arc Exposure of Plastics Intended for Outdoor Applications.
 11. ASTM D3045 – Standard Practice for Heat Aging of Plastics Without Load.
 12. ASTM D4263 – Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
 13. ASTM D4434 – Standard Specification for Poly(Vinyl Chloride) Sheet Roofing.
 14. ASTM D5602 – Standard Test Method for Static Puncture Resistance of Roofing Membrane Specimens.
 15. ASTM D5635 – Standard Test Method for Dynamic Puncture Resistance of Roofing Membrane Specimens.
 16. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
 17. ASTM E108 – Standard Test Methods for Fire Tests of Roof Coverings.
 18. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.
 19. ASTM E903 – Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
 20. ASTM E1980 – Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
 21. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
 22. ASTM G154 – Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials.
- D. California Code of Regulations (CCR), Title 24, Part 2: California Building Code (CBC).
- E. Environmental Protection Agency (EPA): Energy Star Certified Roof Products List.
- F. Factory Mutual (FM) and Factory Mutual Global – Factory Mutual Engineering Corporation (FMG): Roof Assembly Classifications:
1. FM Approvals: RoofNav, listing of FM approved roofing products and assemblies.
 2. FM – Approval Guide.
 3. FM 4450 – Approval Standard for Class 1 Insulated Steel Deck Roofs.
 4. FM 4470 – Approval Standard for Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR), and Liquid-Applied Roof Assemblies for Use in Class 1 and Noncombustible Roof Deck Construction.
 5. FM Global Property Loss Prevention Data Sheets: 1-28 Wind Design.
 6. FM Global Property Loss Prevention Data Sheets: 1-29 Roof Deck Securement and Above-Deck Roof Components.
- G. German Institute for Standardization (DIN) – Standard 51130.

POLYVINYL-CHLORIDE (PVC) ROOFING

H. National Roofing Contractors Association (NRCA): Roofing and Waterproofing Manual.

I. Underwriters Laboratories (UL):

1. Fire Hazard Classifications; Fire Resistance Products, Systems and Designs, UL Product iQ.
2. UL 790 – Standard for Standard Tests Methods for Fire Tests of Roof Coverings.

1.3 SYSTEM DESCRIPTION

A. Adhered thermoplastic PVC sheet roofing system. See Schedule in Part 3 below for specific roofing system descriptions.

1. PVC membrane.
2. Cover board.
3. Extruded polystyrene insulation (XPS). Expanded polystyrene insulation (EPS) and polyisocyanurate (Polyiso) insulation are not acceptable.
4. Vapor retarder for roof sections subject to risk of vapor flow or accumulation of condensation. Locations as indicated on Drawings.
5. Thermal barrier board for roof sections built on metal deck or similar non-rated substrates.

1.4 SYSTEM REQUIREMENTS

A. General:

1. Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.
2. Comply with manufacturer details for PVC Single Ply Membrane, following basic NRCA recommended details, as approved by membrane manufacturer.
3. External Fire Resistance: UL Class A, including field and all parapet curbs.
4. Field-of-Roof Wind Uplift: Minimum FM 1-90.
5. Corner or Zone 3 Uplift Design Pressure by Project Engineer: See Appendix A Structural Calculations and Drawings for the extent of “Corner” or Zone 3.
6. Perimeter or Zone 2 Uplift Design Pressure by Project Engineer: See Appendix A Structural Calculations and Drawings for the extent of “Perimeter” or Zone 2.
7. Field-of-Roof or Zone 1 Uplift Design Pressure by Project Engineer: See Appendix A Structural Calculations and Drawings for the extent of “Field” or Zone 1.
8. Secondary Interior Field-of-Roof or Zone 1’ (Zone 1 Prime) Uplift Design Pressure by Project Engineer: See Appendix A Structural Calculations and Drawings for the extent of “Secondary Field” or Zone 1’ (Prime).
9. See ASCE 7 for definition and extent of Zones 1’, 1, 2 and 3.
10. Completed installation must comply with indicated CBC Design Number, where occurs.
11. Completed roof surfaces must not pond water.
12. Roofing materials to be compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

B. Installation and materials approved by roofing manufacturer, meeting requirements of CCR Title 24, specified requirements, and Reference Standards.

C. FM Listing:

POLYVINYL-CHLORIDE (PVC) ROOFING

1. Provide roofing membrane, base flashings, and component materials that comply with requirements in FM 4450 and FM 4470 as part of a membrane roofing system and that are listed in FM's "Approval Guide" for Class 1 or noncombustible construction, as applicable.
 2. Identify materials with FM markings.
 3. Each roof assembly must have current RoofNav report and assembly number showing compliance with FM requirements and all other criteria specified herein or shown on Drawings.
 - a. Exception: Where insulation thickness for the project roof exceeds the maximum thickness shown in RoofNav assemblies, the roof system is permissible provided that the roof system matches all other criteria in this specification and in the listed RoofNav assembly.
 4. For roof structures using plywood substrate (roof deck), where no current RoofNav assembly number can be found, the roof assembly shall be fastened to the plywood per structural requirements and in accordance with RoofNav assembly numbers which have the following:
 - a. Assembly Characteristics:
 - 1) Roof System: Single-ply system.
 - 2) Application: New roof or reroof.
 - 3) Cover Securement: Adhered.
 - 4) Deck Type: Steel or existing.
 - 5) Slope: Minimum 0.5 inches in 12 inches.
 - b. Assembly Ratings:
 - 1) Wind Uplift: Per structural calculations, with minimum 90 psf.
 - 2) Internal Fire: NC or 1.
 - 3) Exterior Fire: Class A.
 - 4) Hail: MH or SH.
- D. Conform to CCR Title 24 for roof assembly fire hazard requirements.
- E. Underwriters Laboratories, Inc. (UL): Conform to requirements of indicated UL Assembly.
- F. Energy Star Listing: Roofing system must be listed on the ENERGY STAR "Certified Roof Products List" for low-slope roof products.
- G. Fire-Test-Response Characteristics/Requirements:
1. Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction.
 2. Materials must be identified with appropriate markings of applicable testing and inspecting agency.
 3. Exterior Fire-Test Exposure: For application and roof slopes indicated:
 - a. Class A per UL 790, for all roof decks.
 - b. Class A per ASTM E108, for all roof decks, except combustible decks.
- H. Energy Performance: Provide roofing system with Solar Reflectance Index not less than 78 when calculated in accordance with ASTM E1980 based on testing identical products by a qualified testing agency.

- I. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.
- J. Roofing components must be secured to the structural deck in compliance with FMG Property Loss Prevention Data Sheet 1-29 for the more restrictive of wind loads determined by ASCE/SEI 7 and FMG Property Loss Prevention Data Sheet 1-28.

1.5 SUBMITTALS

- A. Submit under provisions of Sections 01 33 00 – Submittal Procedures and 01 33 23 – Shop Drawings, Product Data, Samples.
- B. Product Data: Provide data on product characteristics, performance criteria, limitations.
 - 1. For adhesives and sealants, include printed statement of VOC content.
 - 2. For roof materials, documentation indicating that roof materials comply with Solar Reflectance Index requirement.
 - 3. For adhesives and sealants used inside the weatherproofing system, documentation indicating that products comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Manufacturer's Installation Instructions:
 - 1. Indicate special environmental conditions required for installation.
 - 2. Indicate adhesive recommendations.
 - 3. Shop Drawings:
 - a. Indicate fastener patterns and attachment rate meeting specified FM Listing for each roof area and to address each uplift condition.
 - b. Include plans, elevations, sections, details, and attachments to other Work.
 - c. Include base flashings and membrane terminations.
 - d. Include layouts for membrane and insulation board, including tapered insulation
 - 4. Indicate installation techniques.
- D. Manufacturer's Certificates and Reports:
 - 1. Certify that products meet or exceed specified requirements.
 - 2. Certify that the roof membrane system has been installed in accordance with the manufacturer's directions.
 - 3. Certify that insulation is approved by manufacturer for use with specified roofing membrane materials.
 - 4. Certify that material thickness for the supplied material is within 2 mils of specified thickness.
 - 5. Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "System Description" article above.
 - 6. Submit evidence of meeting design requirements.
 - 7. Submit current RoofNav report showing exact system to be installed and corresponding RoofNav assembly number. RoofNav report must include statement that the corresponding RoofNav assembly number meets minimum System Requirements for Wind Uplift.

- E. System Performance: Provide documentation that the roofing components submitted meet or exceed the system performance requirements as an assembly.
- F. Maintenance Data: Provide documentation for maintenance of roofing system to be included in maintenance manuals.
- G. Inspection Report: Provide copy of roofing system manufacturer's inspection report of completed roofing installation.
- H. Submittal Schedule:
1. Submittal must include the following documents.

R=Required	Literature	Sample
1. Roofing Membrane and Flashing Sheets (reinforced and non-reinforced)	R	R
2. Walkway Protection (each type)	R	R
3. Adhesive – Membrane	R	
4. Fastener(s) – Preclad Metal	R	R
5. Securement / Termination Bar	R	
6. PVC cord	R	
7. Sealant (and primer)	R	
8. Pipe Supports	R	
9. Tape Separator	R	
10. Manufacturer sample warranty	R	
11. Manufacturer approved applicator letter	R	
12. Manufacturer confirmation of specification review and acceptance, and intent to warrant	R	
13. Intended Roof Membrane Layout (Plan)	R	
14. Intended Rigid Roof Insulation Layout (Plan), including fastener patterns	R	
15. Rigid Roof Insulation (all types)	R	
16. FM Global Approval Listing for entire roofing assembly	R	
17. FM Global Wind Uplift Listing for entire roofing assembly	R	
18. RoofNav Report	R	
19. UL Approval Listing	R	
20. Adhesion Test Results	R	

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with the following:
- 20 years' documented experience with manufacturing PVC roofing.
 - Documentation of a PVC roofing system that has been installed for a minimum of 20 years and has a 10 year, or longer, warranty.
 - FMG approval for membrane roofing system identical to that used for this Project.
- B. Applicator: Company specializing in performing the work of this Section with five years' documented experience and approved by manufacturer.

POLYVINYL-CHLORIDE (PVC) ROOFING

1.7 QUALITY ASSURANCE

- A. Source Limitations: Obtain components for membrane roofing system from or approved by roofing membrane manufacturer.

B. Preliminary Roofing Conference:

1. Before starting roof deck construction and/or one week prior to commencing work of this Section, conduct conference at Project site.
2. Prepare an agenda, preside over the conference, and record minutes, and distribute copies within two days after the conference to participants, with two copies to the CDCR Representative.
3. Meet with the CDCR Representative, Subcontractor, testing and inspecting agency representative, roofing installer, roofing system manufacturer's representative, deck installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
4. Review methods and procedures related to roof deck construction and roofing system including.
5. Review methods and procedures related to roofing installation, including manufacturer's written instructions, approved submittals, and Contract Documents.
6. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
7. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
8. Review structural loading limitations of roof deck during and after roofing.
9. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
10. Review governing regulations and requirements for insurance and certificates if applicable.
11. Review temporary protection requirements for roofing system during and after installation.
12. Review roof observation and repair procedures after roofing installation.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.

1. Protect stored liquid material from direct sunlight.
2. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Roof Insulation:

1. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources.
2. Store in a dry location.

3. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Do not install materials when existing or forecasted temperature or weather conditions are detrimental to successful installation, or are not in compliance with manufacturers' recommendations, written instructions or warranty requirements.

1.10 WARRANTY

- A. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.

B. Manufacturer's Warranty:

1. Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
2. Warranty includes membrane roofing, base flashings, walkway products, roof insulation, fasteners, cover boards, substrate boards, roofing accessories, and other components of roofing system.
3. Warranty must be Non-Prorated and provide No Dollar Limit (NDL).
4. Warranty Period: Manufacturer's maximum warranty available without added cost, minimum 20 years from date of completed installation.

PART 2 PRODUCTS

2.1 BASE PRODUCTS

- A. Products name or identified by make or model number, or other designation and described below are base products. Base products establish the standards of type, function, dimension, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.
- B. Products of manufacturers not listed may be proposed for substitution subject to the requirements of Section 01 25 00 – Substitution Procedures.

2.2 PRODUCTS

A. PVC Roofing Membrane with Backing:

1. Membrane: ASTM D4434, Type III or Type II Grade 1; reinforced Polyvinyl Chloride sheet; 80 mils (0.080 inch) thick; white exposed face color; with factory-applied felt backing; conforming to the following criteria:

<u>Properties</u>	<u>Test</u>	<u>Min. Results</u>
Tearing Strength, lbf (N)	ASTM D1004	10 lbf min. (45 Newtons)

POLYVINYL-CHLORIDE (PVC) ROOFING

Weight Change After Immersion in Water	ASTM D570	3.0 % max.
Seam Strength, min., (% of breaking strength)	ASTM D751	75%
Retention of Properties After Heat Aging	ASTM D3045	90% of original
Tensile Strength, min., (% of original)	ASTM D751	90%
Elongation min. (% of original)	ASTM D751	90%
Low Temperature Ben, -40 deg. F (-40 degrees C)	ASTM D2136	Pass
Accelerated Weathering Test	ASTM G154	
Cracking (7x magnification)	--	None @ 5,000 hours
Discoloration (by observation)	--	Negligible @ 5,000 hours
Crazing (7x magnification)	--	None @ 5,000 hours
Static Puncture Resistance, 33 lbf	ASTM D5602	Pass
Dynamic Puncture Resistance, 14.7 ft-lbf	ASTM D5635	Pass
Breaking Strength (lbf/in.)	ASTM D751	200 lbf/in
Tear Resistance, min. (lbf)	ASTM D1004	10 lbf
Linear Dimensional Change (shrinkage) %	ASTM D1204	0.5% typical
Solar Reflectance:	ASTM C1549	0.70 min.
Thermal Emissivity:	ASTM E903	0.75 min.
Solar Reflective Index:	ASTM E1980	78 min. for<2:12 29 min. for>2:12

Energy Smart Color: White.

2. Acceptable Manufacturers/Products:

a. Basis of Design, meeting the criteria and requirements specified herein:

- 1) Sika Sarnafil; G410FB Adhered Feltback Single Ply Roofing Membrane.
- 2) For manufacturers/products not listed, comply with substitution requirements in Section 01 25 00 – Substitution Procedures.

B. PVC Roofing Membrane without Backing:

1. Membrane: ASTM D4434, Type III or Type II Grade 1; reinforced Polyvinyl Chloride sheet; 80 mils (0.080 inch) thick; white exposed face color; no backing; conforming to the following criteria:

<u>Properties</u>	<u>Test</u>	<u>Min. Results</u>
Tearing Strength, lbf (N)	ASTM D1004	10 lbf min. (45 Newtons)
Weight Change After Immersion in Water	ASTM D570	3.0 % max.
Seam Strength, min., (% of breaking strength)	ASTM D751	75%
Retention of Properties After Heat Aging	ASTM D3045	--
Tensile Strength, min., (% of original)	ASTM D751	90%
Elongation min. (% of original)	ASTM D751	90%
Low Temperature Ben, -40 deg. F (-40 degrees C)	ASTM D2136	Pass
Accelerated Weathering Test	ASTM G154	
Cracking (7x magnification)	--	None @ 5,000 hours
Discoloration (by observation)	--	Negligible @ 5,000 hours
Crazing (7x magnification)	--	None @ 5,000

POLYVINYL-CHLORIDE (PVC) ROOFING

		hours
Static Puncture Resistance, 33 lbf	ASTM D5602	Pass
Dynamic Puncture Resistance, 14.7 ft-lbf	ASTM D5635	Pass
Breaking Strength (lbf/in.)	ASTM D751	200 lbf/in
Tear Resistance, min. (lbf)	ASTM D1004	10 lbf
Linear Dimensional Change (shrinkage) %	ASTM D1204	0.5 typical
Solar Reflectance:	ASTM C1549	0.70 min.
Thermal Emissivity:	ASTM E903	0.75 min.
Solar Reflective Index:	ASTM E1980	78 min. for<2:12 29 min. for>2:12

Energy Smart Color: White.

2. Acceptable Manufacturers/Products:
 - a. Basis of Design, meeting the criteria and requirements specified herein:
 - 1) Sika Sarnafil; G410 Adhered Single Ply Roofing Membrane.
 - 2) For manufacturers/products not listed, comply with substitution requirements in Section 01 25 00 – Substitution Procedures.
- C. Sheet Membrane Flashing: Roofing manufacturer's standard sheet flashing of same material type, reinforcement, and color as PVC sheet membrane; minimum 60 mil thickness.
- D. PVC-Laminated Sheet Metal Flashing: 25-gauge G90 galvanized steel sheet laminated to 20 mil non-reinforced membrane in soft white color used for flashing and edge metal detailing.
 - E. Cover Board:
 1. Cover board: Siliconized gypsum sheathing board; with fiberglass facer mat complying with ASTM C1177, or non-faced homogenous composition of gypsum and cellulose fiber complying with ASTM C1278.
 - a. 1/2-inch minimum thickness.
 2. Acceptable Manufacturers/Products, as listed below and meeting the criteria and requirements specified herein, will be acceptable:
 - a. Georgia Pacific; DensDeck Prime Roof Board.
 - b. USG; Securock Gypsum-Fiber Roof Board.
 - c. National Gypsum; DEXcell FA Glass Mat Roof Board.
 - d. For manufacturers/products not listed, comply with substitution requirements in Section 01 25 00 – Substitution Procedures.
 - F. Insulation: As specified in Section 07 22 00 – Roof and Deck Insulation.
 - G. Vapor Retarder: Fire Resistant Sheet Vapor Retarder.
 1. Conform to UL and FM requirements for the product and the roof assembly.
 2. Permeability rating to be 0.03 perms maximum.

H. Thermal Barrier Board over Metal Deck or Similar Non-Rated Substrate:

1. Thermal Barrier Board: Gypsum sheathing faced with fiberglass mat surface front and back complying with ASTM C1177, or non-faced homogenous composition of gypsum and cellulose fiber complying with ASTM C1278.
 - a. 5/8-inch thick Type 'X'.
2. Acceptable Manufacturers/Products, as listed below and meeting the criteria and requirements specified herein, will be acceptable:

POLYVINYL-CHLORIDE (PVC) ROOFING

- a. Georgia Pacific; DensDeck Roof Board.
 - b. USG; Securock Glass Mat or Glass Fiber Roof Board.
 - c. National Gypsum; DEXcell FA Glass Mat Roof Board.
 - d. For manufacturers/products not listed, comply with substitution requirements in Section 01 25 00 – Substitution Procedures.
- I. Cants: 4-inch x 4-inch pressured-treated perlite, or as approved by roofing system manufacturer for warranted system.
- J. Nailers at Roof Edges, Parapet Caps and Curbs:
- 1. Wood: #2 wolmanized pressure-treated wood.
 - 2. Metal: One of the following where most appropriate for roofing conditions and FM approval:
 - a. 20-gauge galvanized metal box assembly; ANSI/SPRI/FM 4435/ES-1 tested and approved with FM ratings indicated in “System Requirements” Article herein.
 - 1) Acceptable Manufacturers/Products, as listed below and meeting the criteria and requirements specified herein, will be acceptable:
 - a) Hickman Edge Systems; EdgeBox R1.
 - b) For manufacturers/products not listed, comply with substitution requirements in Section 01 25 00 – Substitution Procedures.
 - b. Heavy-gauge extruded aluminum special shapes and sizes; ANSI//SPRI/FM 4435/ES-1 tested and approved with FM ratings indicated in “System Requirements” Article herein.
 - 1) Acceptable Manufacturer/Products, as listed below and meeting the criteria and requirements specified herein, will be acceptable:
 - a) Metal-Era Inc.; Eliminator-T.
 - b) For manufacturers/products not listed, comply with substitution requirements in Section 01 25 00 – Substitution Procedures.
 - c. Where FM approval is not required, 18-gauge pair of hot-dipped galvanized metal “C” profile closures nested to create a custom-fabricated box profile; see Drawings.
 - 1) Must be able to resist forces as indicated in “System Requirements” Article herein.
 - 2) Must be able to be adjusted as required for particular roof slope during installation.
- K. Adhesives:
- 1. Chemically compatible with roof system components.
 - 2. Roofing manufacturer’s recommended bonding adhesives for fully adhered membrane.
 - 3. Adhesives and sealants that are used inside the weatherproofing system must comply with the following limits for VOC content when calculated in accordance with 40 CFR 59, Subpart D (EPA Method 24):
 - a. Plastic Foam Adhesives: 50 g/L.
 - b. Gypsum Board and Panel Adhesives: 50 g/L.
 - c. Multipurpose Construction Adhesives: 70 g/L.
 - d. Fiberglass Adhesives: 80 g/L.
 - e. Contact Adhesives: 80 g/L.
 - f. Plastic Cement Welding Compounds: 350 g/L.
 - g. PVC Welding Compounds: 510 g/L.
 - h. Other Adhesives: 250 g/L.

- i. Single-Ply Roof Membrane Sealants: 450 g/L.
- j. Non-membrane Roof Sealants: 300 g/L.
- k. Sealant Primers for Nonporous Substrates: 250 g/L.
- l. Sealant Primers for Porous Substrates: 775 g/L. n.

L. Cold Applied Waterproofing:

- 1) Polyurethane-modified methyl methacrylate reinforced roof coating system base coat, two-part moisture-curing for use with a compatible top coat.
 - a) Basis of design product: Tremco, AlphaGuard PUMA Base Coat.
 - b) Combustion Characteristics, UL790: Maintains combustion characteristics of existing roof system.
 - c) Volatile Organic Compounds (VOC), maximum, ASTM D3960: 0 g/L.
 - d) Tensile Strength, ASTM D5147: 175 lbf/in (31 N/mm).
 - e) Elongation, Reinforced, ASTM D5147: 40 percent.
 - f) Crack Bridging, ASTM D5147: Pass - 2 mm.
 - g) Hardness, Shore A, minimum, ASTM D2240: 93.
 - h) Minimum Thickness, Reinforced Base Coat: 80 mils (2.0 mm) wet total: Apply 40 mils (1.0 mm) wet, plus 40 mils (1.0 mm) wet over reinforcing fabric.
- 2) Polyurethane-modified methyl methacrylate roof coating system topcoat, two-component 0 VOC, UV resistant, for application over compatible base coat.
 - a) Basis of design product: Tremco, AlphaGuard PUMA Top Coat.
 - b) Combustion Characteristics, UL 790: Maintains combustion characteristics of existing roof system.
 - c) Volatile Organic Compounds (VOC), maximum, ASTM D3960: 0 g/L.
 - d) Tensile Strength, ASTM D5147: 175 lbf/in (30 N/mm).
 - e) Elongation, Reinforced, ASTM D5147: 40 percent.
 - f) Crack Bridging, ASTM D5147: Pass, 2 mm.
 - g) Hardness, Shore A, minimum, ASTM D2240: 93.
 - h) Solar Reflectance Index (SRI), minimum, ASTM E1980: 95.
 - i) Minimum Thickness: 32 mils (0.81 mm) wet over cured base coat.
- 3) Polyester Reinforcing and Protection Fabric: 100 percent stitch-bonded mildew-resistant polyester fabric intended for reinforcement of compatible fluid-applied membranes and flashings and as a protection layer under pavers or stone aggregates.
 - a) Basis of design product: Tremco, Permafab.
 - b) Tensile Strength, Minimum, ASTM D1682: 50 lbf (23 kg) avg..
 - c) Elongation, Minimum, ASTM D1682: 60 percent.
 - d) Tear Strength, Minimum, ASTM D1117: 16 lbf (7.3 kg) avg..
 - e) Weight: 3 oz./sq. yd (102 g/sq. m).
- 4) Primer, Methyl Methacrylate: Two-component primer for concrete and metal substrates for application of PUMA coatings.
 - a) Basis of design product: Tremco, AlphaGuard PUMA Primer - 107.
 - b) Coverage Rate: 1 gal/100 sq. ft (16 mils) (0.40 mm) wet.

M. Sealants: Roofing manufacturer's recommended sealants for fully adhered membrane.

N. Walkway Protection:

- 1. General: See Drawings for walkway protection locations and types.

POLYVINYL-CHLORIDE (PVC) ROOFING

2. Walkway must be 36 inches wide minimum, and 72 inches wide minimum at mechanical unit access panels and at locations of routine maintenance.
3. Gridded PVC Roof Walkway: A rolled-out open grid walkway protection mat used to protect roofing membrane from mechanical abuse, with cross directional top ribs and a drainage rating of V10 per DIN 51130.
 - a. Required Slip Resistance:
 - 1) Minimum slip resistant rating of 0.6/0.5 per ASTM F1677.
 - 2) Minimum certified slip resistant rating of R10 per DIN 51130.
 - b. Acceptable Manufacturers/Products: Basis of Design, meeting the criteria and requirements specified herein:
 - 1) Sika Sarnafil; Crossgrip XTRA.
 - 2) Or comparable products by approved roofing manufacturer.
 - 3) For manufacturers/products not listed, comply with substitution requirements in Section 01 25 00 – Substitution Procedures.
4. Weldable PVC Roof Walkway Membrane: A rolled-out walkway with textured surface used to protect roofing membrane from mechanical abuse.
 - a. Required Slip resistance:
 - 1) Walkway surface must have a textured raised pattern and a minimum static coefficient of friction of 0.5 when dry and 0.6 when wet.
 - a. Acceptable Manufacturers/Products: Basis of Design, meeting the criteria and requirements specified herein:
 - 1) Sika Sarnafil; Sarnatred V.
 - 2) Or comparable products by approved roofing manufacturer.
 - 3) For manufacturers/products not listed, comply with substitution requirements in Section 01 25 00 – Substitution Procedures.
- O. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, neoprene washers at fastener penetrations, and other accessories for complete weather tight installation.
 - P. Equipment:
 1. Screw guns: Depth, and torque sensitive.
 2. Generator.
 3. Drills for concrete fasteners.
 4. Membrane heat welder.

PART 3 EXECUTION

3.1 GENERAL

- A. Install all materials in accordance with manufacturer's written instructions, to maintain required warranty, and to meet requirements of approved roof assembly.

3.2 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
 1. Remove sharp projections.

POLYVINYL-CHLORIDE (PVC) ROOFING

2. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
 3. Verify substrate does not have depressions that may cause water ponding after final installation of roofing assembly.
 - a. Inspect substrate for flatness. Any depressions greater than 1/2-inch over a 10-foot length must be repaired to achieve a uniform flat plane.
 - 1) For concrete decks: Prep the substrate and install cementitious leveling compound following manufacturer's written instructions to achieve a uniform flat plane, or install layer(s) of 1/4-inch-thick thermal barrier underlayment board or cementitious board with subsequent layer joints, if used, offset 6 inches minimum and as necessary to achieve an approximately uniform flat plane. All fill materials used must comply with all UL Listing requirements and roofing system manufacturer's warranty requirements.
 - 2) For metal decks: Install layer(s) of 1/4-inch-thick thermal barrier underlayment board or cementitious board with subsequent layer joints, if used, offset 6 inches minimum and as necessary to achieve a uniform flat plane. All fill materials used must comply with all UL Listing requirements and roofing system manufacturer's warranty requirements. For any depressions greater than 1/2-inch over a single area greater than 500 sf, or for any conditions where structural integrity of the roof deck is compromised, contact the CDCR Representative.
 4. For concrete decks:
 - a. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
 - b. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.
 - c. Test for capillary moisture by the plastic sheet method in accordance with ASTM D4263. Test for internal humidity and moisture per ASTM F2170 to comply with roofing manufacturer's requirements and specified warranty.
- B. Do not proceed with roofing until all unsatisfactory conditions have been reported to the CDCR Representative and corrected. Beginning application means acceptance of existing conditions meeting the requirements of this Section.

3.3 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation in accordance with roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.4 THERMAL BARRIER UNDERLAYMENT BOARD APPLICATION FOR ROOF SECTIONS BUILT ON STRUCTURAL METAL DECK

- A. Install thermal barrier underlayment board on structural metal or wood deck.
- B. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.
- C. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface.
- D. Mechanically fasten boards to structural deck per FMG assembly requirements.

3.5 VAPOR RETARDER APPLICATION

- A. Adhesively apply vapor retarder to concrete deck surface thermal barrier board over structural metal and wood deck in accordance with manufacturer's instructions.
- B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.

3.6 INSULATION APPLICATION

- A. Ensure substrate and insulation is clean and dry.
- B. Adhesively apply field insulation in two layers minimum.
- C. Attach insulation boards: Install each layer of insulation and adhere to substrate as required by listed assembly requirements, and as follows:
 - 1. Attach first layer of insulation boards to structural deck in accordance with insulation manufacturer's instructions, approved shop drawings, and assembly listing.
 - 2. Attach subsequent layers of insulation boards to the previous layer of insulation boards with joints staggered minimum 6 inches from joints of previous layer in accordance with insulation manufacturer's instructions, approved shop drawings, and assembly listing.
- D. Place the constant thickness layers first and the tapered thickness insulation layers second for required slope pattern in accordance with manufacturer's instructions and approved shop drawings.
- E. Minimum Total Insulation Thickness: As required to achieve a minimum R-30 insulation value.
- F. Lay boards with edges in moderate contact without forcing, 1/4-inch maximum joint width. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- G. Tapered Insulation:
 - 1. Adhesively apply tapered insulation to form slopes or crickets as indicated or required.
 - 2. Lay tapered boards for a distance of 24 inches back from roof drains for positive drainage.
 - 3. Attach to base insulation as required to prevent shifting.
 - 4. Minimum Slope after Installation: 1/2 inch per foot.
 - 5. Provide smooth transitions. Abrupt or vertical drops not allowed at joints.

POLYVINYL-CHLORIDE (PVC) ROOFING

- H. Apply no more insulation than can be covered with membrane in same day and before approaching precipitation.
- I. Tape joints of insulation in accordance with insulation manufacturer's instructions.
- J. Install temporary water cutoffs at completion of work each day and remove upon resumption of work.

3.7 COVER BOARD APPLICATION

- A. Adhesively apply one of layer cover board with joints staggered minimum 6 inches from joints of top layer of thermal insulation and tapered insulation in accordance with roof membrane manufacturer's recommendations, FMG assembly requirements, and approved shop drawings.

3.8 ADHERED ROOFING MEMBRANE INSTALLATION

- A. Adhesively apply roofing membrane over area to receive roofing in accordance with membrane roofing system manufacturer's written instructions, FMG assembly requirements, and approved shop drawings.
 - 1. Unroll roofing membrane and allow it to relax before installing.
- B. Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical personnel.
- C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
 - D. Bonding Adhesive:
 - 1. Apply bonding adhesive to substrate at rate required by manufacturer before installing roofing membrane.
 - 2. Do not apply bonding adhesive to splice area of roofing membrane.
- E. Mechanically or adhesively fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.
- F. Apply roofing membrane with side laps shingled with slope of roof deck where possible.
 - G. Seams:
 - 1. Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane in accordance with manufacturer's written instructions to ensure a watertight seam installation.
 - 2. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane as required by roof membrane manufacturer.
 - 3. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - 4. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.
- H. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

POLYVINYL-CHLORIDE (PVC) ROOFING

3.9 COLD APPLIED WATERPROOFING

- A. Fluid-Applied Flashing Application: Apply base coat and top coat in accordance with manufacturer's written instructions.
 - 1. Apply base coat to achieve minimum wet mil coating thickness indicated in product listing, unless greater thickness is recommended by manufacturer.
 - 2. Apply top coat over flashing base coat and spread coating evenly to achieve minimum wet mil coating thickness indicated in product listing, unless greater thickness is recommended by manufacturer.
- B. Polyester Reinforcing and Protection Fabric: Install fabric at all ninety-degree corners, transitions and where required by the Manufacturer.
 - 1. Fully embed fabric so as not to be visible.
 - 2. Install fabric at all roof drain sumps.
 - 3. Install fabric at all roof repair areas.
 - 4. Install fabric at all areas required by the Manufacturer to maintain roofing warranty.

3.10 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates in accordance with membrane roofing system manufacturer's written instructions and approved shop drawings.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with sheet flashing.
- D. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.
- F. Where membrane terminates at sheet metal flashing, provide two-piece flashings to accommodate future reroofing.

3.11 WALKWAY INSTALLATION

- A. Gridded PVC Roof Walkway: Walkway must be secured to the roofing membrane with loops of the roofing membrane welded to the field sheet. Do not adhere walkway directly to roofing membrane. See walkway installation detail on Drawings. Consult manufacturer's Product Data Sheet for additional information.
- B. Weldable PVC Roof Walkway Membrane with textured surface: Apply continuous coat of adhesive to roofing membrane and back of walkway material in accordance with roofing manufacturer's written instructions. Apply uniform pressure with roller. Weld entire perimeter of walkway to roofing membrane.

3.12 MANUFACTURER'S FIELD SERVICES

- A. Before start, during, and upon completion of installation, membrane manufacturer's technical representative must conduct inspections to ensure that roofing system is installed in accordance with membrane manufacturer's recommended specifications and details.
- B. A minimum of three site visits must be made by manufacturer's technical representative.
- C. Notify the CDCR Representative 48 hours in advance of date and time of each site visit.
- D. Final Roof Inspection:
 - 1. At least one of the manufacturer's site visits must be after completion of the installation.
 - 2. Submit written report after Final Roof Inspection to the CDCR Representative.
- E. Provide certification in accordance with Submittal requirements in this Section.

3.13 FIELD QUALITY CONTROL

- A. Perform field testing under provisions of Section 01 45 00 – Quality Control.
- B. Testing Agency:
 - 1. Contractor must engage an independent qualified testing agency to perform the following tasks:
 - a. Inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components.
 - b. Provide all inspections listed herein and as required by CDCR.
 - c. Perform Electronic Field Vector Mapping (EFVM) testing as required and described below.
 - d. Inspect for water intrusion after all tests described below.
 - e. Prepare written reports after each inspection and submit reports to CDCR Representative.
- C. Water and EFVM Testing: Provide the following tests:
 - 1. All tests as required by roofing manufacturer and to obtain manufacturer's warranty as specified herein.
 - 2. Temporarily plug all roof drains and flood area with enough water to completely cover clamping ring and area surrounding drains to achieve a minimum of two inches of water head at drain. Use dams if required. Leave water in place for 48 hours.
 - 3. Water test scuppers similar to roof drains as required by roofing inspector or CDCR.
 - 4. Monitor weather conditions to prevent damage to building caused by accumulation of water during a rain event.
 - 5. Arrange for testing agency to inspect for water intrusion.
 - 6. On the same day, after inspection, remove drain plugs and, wet entire roof membrane, flashings and roof accessories by means of soaker hose at the rate of not less than one inch per hour rain equivalent for a duration of not less than two hours.
 - 7. Arrange for testing agency to inspect for water intrusion in these areas.
 - 8. Where solar panels or overburden, such as ballast, pavers, green roofs and similar, occur on roofs, perform EFVM tests by testing agency over the completed waterproof roof membrane to test for capillary defects and/or breaches in the roof membrane. EFVM

testing must be performed 24 hours or more after water tests and prior to installation of solar panels and/or overburden.

9. Arrange for roofing manufacturer's representative to perform inspections as required to achieve specified warranty(ies).
 10. Locate and correct all identified leaks, defects and irregularities.
 11. Repeat tests until no water intrusion is found.
 12. Remove temporary plugs and dams and restore roofs at conclusion of tests.
- D. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements. Contractor is solely responsible for all repairs or replacement of roofing assembly and all other items damaged by water intrusion.
- E. Additional testing and inspecting, at Contractor's expense, must be performed to determine compliance of replaced or additional work with specified requirements.

3.14 PROTECTING AND CLEANING

A. Waterstops:

1. Install temporary cutoffs around incomplete edges of the roofing assembly at the end of each workday and when work must be postponed because of inclement weather.
 2. Straighten the insulation line using pieces of insulation loosely laid, and seal the roofing systems sheet membrane to the deck or existing membrane.
 3. Use a heavy application of roof cement at least 6 inches in width, overlaid with an embedded reinforcement.
 4. Remove the temporary seals completely when work resumes, cutting out the contaminated membrane.
 5. Remove all sealant, contaminated membrane, insulation fillers, etc. from the work area and properly dispose off-site.
- B. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to the CDCR Representative.
- C. Correct deficiencies to or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Project Completion and in accordance with warranty requirements.

3.15 SCHEDULE

A. General:

1. See Product descriptions in this specification section for detailed information and requirements for each component listed below.
2. All proposed roof assemblies must be FMG approved and have an approved current RoofNav report and assembly number. See "Submittals" article herein.
3. All proposed roof assemblies must meet all requirements specified in this specification section.

POLYVINYL-CHLORIDE (PVC) ROOFING

4. Roof insulation must be XPS (extruded polystyrene). EPS (expanded polystyrene and Polyiso (polyisocyanurate) insulations are not acceptable.
 5. All roofing must be fully-adhered systems unless noted otherwise.
- B. Roof System 1: Location: Building Phase 1 Facility B Buildings: Unit 4 Addition, CCCMS;
Phase 2 Facility D Buildings: 102 Gym
1. Components:
 - a. Single-ply PVC roofing, minimum 0.080 inches thick.
 - b. Cover board.
 - c. XPS insulation.
 - d. Vapor retarder.
 - e. Thermal barrier (mechanically fastened).
 - f. Steel deck.
 2. Acceptable Manufacturers: The following manufacturers will be acceptable if they meet all of the requirements and criteria in this specification section.
 - a. Sika Sarnafil; RoofNav Assembly Number 222906-0-0.
 - b. IB Roof Systems; RoofNav Assembly Number 309059-0-0 (wind uplift 90 lbf/sq.ft.).
 - c. IB Roof Systems; RoofNav Assembly Number 353512-0-0 (wind uplift 135 lbf/sq.ft.).
 - d. IB Roof Systems; RoofNav Assembly Number 437650-0-0 (wind uplift 90 lbf/sq.ft.).
 - e. IB Roof Systems; RoofNav Assembly Number 466028-0-0 (wind uplift 135 lbf/sq.ft.).
 - f. For manufacturers/assemblies not listed, comply with substitution requirements in Section 01 25 00 – Substitution Procedures.
- C. Roof System 2: Location: Not Used
- D. Roof System 3: Location: Building Phase 1 Facility B Buildings: 204, 204.1, 204.3, 204.4,
204.5, 204.6, 204.7, 204.8, Unit 5.
1. Components:
 - a. Single-ply PVC roofing, minimum 0.080 inches thick.
 - b. Cover board.
 - c. XPS insulation.
 - d. Vapor retarder.
 - e. Concrete deck.
 2. Acceptable Manufacturers: The following manufacturers will be acceptable if they meet all of the requirements and criteria in this specification section.
 - a. Sika Sarnafil; RoofNav Assembly Number 97158-0-0.
 - b. IB Roof Systems; RoofNav Assembly Number 345180-0-0 (wind uplift 210 lbf/sq.ft.).
 - c. IB Roof Systems; RoofNav Assembly Number 356667-0-0 (wind uplift 90 lbf/sq.ft.).
 - d. Versico Roofing Systems; RoofNav Assembly Number 401994-0-0.
 - e. Carlisle; RoofNav Assembly Number 401994-0-0.
 - f. Environmental Roofing Components; RoofNav Assembly Number 302372-0-0.
 - g. Pro-Link Roofing Systems; RoofNav Assembly Number 302372-0-0.
 - h. For manufacturers/assemblies not listed, comply with substitution requirements in Section 01 25 00 – Substitution Procedures.

END OF SECTION

POLYVINYL-CHLORIDE (PVC) ROOFING

SECTION 07 60 00

FLASHING AND SHEET METAL

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Galvanized sheet metal.
 - 2. Fasteners.
 - 3. Fabrications.
 - 4. Finish.
- B. Related Sections:
 - 1. Section 05 05 53 – Security Metal Fasteners.
 - 2. Section 05 50 00 – Metal Fabrications.
 - 3. Section 06 10 00 – Rough Carpentry: Wood blocking, nailers, and grounds.
 - 4. Section 07 92 00 – Joint Sealants.
 - 5. Section 09 90 00 – Painting and Coatings.

1.2 REFERENCES

- A. AA (Aluminum Association) – Aluminum Construction Manual: Aluminum Sheet Metal Work and Building Construction.
- B. AISI (American Iron and Steel Institute) – Stainless Steel – Uses in Architecture.
- C. ASTM A167 – Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
- D. ASTM A240/A240M – Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- E. ASTM A653/A653M – Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- F. ANSI/ASTM B32 – Solder Metal.
- G. FS O-F-506 – Flux, Soldering, Paste and Liquid.
- H. NRCA – National Roofing Contractors Association: Roofing Manual.
- I. SMACNA – Architectural Sheet Metal Manual.

1.3 QUALITY ASSURANCE

- A. Applicator: Company specializing in sheet metal flashing work with minimum three years experience.

B. Pre-installation Conference:

1. Convene pre-installation conference in accordance with Section 01 31 19 – Project Meetings.
2. Attend conference with roofing installer, roofing manufacturer's representative, General Contractor and the CDCR Representative.

1.4 SUBMITTALS

- A. Shop Drawings: Indicate overall layout of sheet metal work; type, thickness, and details of sheet metal components; joints, expansion joints, attachment and anchoring of sheet metal components.
- B. Warranties: Sample of special warranties.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver flashing and sheet metal wrapped for protection and marked to facilitate identification.
- B. Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation.
- C. Prevent contact with materials during storage which may cause discoloration, staining, or damage.
- D. Store and handle in protective wrapping until ready for use.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Before fabricating sheet metal, verify shapes and dimensions of surfaces to be covered.

1.7 SEQUENCING AND SCHEDULING

- A. Coordinate Work of this Section with work of other Sections whose work affects or is affected by the Work of this Section.

1.8 WARRANTY

- A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal. Warranty Period: 10 years from date of Project completion.

PART 2 PRODUCTS

2.1 MATERIALS

A. Sheet Metal:

1. Stainless Steel: ASTM A240/A240M, Type 304, 2D (dull, cold rolled) annealed finish, soft except where harder temper is required for forming or performance, 16 gauge unless otherwise indicated on Drawings.
2. Other sheet metal, unless otherwise specified or indicated, must be 22-gauge zinc-Coated (Galvanized) Steel Sheet conforming to ASTM A653/A653M, G90 (Z275) coating designation; structural quality, mill phosphatized for field painting.
3. Provide associated trim, corner plates, clips, joint covers, and similar items, as required for a complete and watertight installation.

B. Fasteners:

1. Material:
 - a. Non-corrosive or hot-dipped galvanized compatible with flashing and sheet metal material.
 - b. Provide stainless steel fasteners for stainless steel sheet metal.
 - c. Provide tamper proof metal fasteners at exposed locations in accordance with Section 05 05 53 – Security Metal Fastenings.
2. Type and Size:
 - a. Nails, rivets, sheet metal screws as indicated and as required to hold flashing and sheet metal securely in place.
 - b. Where sheet metal is installed over other sheet metal, fasten through 1-inch-diameter tinned discs.
3. Spacing: 3-inches on center, unless otherwise indicated.

C. Solder: ASTM B32, Alloy Grade 50A.

D. Flux: FS O-F-506.

E. Sealant: Type specified in Section 07 92 00 – Joint Sealants.

F. Reglets:

1. Standard or surface mounting types, as indicated; of either galvanized steel or plastic, unless otherwise indicated.
2. For embedded types, provide with strippable tape covers or with channel prefilled with sealant.
3. Manufacturers
 - a. Fry Reglet Corp; Springlock Flashing System Type ‘CO’
 - b. MM Systems Corp.
 - c. For manufacturers/products not listed, comply with substitutions requirements in Section 01 25 00.

2.2 FABRICATION

- #### **A. Field-fabricate only those items that cannot be fabricated in the shop.**

- B. Fabricate products in accordance with the reviewed approved Shop Drawings and the SMACNA Architectural Sheet Metal Manual referenced standard, and NRCA Roofing Manual.
- C. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- D. Form pieces in longest practical lengths.
- E. Form flashing and sheet metal to fit snugly and without sharp edges.
- F. Form seams neatly, and make straight.
- G. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- H. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
- I. Fabricate flashings vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.
- J. Joints
 - 1. Make joints watertight and allow for expansion.
 - 2. Reinforce sheet metal corners as required.
 - 3. Conceal reinforcement within finished assembly.
- K. Fastenings: Use concealed hook strips and fasteners. Exposed hook strips and fasteners not acceptable.

2.3 FINISH

- A. Galvanized Items: Mill phosphatized for painted finish in accordance with Section 09 90 00 – Painting and Coating.
- B. Back paint concealed metal surfaces with one coat protective backing paint.
- C. Coat contacting dissimilar metals with protective compound.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that conditions are satisfactory for the installation of flashing and sheet metal.
- B. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, cant strips and reglets are in place, and nailing strips located.
- C. Verify roofing membrane termination and base flashings are in place, sealed, and secure.
- D. If unsatisfactory conditions exist, do not commence installation until such conditions have been corrected. Beginning installation means acceptance of existing conditions.

FLASHING AND SHEET METAL

3.2 PREPARATION

- A. Remove dirt, foreign objects, and foreign materials from surfaces to receive flashing and sheet metal.
- B. Surfaces must be clean, smooth, even, and free from defects prior to installation.

3.3 INSTALLATION

- A. Soldering:
 - 1. Clean contact surfaces before soldering.
 - 2. Perform soldering so as to thoroughly heat sheet metal and completely sweat solder through full seam width to produce joint of flowed solder 1 inch wide.
 - 3. Sweat lock seams full of solder flat and straight; clean with acid flux after soldering, and wash thoroughly.
- B. Mechanical Fastening:
 - 1. Join parts with concealed rivets or sheet metal screws, type and spacing in accordance with manufacturer installation instructions, NRCA Roofing Manual and approved shop drawings.
 - 2. Place sheets together before drilling.
- C. Lap Joints:
 - 1. Where lap joints are used, lap sheets at least 4 inches.
 - 2. Provide bead of sealant across lapped joints, placed 1 inch from exposed edge of joint.
- D. Butt Joints:
 - 1. Where butt joints are used, provide concealed backing alignment plates or sleeves fitted to one side of joint.
- E. Perform cutting, fitting, drilling, and similar work as required to accommodate the Work of other Sections.
- F. Gravel Stops:
 - 1. Fabricate gravel stops of galvanized steel.
 - 2. Provide prefabricated mitered and soldered internal and external corners.
 - 3. Leave joints between sections open 1/4 inch and back with formed back-up plates lapping each section and a minimum of 3 inches.
 - 4. Seal laps with butyl sealer.
 - 5. Fold back exposed edges 1/2 inch on the underside.
 - 6. Place gravel stops on roofs after roofing felts have been laid.
 - 7. Place in position on a 1/8-inch-thick bed of black plastic cement the full width of the flange and nail not to exceed 12-inches on center.
- G. Parapet Caps:
 - 1. Fabricate of 22-gauge galvanized steel unless otherwise indicated.
 - 2. Provide prefabricated mitered internal and external corners.
 - 3. Leave joints open 1/4 inch between sections, back with formed back-up plates lapping each section and a minimum of 3 inches.
 - 4. Seal laps with butyl sealer.

H. Expansion Joints:

1. Fabricate of 22-gauge galvanized steel unless otherwise indicated.
2. Fabricate in accordance with SMACNA Plate No. 76.

I. Hanging Gutters:

1. Fabricate of 24-gauge galvanized steel, unless otherwise indicated.
2. Lap joints between sections 1-1/2 inches, rivet and solder.
3. Provide loose locked expansion joints midway between outlet tubes to provide for 1-1/2 inches movement in both directions.
4. Provide expansion joints with cover strips in a manner to provide free movement and watertight connection.
5. Form outlet tubes of same material and thickness as gutter and lock and solder the longitudinal seam.
6. Flange the upper end of tubes and rivet and solder to the lining.
7. Extend tubes into downspouts at Support Gutters with 20-gauge strap hangers and install spreaders at midpoint between hangers.

J. Downspouts:

1. Fabricate downspouts of 24-gauge galvanized steel unless otherwise indicated.
2. Telescope end joints 1-1/2 inches and lock longitudinal joints.
3. Hold downspouts in position 1 inch clear of the wall with 1/16- x 1-inch galvanized steel downspout straps spaced not more than 10 feet on center and securely fasten to the wall with expansion anchors.

K. Conductor Heads:

1. Construct conductor heads of 24-gauge galvanized steel unless otherwise indicated.
2. Use flat-locked and soldered seams.
3. Provide 4-inch-long outlet tubes.
4. Close tops of conductor heads with a removable type 1/2-inch mesh stainless steel wire screen.

L. Scupper Linings:

1. Unless otherwise indicated, line scuppers with galvanized steel extending through the walls and projecting into conductor heads.
2. Join scupper linings to wall and roof flanges with locked and smoldered seams.
3. Prime concrete surfaces to receive the scupper lining and coat with plastic cement.

M. Reglets and Counter flashings:

1. Install reglets and counter flashings in accordance with the manufacturer's printed installation drawings and instructions as indicated, and approved shop drawings.

N. Completed installation must be weather tight.

3.4 CLEANING

- A. Following installation, clean exposed surfaces of flashing and sheet metal of excess solder and dirt; remove grease and oil with appropriate solvent; wipe surfaces with clean rags, and leave in condition suitable for the application of paint.

END OF SECTION

FLASHING AND SHEET METAL

SECTION 07 72 00
ROOF ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Lift-Up style prefabricated roof hatches, complete with curbs, hardware, and related accessories.
2. Stainless steel industrial sliding roof hatches, operating hardware, complete with related accessories.
3. Roof hatch perimeter safety railings.

B. Related Sections:

1. Section 05 05 53 – Security Metal Fastenings.
2. Section 05 50 00 – Metal Fabrications.
3. Section 05 52 00 – Metal Railings.
4. Section 07 54 19 – Polyvinyl-Chloride (PVC) Roofing.
5. Section 07 60 00 – Flashing and Sheet Metal.
6. Section 07 92 00 – Joint Sealants.

1.2 REFERENCES

- A. Factory Mutual Engineering Corporation (FM Global): Roof Assembly Classifications.
- B. Underwriters' Laboratories, Inc. (UL): Fire Hazard Classifications.
- C. ASTM International (formerly American Society of Testing and Materials) (ASTM):
1. ASTM A36 – Standard Specification for Carbon Structural Steel.
 2. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 3. ASTM A276 – Standard Specification for Stainless Steel Bars and Shapes.
 4. ASTM A240 – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 5. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 6. ASTM A513 – Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.
 7. ASTM A568 – Standard Specification for Steel, Sheet, Carbon, Structural and High Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
 8. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 9. ASTM D2244 – Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.

10. ASTM D4214 – Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.

D. American Welding Society (AWS):

1. AWS D1.1 – Structural Welding Code – Steel.
2. GMAW-S – Short Circuit Gas Metal Arc Welding.
3. ANSI/AWS B.2.1.004 – Gas Metal Arc Welding of Carbon Steel (M-1, Group 1), 10 through 18 Gage, in the As-Welded Condition, With or Without Backing.

E. California Building Code (CBC):

1. Chapter 16A – Structural Design.

F. Occupational Safety and Health Administration (OSHA):

1. OSHA 1910.28(b) – Protection from Fall Hazards.
2. OSHA 1910.29(b) – Guardrail Systems.

G. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):

1. Architectural Sheet Metal Standard.

1.3 COORDINATION

- A. Coordinate work with other operations and installation of adjacent materials, especially roofing and flashing, to avoid damage, maintain roof watertightness, and provide leakproof, weathertight, secure and noncorrosive installation.

1.4 SUBMITTALS

- A. Submit in accordance with Sections 01 33 00 – Submittal Procedures and 01 33 23 – Shop Drawings, Product Data, and Samples.
- B. Product Data: Manufacturer’s technical data for each type of hatch assembly to be used, including:
 1. Material descriptions, construction details, dimensions, profiles and finishes.
 2. Preparation instructions and recommendations.
 3. Storage and handling requirements and recommendations.
 4. Specific manufacturer’s installation instructions, templates, setting drawings, installation criteria, details of anchorage devices, and interface with adjacent components.
- C. Shop Drawings: For each type of unit, indicate layout, profiles, dimensions, adjacent construction, and product information, including manufacturer, model, materials, size, operation, components, hardware, finishes, anchorage, and installation details with required clearances and tolerances.
 1. Show connection of units and hardware to other Work. Include schedules showing location of each type and size of unit.
 2. For Safety Railings: Include dimensional plans, applicable material specifications, elevations and sections detailing mounting and connections.
 3. Indicate field measurements of required openings for each roof hatch.

ROOF ACCESSORIES

- D. Calculations; For Railings and Structural and Safety Components: Provide specific calculations, prepared and sealed by Professional Engineer licensed in State of California.
- E. Manufacturer's Certificates; For Safety Railings and Industrial Sliding Roof Hatches: Certify products meet or exceed specified requirements.
- F. Warranty:
 - 1. Sample of manufacturer's warranty.
 - 2. Manufacturer's special warranty on painted finishes.
- G. Closeout Submittals: Provide Operation and Maintenance manuals, including methods for cleaning and maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performances.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer must specialize in manufacturing products specified in this Section and have a minimum of five years documented successful experience.
 - 1. For Safety Railings and Industrial Sliding Roof Hatches: Provide supporting written evidence including list of installations, descriptions, name, and contact information.
- B. Installer Qualifications: Installer must have a minimum of two years documented successful experience installing similar products.
- C. Welder Qualifications; For Safety Railings and Industrial Sliding Roof Hatches: Welders must be certified in accordance with American Welding Society procedures AWS D1.1, GMAW-S, and ANSI/AWS B.2.1.004 for applicable material used in production of specified products.
- D. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of adjacent roofing.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging container with identification labels intact until ready for installation. Inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on carrier's freight bill of lading.
- B. Exercise proper care in unloading and handling Work to avoid bending, denting, crushing, and scratching or other damage to the product. Protect materials from exposure to moisture.
- C. Store materials in a dry, clean, protected, warm, well-ventilated, weather-tight location.
 - 1. If outdoor storage is required, store materials under cover in a dry, clean location off the ground at an incline, to prevent pooling of any moisture and promote runoff. Provide tarp materials in a tent-like arrangement, elevated above the product with open sides to allow airflow.
 - 2. Store all hardware in a dry controlled environment.

ROOF ACCESSORIES

- D. When using forklifts, use forks of proper length to fully support product being moved. Consult shop drawings or consult with factory for proper lift points.

1.7 PROJECT CONDITIONS

- A. Do not install products in inclement weather, or under environmental conditions detrimental to products or adjacent roofing materials, or contrary to manufacturer's installation instructions.

1.8 WARRANTY

- A. Manufacturer's Warranty: Provide manufacturer's standard written warranty. Materials shall be free of defects in material and workmanship within specified warranty period. Should a product fail to function in normal use with warranty period, manufacturer must furnish a replacement or new product to meet CDCR requirements.
 - 1. Warranty Period: Manufacturer's standard, minimum 5 years from date of Project Completion.
- B. Special Warranty on Painted Finishes: Provide manufacturer's written warranty in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: 10 years from date of Project Completion.

PART 2 PRODUCTS

2.1 MANUFACTURED LIFT-UP STYLE ROOF HATCH UNITS

- A. Acceptable Manufacturers/Products, as listed below and meeting the criteria and requirements specified herein, will be acceptable:
 - 1. Bilco; Type Security.
 - 2. Nystrom; RHSG
 - 3. Milcor: M-1
 - 4. For manufacturers/products not listed, comply with substitution requirements in Section 01 25 00 – Substitution Procedures.
- B. Description:
 - 1. Service stair roof hatch.
 - 2. Size: Indicated in the drawings.
 - 3. Security Interface: Hatch must be monitored as specified in relevant Sections in Division 28 – Electronic Safety and Security.
 - 4. Provide security hardware reinforcing plates and security fasteners as indicated for attachment of security hardware to cover.
 - 5. Opening and Closing Criteria: The roof hatch must be spring loaded and require no more than 15 lbs of force to open the latch mechanism and 30 lbs of force to open the roof hatch.

ROOF ACCESSORIES

6. Safety Post: Manufactured telescoping spring-balanced tubular post with adjustable mounting hardware, automatic locking feature when fully extended, and handy release lever.
 - a. Type 304 stainless steel with sand blast finish.
 - b. Hot-dipped galvanized steel.
 - c. Yellow powder-coated steel.
- C. Fabrication
 1. Fabricate components free of visual distortion or defects; fit components for weathertight assembly.
 2. Cover and Frame:
 - a. 14-gauge G-90 galvanized steel with 3-inch beaded, welded flange, backed with 1-inch-thick fiberglass insulation, and fully covered and protected by a 22-gauge, galvanized steel cover liner.
 3. Curb:
 - a. 12 inches high, of 14-gauge galvanized steel, and formed with a 3-1/2-inch flange with holes provided for securing to the roof deck.
 - b. Curb must be equipped with integral metal cap flashing of the same material and gauge as the curb, fully welded at the corners for weather tightness and insulated with 1-inch-thick rigid fiberboard insulation.
 4. Hardware:
 - a. Latch:
 - 1) Slam latch with interior and exterior turn handles and padlock hasps.
 - 2) Factory prepared to receive deadbolt detention lock supplied and installed by others in the field.
 - b. Hinges:
 - 1) Heavy-duty pintle, stainless steel.
 - 2) Heavy-duty manganese bronze hinges.
 5. Assembly:
 - a. Hatch must be completely assembled with compression spring operators enclosed in telescopic tubes, positive snap latch with turn handles and [Folger Adam deadbolts with keying to both sides, and]neoprene or EPDM rubber draft seal.
 - b. Cover must be equipped with an automatic hold/open arm complete with vinyl grip handle to permit easy release with one hand.
 - c. Hold/open assembly must be capable of maintaining cover in position at any point through entire range of movement.
 6. Finish: Factory finish with manufacturer's standard finish coat.

2.2 ROOF HATCH PERIMETER SAFETY RAILINGS

- A. Acceptable Manufacturers/Products, as listed below and meeting the criteria and requirements specified herein, will be acceptable:
 1. Bilco; Bil-Guard 2.0 Roof Hatch Railing System.
 2. Babcock Davis;
 3. For manufacturers/products not listed, comply with substitution requirements in Section 01 25 00 – Substitution Procedures.
- B. Description:

ROOF ACCESSORIES

1. General: Factory fabricated, corrosion resistant construction. Comply with OSHA standards 28 CFR 1910.28(b)(1)(i) and 29 CFR 1910.29(b).
2. At Industrial Sliding Roof Hatches: Four-sided, removable railing to include 1.5-inch square 11-gauge steel tubing vertical posts, and horizontal railings of 1.74-inch outside diameter, 0.065-inch wall thickness mild steel tubing, galvanized during fabrication.
3. At Lift-Up Style Roof Hatches: Four-sided, removable railing to include 1.25-inch schedule 40 pipe in 6061 T6 aluminum alloy, with cast aluminum locking mechanism and spring hinges, and Type 316 stainless steel fasteners.
4. Top-rail and mid-rail must be sized and dimensioned to provide a safety railing system, which meets Federal OSHA requirements for Standard Railings at time of production and meet OSHA strength requirements with a safety factor of two.
5. Hatch rail system must attach to cap flashing of roof hatch and not penetrate any roofing material.
6. Height: 42 inches above finished roof surface.
7. Ensure continuous barrier around roof hatch with self-closing hinged gate and positive latching.
8. Safety yellow powder coat paint finish or Custom color.

C. Materials:

1. For Aluminum Railings:
 - a. Posts and rails: 1-1/4-inch 6061 T6 Schedule 40 aluminum pipe.
 - b. Fitting: Cast aluminum 5052-H32 with set screw.
 - c. Mounting Brackets: 3/8-inch-thick extruded aluminum or 3/16-inch steel, zinc plated with nut backing plate.
 - d. Pivoting post guides with compression fittings and latching mechanism: Cast aluminum.
 - e. Self-closing hinges and all fasteners: Type 316 stainless steel.
2. For Steel Railings:
 - a. Structural or formed steel shapes conforming to ASTM A36; tubing conforming to ASTM A500 Grade B, ASTM A513; bars conforming to ASTM A36, M1020; size, strength and welding details in accordance with approved Shop Drawings. Hot-dipped galvanized G90 after fabrication per ASTM A123.
 - b. Mounting Brackets: 1/4-inch-thick hot dipped galvanized steel.
 - c. Self-closing hinges and all fasteners: Type 316 stainless steel.

D. Fabrication:

1. Fit and shop assemble items in larger practical sections, for delivery to site.
2. Fabricate items with joints tightly fitted and screwed.
3. Provide clamps, fasteners, and accessories as required for complete installation.
4. Supply components required for anchorage of fabrications in accordance with approved Shop Drawings and approved structural calculations. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that conditions are satisfactory for the installation of work.
- B. If substrate preparation and supporting construction is the responsibility of another installer, notify Architect and CDCR Representative of substrate condition before proceeding with work.
- C. If unsatisfactory conditions exist, do not commence installation until such conditions have been corrected. Beginning installation means acceptance of existing conditions.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install Work in accordance with the manufacturer's printed instructions, approved Shop Drawings, and product carton instructions for installation.
- B. Install Work level, square, plumb, rigid, and in proper alignment with adjacent work. Use fasteners, separators, sealants, and other miscellaneous items as required for a complete watertight installation.
- C. Install frames to fit substrates and bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for watertight performance.
- D. Coat concealed side of uncoated aluminum, steel and stainless steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
- E. Anchor all Work securely in place, capable of resisting forces specified, and resisting exposure to weather without failing, rattling, leaking, or becoming loose.
- F. Attach ladder safety post according to manufacturer's written instructions.
- G. Attach safety railing system to roof hatch curb.
- H. Tolerances: All dimensional requirements must be in accordance with manufacturer's installation instructions and shop drawing.

3.4 FIELD QUALITY CONTROL

- A. Hatch covers, when complete, must operate smoothly, correctly, quietly, and free from binding; exposed surfaces must be clean and free from dents or other defects and damage; and each assembly must be watertight.
- B. Verify all anchorage of all work is in accordance with manufacturer's installation instructions, approved Shop Drawings, approved structural calculations, and applicable data sheets.

3.5 ADJUSTMENT AND CLEANING

ROOF ACCESSORIES

- A. Test units for proper function. Clean and lubricate joints and hardware. Adjust until proper smooth operation is achieved.
- B. Repair or replace damaged installed products or components.
- C. Touch up damaged finishes, including galvanizing and painting by proper methods acceptable to CDCR and to restore finishes so no evidence remains of corrective work.
- D. Clean exposed surfaces per manufacturer's written instructions and which do not damage finishes.

3.6 PROTECTION

- A. Protect installed products until Project Completion.
- B. Touch-up, repair, or replace damaged products before written acceptance by CDCR Representative.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Preparing sealant substrate surfaces.
 - 2. Non-firestop sealant and backing.
- B. Related Sections:
 - 1. Section 07 84 00 – Firestopping.
 - 2. Sealants used in conjunction with Building Components as indicated in all divisions.

1.2 REFERENCES

- A. ASTM International (formerly American Society for Testing and Materials) (ASTM):
 - 1. ASTM C719 – Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle)1,2.
 - 2. ASTM C732 – Standard Test Method for Aging Effects of Artificial Weathering on Latex Sealants.
 - 3. ASTM C794 – Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
 - 4. ASTM C834 – Standard Specification for Latex Sealants.
 - 5. ASTM C881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
 - 6. ASTM C882 – Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
 - 7. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
 - 8. ASTM D412 – Standard Test Method for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 - 9. ASTM D624 – Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
 - 10. ASTM D695 – Standard Test Method for Compressive Properties of Rigid Plastics.
 - 11. ASTM D2240 – Standard Test Method for Rubber Property-Durometer Hardness.

1.3 DEFINITIONS

- A. Inmate Accessible Areas: As defined in Section 01 35 53 – Security Procedures, except as modified herein.

1.4 SUBMITTALS

- A. Product Data:
 - 1. For sealants and sealant primers used inside the weatherproofing system, including printed statement of VOC content.

- B. Samples: Submit showing the standard colors available for each sealant material intended for installation in an exposed location.
- C. Certificates: Submit certificate that materials specified and proposed for use are suitable for intended application.
- D. Manufacturer's installation instructions.
- E. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

- A. Applicator: Company with minimum 3 years' experience in the application of materials of the type specified in this Section.
- B. Regulatory Requirements: Joint Sealers must meet all current limits set by regulatory agencies regarding Volatile Organic Compounds (VOC).

1.6 FIELD SAMPLES

- A. Provide field samples in accordance with Section 01 45 00 – Quality Control.
- B. Construct field sample panel of size reviewed by the CDCR Representative, illustrating sealant types, colors, and tooled surfaces.
- C. Locate as directed.
- D. Accepted sample may remain as part of the Work.

1.7 MOCK-UPS

- A. Provide sealant and related accessories for mock-ups in accordance with Section 01 45 00 – Quality Control.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in the unopened, original containers or unopened packages with manufacturer's name, labels, product identification, and lot numbers where appropriate.
- B. Store materials in the original, unopened containers or packages, and under conditions recommended by manufacturer.

1.9 WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Failures include but are not limited to the following:
 - a. Loss of adhesion or cohesion.
 - b. Failure to cure.
 - 2. Warranty Period: One year from date of Project Completion.

JOINT SEALANTS

- B. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 3. Mechanical damage caused by individuals, tools, or other outside agents.
 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 PRODUCTS

2.1 GENERAL

- A. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Architectural Sealants: Not more than 250 g/L.
 2. Nonmembrane Roof Sealants: 300 g/L.
 3. Single-Ply Roof Membrane Sealants: 450 g/L.
 4. Sealant Primers for Nonporous Substrates: Not more than 250 g/L.
 5. Sealant Primers for Porous Substrates: Not more than 775 g/L.
 6. Modified Bituminous Sealant Primers: 500 g/L.

2.2 SEALANTS

- A. Type A1 Sealant – Traffic (Pedestrian) Except in Inmate Accessible Areas:
1. Acceptable Manufacturers/Products, as listed below and meeting the criteria and requirements specified herein, will be acceptable:
 - a. Pecora Corp.; Urexpam NR-200 for joints with no greater than 5% slope.
 - b. Pecora Corp.; Dynatrol II SG for joints with 5% to 15% slope.
 - c. Sika Corp.; Sikaflex-2c SL for joints with no greater than 5% slope.
 - d. Master Builders Solutions; MasterSeal SL-2 for joints with no greater than 5% slope.
 - e. Master Builders Solutions; MasterSeal SL-2 for joints with 5% to 15% slope.
 - f. For manufacturers/products not listed, comply with substitution requirements in Section 01 25 00 – Substitution Procedures.
 2. Two-Component, self-leveling polyurethane elastomeric sealant.
 3. Meets Federal Specification TT-S-00227E, Type II, Class A; and ASTM C920, Type M, Grade NS, Class 50, use M, G, A.
- B. Type C Sealant – Security (Rigid Joints) in Inmate Accessible Areas:
1. Acceptable Manufacturers/Products, as listed below and meeting the criteria and requirements specified herein, will be acceptable:
 - a. Pecora Corp.; DynaPoxy EP-1200.
 - b. Sika Corp.; Sikadur 31 Hi-Mod Gel.
 - c. Euclid Chemical Company; Euco #452 Gel.
 - d. Simpson Strong-tie; CI-GC Gel-Viscosity (for joints 1/4 inch wide or less).
 - e. Simpson Strong-tie; SET 3G (for joints wider than 1/4 inch).

- f. For manufacturers/products not listed, comply with substitution requirements in Section 01 25 00 – Substitution Procedures.
 2. High-solids, high-modulus, two-component, tamperproof, epoxy resin; Shore D hardness of 70 or higher.
 3. Compressive Strength: Minimum 10,000 psi in 7 days when tested in accordance with ASTM D695 at 75 degrees F and 50 percent relative humidity.
 4. Meets ASTM C881, Type I and II, Grade 3, Classes B & C.
- C. Type E Sealant – General Purpose Siliconized Acrylic Latex:
 1. Acceptable Manufacturers/Products, as listed below and meeting the criteria and requirements specified herein, will be acceptable:
 - a. Pecora Corp.; AC-20.
 - b. Master Builders Solutions; MasterSeal NP 520.
 - c. Tremco; Tremflex 834.
 - d. For manufacturers/products not listed, comply with substitution requirements in Section 01 25 00 – Substitution Procedures.
 2. Latex acrylic based sealant in accordance with ASTM C834, paintable.
- D. Type F Sealant – Silicone:
 1. Acceptable Manufacturers/Products, as listed below and meeting the criteria and requirements specified herein, will be acceptable:
 - a. Dow Corning Corp.; Dowsil 795.
 - b. Momentive/GE Silicones; Silpruf SCS2000.
 - c. Pecora Corp.; 895 NST.
 - d. Tremco; Spectrem 2.
 - e. Sika Corp.; SikaSil WS-295.
 - f. For manufacturers/products not listed, comply with substitution requirements in Section 01 25 00 – Substitution Procedures.
 2. Low-modulus silicone sealant in accordance with ASTM C920, Type S, Grade NS, Class 50.
- E. Type G Sealant/Adhesive – Construction Adhesive/Sealant for Thresholds:
 1. Acceptable Manufacturers/Products, as listed below and meeting the criteria and requirements specified herein, will be acceptable.
 - a. Sika Corp.; 31 Hi-Mod Gel.
 - b. Master Builders Solutions; MasterSeal CR 195.
 - c. Simpson Strong-tie; SET 3G.
 - d. For manufacturers/products not listed, comply with substitution requirements in Section 01 25 00 – Substitution Procedures.
 2. Two-Component, 100% solids, solvent-free, moisture-tolerant, high-modulus, high-strength, structural epoxy paste adhesive.
 - a. Modulus of Elasticity in Compression (ASTM D695): 5.6×10^5 psi (7 days).
 - b. Flexural Strength (ASTM D790): 6,100 psi (7 days).
 - c. Modulus of Elasticity in Flexure (ASTM D790): 1.5×10^6 psi (7 days).
 - d. Tensile Strength (ASTM D638): 3,300 psi (7 days).
 - e. Elongation at Break (ASTM D638): 0.9% (7 days).
 - f. Tensile Adhesion Strength – Hardened Concrete to Steel (ASTM C882): 2,900 psi (2 days).
 - g. Shear Strength (ASTM D732): 4,600 psi (7 days).

- h. Heat Deflection Temperature – Fiber Stress Loading 264 psi (ASTM D648): 135⁰ F.
- 3. Meets ASTM C881, Types I, II & IV, Grade 3, Classes B & C and AASHTO M-235 specifications.

2.3 MISCELLANEOUS MATERIALS

- A. Backer Rod:
 - 1. Material: Closed-cell foam, non-staining, non-gassing, resilient material such as neoprene, butyl, or polyurethane, compatible with sealant to be used.
 - 2. Sized and shaped to control depth of sealant and to provide 20 percent to 50 percent compression upon insertion.
- B. Joint Cleaner:
 - 1. For metal and glass: Xylol, xylene, toluol, or toluene.
 - 2. For removing lacquer coatings: Lacquer thinner.
- C. Primer: As recommended by sealant manufacturer for use intended.
- D. Masking Tape: Pressure-sensitive adhesive paper type.
- E. Bond Breaker: Pressure-sensitive adhesive polyethylene tape.

2.4 SEALANT COLORS

- A. Sealant color for use in exposed locations must be as selected by the CDCR Representative from manufacturer's standard colors.
- B. Wherever sealants are not exposed to view, provide manufacturer's standard color which has the best overall performance characteristics for the application indicated.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Inspect joints to be sealed to determine if conditions are satisfactory for the proper installation of joint sealants.
- B. If unsatisfactory conditions exist, do not commence Work until such conditions have been corrected. Beginning of installation means acceptance of existing conditions.

3.2 GENERAL

- A. Provide sealant wherever necessary to:
 - 1. Prevent light leakage.
 - 2. Prevent moisture leakage.
 - 3. Facilitate cleaning and sanitation.
 - 4. Seal exposed joints around door and window frames, signs, display boards, casework, fire extinguisher cabinets, fire alarm boxes, plumbing fixtures, electrical device cover plates, light fixtures, and other items indicated to be set in sealant.

3.3 PREPARATION

- A. Cleaning: Clean joint surfaces, using joint cleaner as necessary, of dust, dirt, oil, grease, rust, lacquers, laitance, release agents, moisture, and other matter which could adversely affect adhesion of sealants.
- B. Masking: Mask areas adjacent to joints.
- C. Priming: Apply primer, if required, in accordance with manufacturer's printed instructions.
- D. Joints must enclose sealant on three sides.
 - 1. Where adequate joints for sealants have not been provided, suitable joints must be cleaned out to the depth required, or as indicated, and ground to a minimum width of 1/4 inch without damage to the adjoining Work, unless otherwise specified or indicated.
 - 2. No grinding shall be performed on metal surfaces.

3.4 APPLICATION

- A. Install sealant and backing materials in accordance with manufacturer's instructions.
- B. Apply in accordance with manufacturer's instructions regarding ambient temperature for application and curing.
- C. Install backing materials in joints using blunt instrument to avoid puncturing.
 - 1. Do not twist backing while installing.
 - 2. Install backing so that joint depth is 50 percent of joint width, minimum 1/4 inch deep.
- D. Apply sealants in joints using pressure gun with nozzle cut to fit joint width.
- E. Place sealants in uniform, continuous beads without gaps or air pockets.
- F. Tool joints to required configuration within 10 minutes of sealant application.
- G. If masking materials are used, remove immediately after tooling.
- H. Seal joints adjacent to painted Work before the final coat of final paint coat is applied.
- I. Verify adhesion of sealants to substrates.

3.5 CLEANING

- A. Remove spilled and excess materials adjacent to joints without damaging adjacent surfaces.
- B. Leave finished Work in neat, clean condition with no evidence of spillovers or damage to adjacent surfaces.

3.6 SCHEDULE

- A. Type A1 Sealant – Traffic (Pedestrian):

1. Not Used.
- B. Type B Sealant – Security (Flexible/Dynamic Joints) in Inmate Accessible Areas:
 1. Not Used.
- C. Type C – Security (Rigid Joints):
 1. For interior rigid joints located in Inmate Accessible Areas, except as otherwise indicated.
 2. All construction joints, window and hollow metal frame perimeters, and bedding of furnishings, equipment, plumbing fixtures, electrical fixtures, and other items fastened to wall, ceiling, and floor surfaces in the following locations:
 - a. Housing Cells.
 - b. Holding Cells.
 - c. Inmate Showers.
 - d. Inmate Toilet rooms where all walls (with the exception of chase walls) are of CMU and/or concrete construction.
 - e. Housing Unit Dayrooms within 10 feet of walking surfaces accessible to inmates.
 - f. Inmate side of enclosed Non-Contact Visiting rooms and Interview rooms.
 - g. Group Yards and Small Management Yards.
 - h. Other locations indicated.
 3. Do not apply Type C sealant until all building wall and roof loads have been imposed for a period of not less than 7 days.
- D. Type D – Butyl Rubber:
 1. Interior wall penetrations for pipe and conduit that will be concealed by escutcheons and other trim and plate, and for lap joints in sheet metal.
 2. Glazing.
- E. Type E – General Purpose Siliconized Acrylic Latex:
 1. Joints, voids, and penetrations not otherwise scheduled herein for interior surfaces exposed to view and requiring painting.
 2. Bedding of fixtures, partitions, equipment, and accessories fastened to walls and floors, and flanges and escutcheons of items penetrating surfaces in the following locations: kitchens, dining rooms, staff and public toilet rooms, inmate toilet rooms except as otherwise scheduled, change rooms, and other areas requiring sanitary conditions to eliminate any open joints between contact surfaces.
- F. Type F – Silicone:
 1. Exterior and interior joints in contact with organically-coated aluminum.
 2. Exterior and interior vertical joints in concrete, except as otherwise specified.
 3. Exterior joints in masonry and portland cement plaster.
 4. Around metal door, window and louver frames penetrating exterior concrete, masonry and portland cement plaster surfaces, except as otherwise specified.
- G. Conflicts:
 1. In the event of conflict between the above Schedule and sealant type indicated on Drawings, notify the CDCR Representative.
 2. The CDCR Representative will determine sealant type to be installed at locations in question.

JOINT SEALANTS

3. Install sealant type directed by the CDCR Representative, complete with all necessary joint preparation and accessories.

END OF SECTION

THIS PAGE IS INTENTIONALLY LEFT BLANK

SECTION 07 95 00
EXPANSION CONTROL

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Expansion joint covers for exterior application.
- B. Related Sections:
 - 1. Section 05 05 53 – Security Metal Fastenings.
 - 2. Section 05 50 00 – Metal Fabrications.
 - 3. Section 07 60 00 – Flashing and Sheet Metal.

1.2 REFERENCES

- A. ASTM C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- B. ASTM E283 – Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- C. DIN 18542 – Impregnated Cellular Plastics Strips For Sealing External Joints – Requirements and Testing.

1.3 DEFINITIONS

- A. Inmate Accessible Areas: As defined in Section 01 35 53 – Security Procedures, except as modified herein.

1.4 SUBMITTALS

- A. Submit in accordance with Sections 01 33 00 – Submittal Procedures and 01 33 23 – Shop Drawings, Product Data, and Samples.
- B. Manufacturer's Instructions: Indicate installation requirements, material recommendations.
- C. Provide shop drawings detailing all conditions where expansion control is required, including all flashings, etc. for a water proof enclosure.
- D. Provide fire rating testing by a listed UL testing agency.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle materials in manufacturer's original, unopened packaging, clearly identified with manufacturer's name and type of product.

EXPANSION CONTROL

- B. Exposed metal surfaces covered with an adhesive protective paper must have the paper removed as soon as is practicable. Do not subject materials covered with protective paper to prolonged sunlight or extreme temperatures.
- C. Follow additional requirements of the manufacturer.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Aluminum: 6063-T5 alloy with manufacturer's standard clear anodized finish.
- B. Steel: Galvanized; minimum 3/16 inch thick in Inmate Accessible Areas, 26 gauge elsewhere.
- C. Resilient Material: Neoprene, vinyl, or EPDM, as specified.
- D. Sealant: As recommended by manufacturer.
- E. Fasteners: Type and size best suited for intended application; tamper proof metal fasteners in accordance with Section 05 05 53 – Security Metal Fastenings, in exposed Inmate Accessible Areas.

2.2 FABRICATION

- A. General: Expansion joint cover assemblies must be complete with intersections, splices, and caps, and accessories required for a complete installation, weather tight at exterior applications.
- B. Exterior Expansion Joint Covers:
 - 1. Roof-to-Roof
 - a. Type 1:
 - 1) Manufacturers
 - a) Balco, Inc.; Type LPR
 - b) Architectural Art Mfg. Co
 - c) Construction Specialties
 - 2) Provide manufacturer's standard EPDM water barrier.
 - b. Type 2:
 - 1) Manufacturers
 - a) Johns Manville, "Expand-O-Flash" Style CF-EJ
 - 2) Provide .090 inch aluminum plate.
 - 2. Roof-to-Wall
 - a. Type 1:
 - 1) Manufacturers
 - a) Balco Inc.; Type LPRE
 - b) Architectural Art Mfg;
 - c) Construction Specialties
 - 2) Provide manufacturer's standard continuous EPDM water barrier.
 - b. Type 2:
 - 1) Manufacturers
 - a) Johns Manville, "Expand-O-Flash" Style CF-EF

EXPANSION CONTROL

- b) Approved equal.
 - 2) Provide .090 inch aluminum plate.
 - 3. Wall-to-Wall
 - a. Type 1:
 - 1) Manufacturers
 - a) Balco Inc.; Duraflex Exterior Expansion Joint System as indicated
 - b) Architectural Art Mfg;
 - c) Construction Specialties
 - 2) Provide manufacturer's standard continuous EPDM water barrier.
 - b. Type 2: Not used.
- C. Fire Rated Expansion Joint Covers:
- 1. Roof -to-Roof:
 - a. Type 1:
 - 1) Manufacturers
 - a) Balco Inc.; 2HLPR-1
 - b) Architectural Art Mfg;
 - c) Construction Specialties
 - 2) Provide manufacturer's standard continuous EPDM water barrier and Metablock fire barrier.
 - b. Type 2: Wall-to-wall:
 - 1) Manufacturers
 - a) Balco Inc.; 2HCMX-2
 - b) Architectural Art Mfg.
 - c) Construction Specialties
 - 2) Provide manufacturer's standard low profile with .090 inches aluminum plate, EPDM water barrier, and with Metablock fire barrier.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that conditions are satisfactory for installation of expansion control devices.
- B. Verify that joint preparation and affected dimensions are acceptable.
- C. If unsatisfactory conditions exist, do not commence installation until such conditions have been corrected. Beginning installation means installer accepts existing conditions.

3.2 INSTALLATION

- A. Install expansion control devices in accordance with manufacturer's printed installation instructions.
- B. Install joint covers with tamper proof fasteners.
- C. Joints in expansion joint covers must be mitered at turns. End caps must be installed at exposed ends.

EXPANSION CONTROL

- D. Upon completion of installation, components must provide flexible cover, firmly anchored to substrate, weatherproof at exterior applications.

END OF SECTION