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 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.
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

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. Thermal barrier, 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 wood roof decks.

B. Related Sections:
1. Section 01 25 00 – Substitution Procedures.
2. Section 05 30 00 – Metal Decking.
3. Section 06 10 00 – Rough Carpentry.
4. Section 06 16 00 – Sheathing.
5. Section 07 22 00 – Roof and Deck Insulation.
6. Section 07 60 00 – Flashing and Sheet Metal.
7. Section 07 90 00 – Joint Protection.

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.
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.

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. Thermal barrier.
   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: 105 lbf/sq. ft. See Drawings for the extent of "Corner" or Zone 3.
   6. Perimeter or Zone 2 Uplift Design Pressure by Project Engineer: 90 lbf/sq. ft. See Drawings for the extent of "Perimeter" or Zone 2.
   7. Field-of-Roof or Zone 1 Uplift Design Pressure by Project Engineer: 90 lbf/sq. ft. See 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: 90 lbf/sq. ft. See 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:
   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. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

I. 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. 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.

C. 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.

D. System Performance: Provide documentation that the roofing components submitted meet or exceed the system performance requirements as an assembly.

E. Maintenance Data: Provide documentation for maintenance of roofing system to be included in maintenance manuals.

F. Inspection Report: Provide copy of roofing system manufacturer's inspection report of completed roofing installation.

G. 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:
   1. 20 years' documented experience with manufacturing PVC roofing.
   2. Documentation of a PVC roofing system that has been installed for a minimum of 20 years and has a 10 year, or longer, warranty.
   3. 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.

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, thermal barriers, substrate boards, roofing accessories, roof pavers, 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:

Properties	Test	Min. Results
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	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:

Properties	**Test**	**Min. Results**
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 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. Thermal barrier: 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; DEXcel 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:
      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. 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. Sealants: Roofing manufacturer's recommended sealants for fully adhered membrane.

M. Walkway Protection:
   1. General: See Drawings for walkway protection locations and types.
   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.

N. 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.

O. 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.
   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 wood 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. 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.
3) 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 OR WOOD 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, wood deck, and also where specified in drawings 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.

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 thermal barrier 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.

3.9 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.

3.10 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.

3.11 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.

3.12 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.

3.13 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.

3.14 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 assembles must meet all requirements specified in this specification section.
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 421.
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. For manufacturers/assemblies not listed, comply with substitution requirements in Section 01 25 00.

C. Roof System 2: Location: Building 702, 431, 432, 434, 444, 444A, 445, 446, 447, 450
1. Components:
   a. Single-ply PVC roofing, minimum 0.080 inches thick.
   b. Cover board.
   c. XPS insulation.
   d. NO 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. GAF: RoofNav Assembly Number 318234-0-0.
   c. IB Roof Systems, RoofNav Assembly Number 353512-0-0.

d. IB Roof Systems, RoofNav Assembly Number 309059-0-0 (wind uplift 135 lbf/sq. ft.).
e. Seamans Corporation-Fibertite; RoofNav Assembly Number 240092-0-0.
f. For manufacturers/assemblies not listed, comply with substitution requirements in Section 01 25 00.

D. Roof System 3: Location: Buildings: All 270 housing units (Low Roof)
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 356667-0-0.
c. Versico Roofing Systems; RoofNav Assembly Number 401994-0-0.
d. Carlisle; RoofNav Assembly Number 401994-0-0.
e. Environmental Roofing Components; RoofNav Assembly Number 302372-0-0.
f. Pro-Link Roofing Systems; RoofNav Assembly Number 302372-0-0.
g. For manufacturers/assemblies not listed, comply with substitution requirements in Section 01 25 00.

E. Roof System 4: Location: Building All 270 housing units (High Roof), 495, 433, 441, 442, 443, 451
1. Components:
a. Single-ply PVC roofing, minimum 0.080 inches thick.
b. Cover board.
c. XPS insulation.
d. NO 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. GAF; RoofNav Assembly Number 211022-0-0.
c. IB Roof Systems, RoofNav Assembly Number 345162-0-0.
d. Versico; RoofNav Assembly Number 402020-0-0.
e. Carlisle; RoofNav Assembly Number 402020-0-0.
f. Seamans Corporation-Fibertite; RoofNav Number 118025-0-0.
g. Mule-Hide; RoofNav Assembly Number 232518-0-0.
h. Crestwood Industries (DBA i2M): RoofNav Assembly Number 210466-0-0.
i. Environmental Roofing Components: RoofNav Assembly Number 301967-0-0.
j. Pro-Link Roofing Systems: RoofNav Assembly Number 301967-0-0.
k. For manufacturers/assemblies not listed, comply with substitution requirements in Section 01 25 00.

F. Roof System 5: Location: Building 800, 805.
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. Plywood 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.
   b. For manufacturers/assemblies not listed, comply with substitution requirements in Section 01 25 00.

G. Roof System 6: Location: Building 903, 905.
1. Components:
   a. Single-ply PVC roofing, minimum 0.080 inches thick.
   b. Thermal barrier (mechanically fastened).
   c. Plywood deck.
   d. Insulation and vapor barrier below roof deck and not part of roof assembly.
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.
   b. For manufacturers/assemblies not listed, comply with substitution requirements in Section 01 25 00.

END OF SECTION

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 06 10 00 - Rough Carpentry: Wood blocking, nailers, and grounds.
2. Section 07 90 00 - Joint Protection.
3. 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, 2008(R2014) - 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.
   2. 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. 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.
2. 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.
   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 90 00.

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. C&J Metal Products

G. Adhesive Cold Applied Membrane Under Parapet Cap and at Through Wall Scuppers:
   1. High performance, cold applied, flexible, performed waterproof membrane manufactured with cross-laminated, HDPE carrier film with self adhesive bitumen compound.
   2. Manufacturers:
      a. Grace Bituthene 3000/30000HC or equal

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.

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.

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. 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.

G. 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.

H. 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.

I. 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