SECTION 07 2216

ROOF INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof insulation and installation.
   1. HCFC FREE "Green" Polyiso Rigid board type roof insulation(s) for thermal protection as part of roofing assemblies.

1.02 RELATED SECTIONS

A. Section 07 55 50 - Modified Bitumen Roofing

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

1.03 REFERENCES

A. ASTM A-167-94a Specification for Stainless and Heat-Resisting Chromium Nickel Steel Plate, Sheet and Strip

B. ASTM A- 653 Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc - Iron Alloy-Coated (Galvanized) by the Hot-Dip Process

C. ASTM B-29 Pig Lead

D. ASTM B-32 Solder Metal

E. ASTM C-165-95 Test Method for Measuring Compressive Properties of Thermal Insulation

F. ASTM C-208-95 Specifications for Cellulosic Fiber Insulating Board

G. ASTM C-209-92 Test Method for Cellulosic Fiber Insulating Board

H. ASTM C-272-91 Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions

I. ASTM C 518 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

J. ASTM C-728-91 Specification for Perlite Thermal Insulation Board

K. ASTM D-5 Test Method for Penetration of Bituminous Materials

L. ASTM D-36 Test Method for Softening Point of Bitumen (Ring and Ball Apparatus)

M. ASTM D-92 Test Method for Flash and Fire Pints by Cleveland Open Cup

N. ASTM D-312 Specification for Asphalt Used in Roofing

O. ASTM D-5147 Sampling and Testing Modified Bituminous Sheet Material

P. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

Q. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.

R. ASTM E 2114-01 - Standard Terminology for Sustainability Relative to the Performance of Buildings

S. ASTM 2129 -01 - Standard Practice for Data Collection for Sustainability Assessment of Building Product

T. FM Factory Mutual System, Norwood, Massachusetts

U. NRCA National Roofing Contractors Association, Chicago, IL

V. SMACNA Sheet Metal and Air Conditioning Contractors National Association

W. UL Underwriter's Laboratories, Inc., Northbrook, Illinois

X. FS HH-I-1972 Insulation Board, Polyisocyanurate

Y. WH Warnock Hersey International, Inc. Middleton, WI

1.04 DEFINITIONS

A. HCFC FREE "Green" Polyiso Roof Board Insulation is defined as environmentally friendly, with Zero Global Warming, Zero Ozone Depletion (ODP) as in compliance with the US EPA requirements of January 1, 2003 requirement to eliminate production of HCFC 141b.

B. LTTR (Long Term Thermal Resistance) is defined as using techniques from ASTM C1303, CAN/ULC S770 predicting a foam's R-Value that has been shown to be equivalent to the average performance of a permeably faced foam insulation product over 15 years. In Canada this method is used as the Design R-Value. This applies to ALL foam insulation products with blowing agents other than air, such as Polyiso, "Green" Polyiso, extruded polystyrene and polyurethane. The new method is based on consensus standards in the US and Canada. PIMA has reported this method as providing a better understanding of the thermal performance of foam.

1.05 SUBMITTALS

A. Submit under the provisions of the General Conditions Section 00 70 00.

B. Product Data: Manufacturer's specifications and installation instructions for each product specified.

C. Provide approval letters from insulation manufacturer for use of their insulation within this particular roofing system type.

D. Provide a sample of each insulation type.

E. Shop Drawings:

F. Indicate complete installation details of tapered insulation system, including identification of each insulation block, sequence of installation, layout, drain locations, roof slopes, thicknesses, crickets and saddles.

G. Include: Outline of roof, location of drains and scuppers, complete board layout of tapered insulation components, thickness and the average "R" value for the completed insulation system.

H. Certifications: Submit all of the following.
   1. Roof manufacturer's certification that insulation fasteners furnished are acceptable to roof manufacturer.
   2. Roof manufacturer's certification that insulation furnished is acceptable to roofing manufacturer as a component of roofing system and is eligible for roof manufacturer's system warranty.
   3. Wind uplift calculation, per CBC, Chapter 15, 1504 utilizing ASCE 7. Wind uplift shall be provided by the roofing system manufacturer. Calculation shall be signed and sealed by a CA licensed Structural II engineer.

   4. System Manufacturer's or insulation manufacturer's certification that HCFC FREE "Green" Polyiso materials meet Zero ODP (Ozone Depletion Potential) and Zero GWP (Global Warming Potential) specification requirements.

1.06 DESIGN REQUIREMENTS

A. No ponding of water on roof, all runoff flows to drain.

B. All roof insulation overlaid with perlite board. No roofing installed over exposed insulation.

1.07 PERFORMANCE REQUIREMENTS

A. General: Fire Classification, ASTM E-108; Section specifies a roof system with an external fire rating. The descriptions given below are general descriptions. The insulation, recovery board, and all other components shall be included as required by the membrane manufacturer to provide a Factory Mutual Class 1A fire resistance rating or Listed by Underwriter's Laboratories or Warnock Hersey for external fire tests of ASTM - E - 108 Class A.

B. Provide continuity of thermal barrier at building enclosure elements.

C. Flame spread less than 25 when tested in accordance with ASTM E84.

D. Smoke density less than 50 when tested in accordance with ASTM E84.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened packaging, with identifying tags or labels intact and legible.

B. Coordinate scheduling for timely deliveries and prompt installation of materials.

C. Store insulation and support system in a dry, protected area out of direct sunlight. If the storage area is outdoors, store material off the ground and protected by a suitable waterproof cover.

D. Remove insulation which is warped, broken or exposed to moisture from the site.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Handle and install insulation system only under conditions and temperatures recommended by the manufacturer.

B. Coordinate insulation placement to assure that material can be covered promptly with the roof. Do not leave insulation exposed overnight or to inclement weather.

1.10 WARRANTY

A. Provide warranty coordinated with the requirements of other sections specifying roof products.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturers:
   1. Viking Products Group, www.vikingpg.com
   2. Dow, www.dow.com
   3. GAF, www.gaf.com.
   4. U. S. Intec Inc., www.usintec.com.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Polyisocyanurate Roof Insulation: Provide thicknesses of insulation as indicated. Provide combination of types and thicknesses to provide a complete system.
   1. Surface Burning Characteristics: Provide assembly with composite flame spread rating of 25 or less and smoke developed of 50 or less, as determined in accordance with ASTM E 84.
   2. Closed cell polyisocyanurate foam.
      a. R-Value: Minimum 10.
   3. Insulation board shall meet the following requirements:
      a. UL, WH or FM listed under Roofing Systems
      b. Federal Specification HH-I-1972, Class 1
      c. Dimensional Stability ASTM D2126 2% max.
      d. Compressive Strength ASTM D1621 25 psi min.
      e. Vapor Permeability ASTM E-96 1 perm max.

f. Foam Core Density ASTM D1622 2.0 pcf min.
g. Water Absorption ASTM C209 <1 %
h. Flame Spread ASTM E 84, 25 max.
i. R-Factor HR per inch thickness ASTM C 518 (Design Value)

B. Related Materials:
1. Fiber Cant and Tapered Edge Strips: Performed rigid insulation units of sizes/shapes indicated or as required to achieve configurations shown, of perlite or organic fiberboard:

C. Protection Board: preprimed gypsum board 1/2-inch thickness.

D. Adhesive: Insul-Lock HR – The Garland Company.

E. Sprayed in place backfill insulation: Dow Great Stuff or as approved by roofing system manufacturer.

F. Fasteners:
1. Corrosion resistant screw fastener as recommended by roof membrane manufacturer.
2. Factory Mutual Tested and Approved with 3 in. coated disc for 1-90 rating, length required to penetrate deck one inch.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that roof framing system is complete and ready to receive insulation system. Do not proceed with installation until unsatisfactory conditions have been corrected.
1. Verify that work which penetrates roof deck has been completed.
2. Verify that wood nailers are properly and securely installed.
3. Examine surfaces for defects, rough spots, ridges, depressions, foreign material, moisture, and unevenness.
4. Do not proceed until defects are corrected.
5. Do not apply insulation until substrate is sufficiently dry, 12 percent moisture maximum, and ready to receive insulation and adhesive.
6. Broom clean substrate immediately prior to application.
7. Use additional insulation to fill depressions and low spots that would otherwise cause ponding water.

3.02 INSTALLATION

A. General: Install roof insulation in strict accordance with manufacturer's instructions and approved shop drawings.

B. Roofing insulation attachment with mechanical fasteners:
1. Approved insulation board shall be fully attached to the deck with an approved mechanical fastening system. Attachment shall be per roofing system manufacturer’s wind uplift calculation.
2. Place boards in a method to maximize contact bedding. Notch out undersides of insulation where insulation directly covers structural fasteners which are attached to the roof deck. Make a notch equal to the length, width, and depth of steel strap.
3. Filler pieces of insulation require at least two fasteners per piece if size of insulation is less than four square feet.
4. Provide spacing pattern of fasteners manufacturer's recommendations to meet wind uplift requirements. Placement of any fastener from edge of insulation board shall be a minimum of three inches, and a maximum of six inches.
5. Minimum penetration into deck shall be as recommended by the fastener manufacturer, and one inch (1") minimum for wood or metal decks where not specified by the manufacturer
6. Backfill around all conduit, junction boxes, etc. in roof insulation with spray foam insulation. Shave solidified spray foam even with boar insulation surface.
7. Subsequent layers of insulation will be set in insulation adhesive. Stagger the joints of subsequent layers of polyisocyanurate and protection board over the initial layer.

8. Adhere cover board in foam insulation adhesive.

3.03 CLEANING AND PROTECTION

A. Remove debris and cartons from roof deck. Protect finished work to ensure that insulation remains clean and dry, ready to receive roofing membrane.

END OF SECTION

SECTION 07 41 13

METAL ROOF PANELS

PART 1 – GENERAL

1.01 DESCRIPTION:

A. Work described in this section includes all labor, non owner supplied materials, tools, transportation, equipment, and services to install factory finished complete Class A preformed metal roofing system including clips, perimeter and penetration flashing, ridge cap, edge stiffeners, closures, ridge cap, drip stiffener, and gutters. (including gutter expansion joints).

1.02 RELATED SECTIONS:

A. Section 07550 – Modified Bituminous Roofing
B. Section 07220 – Roof and Deck Insulation
C. Section 07620 - Sheet Metal Flashing and Trim.
D.

1.03 SUBMITTALS:

A. Submit under provisions of the General Conditions Section 00 70 00.

B. Shop Drawings: Show roofing system with flashings and accessories in plan and elevation; sections and details. Include metal thicknesses and finishes, panel lengths, joining details, anchorage details, flashings and special fabrication provisions for termination and penetrations. Indicate relationships with adjacent and interfacing work. Shop drawings must be completed by the metal panel manufacturer's engineering department. Any and/or all changes recommended by the successful bidder must be approved by the manufacturer in writing prior to submittal.

C. Product Data: Include manufacturer's detailed material and system description, sealant and closure installation instructions, engineering performance data and finish specifications.

D. Design Test Reports:
1. Indicate fastener types of spacings; and provide fastener pullout values.
2. Submit copy of manufacturer's minimum design load calculations according to ASCE-7-10.
3. Submit copy of certification from manufacturer stating that specified system has been tested in accordance with ASTM-1592 requirements by an independent Engineering Firm. All test results must be submitted including Air (ASTM E 283) Infiltration Tests. These test results must meet or exceed those listed in Section 1.8 (Design and Performance Criteria) and be stamped by an independent Engineering Firm.

1.04 INSTALLER QUALIFICATIONS:

A. Installer:
1. Engage an experienced metal roofing contractor (erector) to install standing seam system who has a minimum of five (5) years experience specializing in the installation of structural standing seam metal roof systems.

2. Contractor must be certified by manufacturer specified a supplier of structural standing seam system and obtain written certification from manufacturer that installer is approved for installation of specified system. If requested, contractor must supply owner with a copy of this certification.

3. Successful contractor is required to maintain a full-time supervisor/foreman who is on the job-site at all times during installation of new roof system. Foreman must have a minimum of five (5) years' experience with the installation of system similar to that specified.

1.05 MANUFACTURER QUALIFICATIONS:

A. The materials outlined in the Material and Method Specifications are based on the performance characteristics of the Rmer Span system by the Garland Company. Bidder will not be allowed to supply panels formed at the job-site on portable rollformers; metal panels must be pre-manufactured and engineered for this project. Bidder will not be allowed to change materials after the bid opening date. If the bidder wishes to propose an alternate manufacturer and/or material than that specified, the following manufacturer criteria must be submitted and approved in writing by the Architect and or Customer 10 days prior to bid due date. Failure to comply with this requirement is grounds for disqualification of Bid.

1. Submit certified test reports from a testing laboratory that bear the stamp of a registered California P.E. to show compliance with specified performance criteria. Test reports must meet the specified negative uplift pressures as listed per this specification for the gauge, panel width and clip spacing specified as confirmed by manufacturers ASTM-E-1592 test results.
2. Tests shall have been made identical systems within the ranges of specified performance criteria.
3. Empirical calculations for roof performance shall only be acceptable for positive loads.
4. Indicate fastener types and spacings and provide fastener pullout values.
5. Submit copy of manufacturer's Factory Mutual Certification for specified system.
6. Submit copy of certification from manufacturer stating that specified system has been tested in accordance with ASTM-1592 requirements by an independent Engineering Firm. All test results must be submitted including Air (ASTM E 283) Infiltration and meet or exceed those listed in Section 1.8 (Design and Performance Criteria).
7. A list of a minimum of five (5) jobs where the proposed alternate material was used under similar conditions. The reference list shall include date of project, size of project, address and contact telephone number.
8. A financial statement demonstrating a current ratio of 2:1 (current assets to current liabilities).
9. A written statement from the manufacturer stating that they will provide the building owner with a daily site inspection for a minimum of one (1) hour by an experienced, full time employee of the company.
10. A written statement from a corporate officer of the manufacturing company stating that he or she has reviewed the specifications and confirms that the proposed system meets or exceeds all performance requirements listed as well as meets the panel size, gauge, weight, clip design, sealant design, uplift pressures and height of the vertical seam.
11. A copy of manufacturer's 30 year NDL standing seam/modified built up warranty.

B. The following samples must be submitted by alternate manufacturers:
1. Submit sample of panel section, at least 6" x 6" showing seam profile and also a sampler of color selected. Submit sample of panel clip.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Manufacturer's responsibility:
   1. Protect components during fabrication and packing from mechanical abuse, stains, discoloration, and corrosion.

   2. Provide protective interleaving between contact areas of exposed surfaces to prevent abrasion during shipment, storage, and handling.

B. Installer's responsibility:
   1. Store materials off ground providing for drainage; under cover providing for air circulation; and protected from wind movement, foreign material contamination, mechanical damage, cement, lime or other corrosive substances.
   2. Handle materials to prevent damage to surfaces, edges and ends of roofing sheets and sheet metal items. Damaged material shall be rejected and removed from the site.

1.07 JOB CONDITIONS:

A. Determine that work of other trades will not hamper or conflict with necessary fabrication and storage requirements for preformed metal roofing system.

B. Protection:
   1. Provide protection or avoid traffic on completed roof surfaces.
   2. Support no roof-mounted equipment directly on roofing system.

C. Ascertain that work of other trades which penetrates the roof or is to be made watertight by the roof is in place and approved prior to installation of roofing.

1.08 QUALITY CRITERIA:

A. Applicable standards:
   1. American Society for Testing and Materials (ASTM):
      B209-03 Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
      E283-93 Test Method for Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
      E1592-01 Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
   2. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Architectural Sheet Metal Manual, Latest Edition.
   4 Underwriters' Laboratories (UL):
      Standard UL – 580 Tests for Wind-Uplift Resistance of Roof Assemblies.
      Standard UL – 790 Class A Fire Rated Materials.

B. Applicable erection tolerances: Maximum variation from true planes or lines: ¼" in 20'-0"; 3/8" in 40'-0" or more.

1.09 DESIGN AND PERFORMANCE CRITERIA:

A. Thermal Movement:
1. Completed metal roofing and flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, producing excess stress on structure, anchors or fasteners, or reducing performance ability.
2. Interface between panel and clip shall provide for **unlimited** thermal movement in each direction along the longitudinal direction.

B. Uniform wind load capacity:

1. Capacity shall be determined using pleated airbag method in accordance with ASTM E 1592, testing of sheet metal roof panels as follows:
(7.1) Roof test specimens shall be either full length or representative of the main body of the roof, free from edge restraint or perimeter attachments, continuous over one or more supports, and containing at least five panel modules for standing seam roof.
(7.1.2) No attachments shall be permitted at sides or end perimeter other than those that occur uniformly throughout roof. Side and end seals shall be flexible and in no way restrain crosswise distortion of panels.
(7.2.1) Panels and accessories shall be production materials of same type and thickness proposed for use on project.
2. Installed roof system shall carry positive uniform design loads with a maximum system deflection of L/180 as measured at the rib (web) of the panel.

C. Underwriters' Laboratories, Inc., (UL) fire resistance P ratings for roof assemblies. Underwriters' Laboratories, Inc., (UL) Class A fire rated materials per UL 790.

D. ASTM E283: **Static pressure air infiltration:**

Pressure	**Leakage Rate**
1.57 PSF	0.0007 cfm/sq.ft.
6.24 PSF	0.0002 cfm/sq.ft.
20.0 PSF	0.0036 cfm/sq.ft.

E. Water penetration (dynamic pressure): No water penetration, other than condensation, when exposed to dynamic rain and 70 mph wind velocities for not less than five minutes duration, when tested in accord with principles of ASMA 501.1.

F. Capacities for gauge, span or loading other than those tested may be determined by interpolation of test results within the range of test data. Extrapolation for conditions outside test range are not acceptable.

G. Cool Roof Features:
- Aged Solar Reflectance = 0.20 or higher
- Thermal Emittance = 0.75 or higher

Verify that colors selected meet this minimum criteria.

1.09 WARRANTIES:

A. Owner shall receive ONE (1) WARRANTY from manufacturer of roof panels covering ALL of the following criteria. Multiple warranties are NOT acceptable:

1. Manufacturer's 30 year NDL watertight warranty. Manufacturer's warranty shall be a total systems warranty including all metal soffit, standing seam roofing, modified bitumen, soffits, and ANSI-SPRI ES-1 Edge metal. The same company shall manufacture the soffit, standing seam metal, modified bitumen, and ANSI-SPRI ES-1. This composite warranty shall provide the city with a single source of liability by guaranteeing both waterproofing systems against leaks for a period of 30 years.
2. Warranty must cover the calculated wind speed of 120 mph uplift pressures.
3. 20 year coverage on finish including checking, crazing, peeling, chalking, fading and or adhesion.
4. Installer shall provide manufacturer with 5 year warranty covering roofing system installation and watertightness.

1.10 PRE-INSTALLATION CONFERENCE:

A. Conduct pre-installation meeting at project site before each construction activity that required coordination with installation of preformed metal roofing system.

B. Other trades involved in or affected by installation of metal roof system shall attend.

C. Advise Architect/Owner of scheduled meeting dates minimum of seven (7) days in advance.

D. Review progress of other construction activities and preparations for particular activity under construction at each pre-installation conference.

E. Record significant discussions and agreements/disagreements of each conference, along with approved schedule. Distribute record of meeting to everyone concerned, promptly, including Owner and Architect.

F. Do not proceed if conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of work and reconvene conference at earliest feasible date.

PART 2 – PRODUCTS

2.01 MANUFACTURERS:

A. Basis of Design: R-Mer Span by Garland Company, Inc. (The), which is located at: 3800 E 91st St,; Cleveland, OH 44105;
Local Representative: Doug Clark (925) 784-6701 – Email: dclark@garlandind.com
1. Materials to be furnished and provided by Alameda USD through CMAS.

2.02 MATERIALS:

A. Metal Roofing System:
1. Whenever a particular make of material, trade name and/or manufacturer's name is specified herein, it shall be regarded as being indicative of the minimum standard of quality required. A bidder who proposes to quote on the basis of an alternate material and/or system will only be considered if the proposed alternate is submitted on time and is documented as being equivalent or superior in quality to the specified system as described in these specifications. Additionally, all manufacturer and contractor/fabricator guidelines must be met as specified.

B. Panel Material:

1. Panel material: Aluminum, 3105-H14 alloy, smooth as per ASTM B209, .040 inch thickness.
2. Flashing, gutters, and flat stock material: Fabricate in profiles indicated on drawings of same material, thickness, and finish as roof system, unless indicated otherwise.

C. Finish on surfaces:
1. Exposed surfaces for coated panels: Metal roofing, gutters, ridge caps, drip stiffener, and flashing components shall receive two coat coil applied, baked-on full-strength (70% resin) fluorocarbon coating system (polyvinylidene fluoride, PVF2), applied by manufacturer's approved applicator. Color shall be as selected by Architect from Manufacturer's standard or designer colors available.
2. Coating system shall provide nominal 1.0 mil dry film thickness, consisting of primer and color coat.
3. Color shall be as selected by Architect or Owner from manufacturer's stock colors available and shall match preformed metal roofing color Section 07430.

D. Characteristics:
1. Configuration: Standing seams incorporating mechanically interlocked, concealed anchor clips allowing unlimited thermal movement, and of configuration which will prevent entrance or passage of water.
   a. Panel/Cap configuration must have a total of four (4) layers of steel surrounding anchor clip for prevention of water infiltration and increased system strength designed to limit potential for panel blow-off.
   b. Profile of panel shall have mesa's every ½" o.c. continuous throughout panel which are a minimum of 1.5" wide. These will absorb thermal stresses, reduce oil canning in panel and increase load carrying capacity.
   c. Exposed fasteners, screws and/or roof mastic is unacceptable and will be rejected. System configuration only allows for exposed fasteners at panel overlap (if required) and trim details (as per manufacturer's guidelines).
   d. Panels must be furnished in continuous lengths from ridge to eave with no overlaps unless approved by manufacturer to length of run.
2. Seam must be 2-3/8" minimum height for added upward pressures and aesthetic appeal. Seam shall have continuous anchor reveals to allow anchor clips to resist positive and negative loading and allow unlimited expansion and contraction of panels due to thermal changes. Integral (not mechanically sealed) seams are not acceptable.
3. Concealed Anchor Clips: Clips must be 16 gauge stainless steel, alloy 316L ONE (1) piece clip with projecting legs for additional panel alignment and provision for unlimited thermal movement in each direction along the longitudinal dimension.
   a. Two-piece (2) clips are NOT acceptable.
   b. Clip design must isolate sealant in panel cap from clip to insure that no sealant damage occurs from the clip during expansion and contraction.
   c. Clip must maintain a clearance of a minimum of 3/8" between panel and substrate for proper ventilation to help prevent condensation on underside of panel and eliminate the contact of panel fastener head to panel.
4. Seam cap: Snap-on cap shall be a minimum of 1" wide "T" shaped of continuous length up to 45 feet accordingly to job condition and field seamed by means of manufacturer's standard seaming machine.
   a. Cap shall be designed to receive continuous double bead of hot applied, foamed in place gasketing sealant which will not come in contact with the

anchor clip to allow unlimited thermal movement of panel without damage to cap sealant.

b. Sealant shall be non-fatigue, nitrogen injected water barrier.

5. Standing Seam Panel Width: 18”
6. Replaceability: Panels shall be of a symmetrical design with snap on cap configuration such that individual panels may be removable for replacement without removing adjacent panels.
7. Panel ends shall be panned at ridge, headwall, and hip conditions where applicable.

E. Accessories:

1. Gable anchor clips: Standing Seam styles galvanized minimum thickness 16 gauge stainless steel.
2. Fasteners:
   a. Concealed fasteners: Corrosion resistant steel screws designed to meet structural loading requirements. The normal minimum screw size shall be #12.
3. Closures: Factory pre-cut closed cell foam meeting ASTM D3575-93 a cross-linked closed cell polyolefin foam, enclosed in metal channel matching panels when used at hip and ridge.
4. Panel joint (endlap) sealant: Non-curing modified isobutylene tri-polymer tape of thickness to fully adhere to both surfaces being joined with indicated service life of 30 years.
5. Insulation: Polyisocyanurate providing a minimum R-Value of 10.

2.03 ACCESSORY PRODUCTS:

A. Sealant:

1. Acceptable product:
   a. Concealed Application: PT1-707 or Bostik Chem-Calk butyl sealant.
   b. Exposed Application: The Garland Company, Tuff Stuff or Equal

B. Underlayment:

1. The Garland Company, R-mer Seal or Equal

C. Gutter Liner:

1. Green-Weld PVB adhered with Green-Lock Structural Adhesive.

2.04 FABRICATION:

A. Shop fabricate metal roofing, gutter, and flashing components to the maximum extent possible, forming metal work with clear, sharp, straight, and uniform bends and rises. Hem exposed edges of flashings.

B. Form flashing components and gutters from full single width sheet in minimum 10’-0” sections. Provide mitered corners, joined using closed end pop rivets and joint sealant.

C. Fabricate roofing and related sheet metal work in accord with approved shop drawings and applicable standards.

PART 3 – EXECUTION

3.01 PREPARATION:

A. Inspection: Examine the alignment and placement of the building structure and substrate. Correct any objectionable warp, waves or buckles in the substrate before proceeding with installation of the preformed metal roofing. The installed roof panels will follow the contour of the structure and may appear irregular if not corrected.

B. Establish straight side and crosswise benchmarks.

C. Use proper size and length fastener for strength requirements. Approximately 5/16” is allowable for maximum fastener head size beneath the panel.

D. Pre-roofing conference: Prior to beginning metal roofing work, a pre-roofing conference shall be held to review work to be accomplished.

1. Contractor, metal roofing subcontractor, metal roofing system manufacturer’s representative and all other subcontractors who have equipment penetrating roof or whose work involves access to roof shall be present.

3.02 ROOFING AND FLASHING INSTALLATION:

A. All details will be shown on manufacturer’s shop drawings to successful bidder; install roofing and flashings in accordance with approved shop drawings and manufacturer’s product data, within specified erection tolerances.

B. Install a high temperature peel and stick underlayment over the entire deck surface.

C. Install 3” x 5” (16 gauge) pre-punched bearing plates with the 16 gauge one piece panel clips as necessary to provide even panel seam height. Bearing plates shall possess two pre-slotted holes and be fastened into the deck. Clip spacing is at end of section.

D. Installation of Roof Panels: Roof panels can be installed by starting from either end and working towards the opposite end. Due to the symmetrical design of the specified panel system, it is also acceptable to start from the middle of the roof and work toward each end.

1. A stainless-steel pop rivet shall be secured through the anchor reveal of the panel leg and extend into the arms of the panel clip located at the ridge of the system. This is done at each arm of the clip along the ridge. The panel is then anchored at both sides of the clip.
   a. Be sure to capture all drilling debris during this operation with a rag or cloth placed on the panels at the drilling operation.
2. The seam caps are shipped with two rolls of factory applied hot melt sealant located inside the caps. To install the caps, hook one side of the cap over the panel edge and rotate over the opposite panel leg. For ease of installation, start at one end of the panel and work toward the opposite end.
3. A hand crimping tool is used to crimp the cap around the top of two adjacent panels.
4. Caps shall then be permanently seamed with manufacturers mechanical seamer.

E. Isolate dissimilar metals and masonry or concrete from metals with bituminous coating. Use gasketed fasteners where required to prevent corrosive action between fastener, substrate, and panels.

F. Limit exposed fasteners to extent indicated on shop drawings.

G. Anchorage shall allow for temperature expansion/contraction movement without stress or elongation of panels, clips, or anchors. Attach clips to structural substrate using fasteners of size and spacing as determined by manufacturer's design analysis to resist specified uplift and thermal movement forces.

H. Seal laps and joints in accordance with roofing system manufacturer's product data.

I. Coordinate flashing and sheet metal work to provide weathertight conditions at roof terminations. Fabricate and install in accordance with standards of SMACNA Manual.

J. Provide temperature expansion/contraction movement of panels at roof penetrations and roof mounted equipment in accordance with system manufacturer's product data and design calculations.

K. Installed system shall be true to line and plane and free of dents, and physical defects with a minimum of oil canning.

L. Form joints in linear sheet metal to allow for ¼" minimum expansion at 20'-0" o.c. maximum and 8'-0" from corners.

M. At joints in linear sheet metal items, set sheet metal items in two ¼" beads of butyl sealant. Extend sealant over all metal surfaces. Mate components for positive seal. Allow no sealant to migrate onto exposed surfaces.

N. Remove damaged work and replace with new, undamaged components.

O. Touch up exposed fasteners using paint furnished by roofing panel manufacturer and matching exposed panel surface finish.

P. Install expansion joints on all gutters exceeding 50'-0" long or a minimum of 1 per 12 units. SMACNA Figure 1-7- Butt Type gutter expansion joint.

3.03 CLEANING:

A. Clean exposed surfaces of work promptly after completion of installation. To prevent rust staining on finished surfaces, immediately remove filings produced by drilling or cutting.

C. Clean roofs in accordance with manufacturer's recommendations.

D. Clean exposed surfaces of roofing and accessories after completion of installation. Leave in clean condition at Date of Substantial Completion for Project. Touch up minor abrasions and scratches in finish.

E. Touch up exposed fasteners using paint furnished by roofing panel manufacturer and matching exposed panel surface finish.

F. Remove all scrap and construction debris from the site.

3.04 FINAL INSPECTION:

A. Final inspection will be performed by a firm appointed and paid for by the owner in accordance with general requirements.

3.05 OWNER SUPPLIED MATERIALS

A. The Owner will only supply the quantity listed in the owner supplied materials section of this specification below. All additional materials and accessories will be the full responsibility of the contractor to provide and install per the specification and project requirements.

B. Any material or accessories required for the installation of the roof system in excess of the Owner provided material must be supplied by the Contractor and added into the bid cost proposal. It is up to the Contractor to determine the precise amount of material required for the completion of this project; and to provide excess material, as required. The cost to handle and fabricate flashing metal from the Owner provided flat stock is contractor's responsibility and to be added into the bid cost proposal.

C. All required flashings as required per each specification section for plumbing, electrical, gas, etc. will be the Contractors responsibility to provide and install as well as to be included in the bid cost.

D. All materials not specifically included in the owner supplied materials section will be the responsibility of the contractor to provide and install in compliance with section 07550.

E. Freight charges of owner supplied materials will be the responsibility of the Owner.

F. Contractor must coordinate and take delivery of materials, count all materials and ensure it matches the list below, unload and properly locate materials at the job site, and properly protect, cover and store at jobsite.

G. Contractor must be able to provide certification in writing from roof system manufacturer that the contractor is approved to install the specified roof system and provide all warranty requirements of section 07550.

a. Materials specifically provided by the Owner:

i.	R-Mer Span – 0.040 Alum	14,250	Square Feet
ii.	R-Mer Seal	70	Rolls
iii.	Freight to jobsite:	1	

END OF SECTION

SECTION 07 55 00

MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 GENERAL

1.1 SCOPE OF WORK

A. The work under this contract shall include all labor, non owner supplied materials, tools, transportation, equipment, services, and facilities necessary for, and reasonably incidental to, the completion of the work as shown on the drawings and/or described in the specifications, for the following scope of work:
   1. Remove and dispose of all roofing, gutters, coping, edge metal, and associated materials down to the structural deck.
      a. Upper Theater: Remove and dispose of all base flashings and detail flashings and prepare roof for an overlay per manufacturers guidelines.
   2. Inspect deck and perform repairs as needed.
   3. Mechanically fasten or adhere R-10 polyiso and ½" densdeck prime per manufacturers ASCE-7 wind uplift calculations.
      a. Upper Theater: Mechanically fasten ½" densdeck prime per manufacturers ASCE-7 wind uplift calculations.
   4. Install new .040 aluminum gutters, counter flashing, detail flashings, coping, and edge metal.
   5. Install 2 ply modified bitumen StressPly system in cold applied asphalt. Allow roof to cure for 30 days.
   6. Apply Title 24 approved Pyramic Plus LO in 2 coats of 1.5 gallons per square (3 gal total).
   7. Paint all conduit lines with Pyramic Plus LO. Install conduits on new Dura-Block supports.
   8. Install new R-Mer Edge Coping in .040 aluminum per districts color choice.

1.2 REFERENCES

A. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.

B. ASTM D 312 - Standard Specification for Asphalt used in Roofing.

C. ASTM D 451 - Standard Test Method for Sieve Analysis of Granular Mineral Surfacing for Asphalt Roofing Products.

D. ASTM D 1079 Standard Terminology Relating to Roofing, Waterproofing and Bituminous Materials.

E. ASTM D 1863 Standard Specification for Mineral Aggregate Used as a Protective Coating for Roofing.

F. ASTM D 4601 Standard Specification for Asphalt Coated Glass Fiber Base Sheet Used in Roofing.

G. ASTM D 5147 Standard Test Method for Sampling and Testing Modified Bituminous Sheet Materials.

H. ASTM D 6162 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.

I. ASTM E 108 - Standard Test Methods for Fire Test of Roof Coverings

J. Factory Mutual Research (FM): Roof Assembly Classifications.

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

L. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal Manual.

M. Underwriters Laboratories, Inc. (UL): Fire Hazard Classifications.

N. Warnock Hersey (WH): Fire Hazard Classifications.

O. ANSI-SPRI ES-1 Wind Design Standard for Edge Systems used with Low Slope Roofing Systems.

P. ASCE 7, Minimum Design Loads for Buildings and Other Structures

Q. UL - Fire Resistance Directory.

R. FM Approvals - Roof Coverings and/or RoofNav assembly database.

S. California Title 24 Energy Efficient Standards.

1.3 DESIGN / PERFORMANCE REQUIREMENTS

A. Perform work in accordance with all federal, state and local codes.

B. Exterior Fire Test Exposure: Roof system shall achieve a UL, FM or WH Class rating for roof slopes indicated on the Drawings as follows:
1. Factory Mutual Class A Rating.
2. Underwriters Laboratory Class A Rating.
3. Warnock Hersey Class A Rating.

C. Design Requirements:
1. Uniform Wind Uplift Load Capacity
   a. Installed roof system shall withstand negative (uplift) design wind loading pressures complying with the following criteria.
      1) Design Code: ASCE 7, Method 2 for Components and Cladding.
      2) Importance Category:
         a) IV
      3) Importance Factor of:
         a) 2.0
      4) Wind Speed: 120 mph
      5) Exposure Category:
         a) B.
      6) Roof Pitch: 1/4” :12.
      7) Roof Area Design Uplift Pressure:
         a) Zone 1 - Field of roof 10.3 psf
         b) Zone 2 - Eaves, ridges, hips and rakes 17.9 psf
         c) Zone 3 – Corners 23.6 psf
2. Live Load: 20 psf, or not to exceed original building design.
3. Dead Load:
   a. Installation of new roofing materials shall not exceed the dead load capacity of the existing roof structure.

D. Energy Star: Roof System shall comply with the initial and aged reflectivity required by the U.S. Federal Government's Energy Star program.

E. LEED: Roof system shall meet the reflectivity and emissivity criteria to qualify for one point under the LEED credit category, Credit 7.2, Landscape & Exterior Design to Reduce Heat Island - Roof.

F. Roof System membranes containing recycled or bio-based materials shall be third party certified through UL Environment.

G. Roof system shall have been tested in compliance with the following codes and test requirements:
   1. Cool Roof Rating Council:
   2. International Code Council Evaluation Service (ICC-ES):
   3. Underwriters Laboratories:
   4. Warnock Hersey
      a. ITS Directory of Listed Products
   5. FM Approvals:
      a. RoofNav Website

1.4 SUBMITTALS

A. Submit under provisions of the General Conditions Section 00 70 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions.

C. Shop Drawings: Submit shop drawings including installation details of roofing, flashing, fastening, insulation and vapor barrier, including notation of roof slopes and fastening patterns of insulation and base modified bitumen membrane, prior to job start.

D. Design Pressure Calculations: Submit design pressure calculations for the roof area in accordance with ASCE 7 and local Building Code requirements. Include a roof system attachment analysis report, certifying the system's compliance with applicable wind load requirements before Work begins.

E. Wind uplift calculation per CBC using ASCE 7-10. Calculation shall diagrammatically show fastening pattern and be stamped by the roofing system manufactures CA licensed structural engineer.

F. Recycled or Bio-Based Materials: Provide third party certification through UL Environment of roof System membranes containing recycled or bio based materials.

G. Verification Samples: For each modified bituminous membrane ply product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

H. Manufacturer's Certificates: Provide to certify products meet or exceed specified requirements.

I. Test Reports: Submit test reports, prepared by an independent testing agency, for all modified bituminous sheet roofing, indicating compliance with ASTM D5147.

J. Manufacturer's Fire Compliance Certificate: Certify that the roof system furnished is approved by Factory Mutual (FM), Underwritters Laboratories (UL), Warnock Hersey (WH) or approved third party testing facility in accordance with ASTM E108, Class A for external fire and meets local or nationally recognized building codes.

K. Any material submitted as equal to or better than the specified material must be

accompanied by a report signed and sealed by a professional engineer licensed in the state in which the installation is to take placed. This report shall show that the submitted equal meets the Design and Performance criteria in this specification. Material substitutions may only be submitted by prime bidding contractors. Substitution requests submitted without a licensed engineer stamp or by non-prime bidding contractors will be rejected for non-conformance.

L. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic inspection and maintenance of all completed roofing work. Provide product warranty executed by the manufacturer. Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with NRCA Roofing and Waterproofing Manual.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified with documented ISO 9001 certification and minimum of twelve years of documented experience and must not have been in Chapter 11 bankruptcy during the last five years.

C. Installer Qualifications: Company specializing in performing Work of this section with minimum five years documented experience and a certified Pre-Approved Garland Contractor.

D. Installer's Field Supervision: Maintain a full-time Supervisor/Foreman on job site during all phases of roofing work while roofing work is in progress.

E. Product Certification: Provide manufacturer's certification that materials are manufactured in the United States and conform to requirements specified herein, are chemically and physically compatible with each other, and are suitable for inclusion within the total roof system specified herein.

F. Manufacturers Inspections: Provide on manufacturers letterhead, a certification that a full time employee of the manufacturer will inspect the project a minimum 3 times per week as indicated in section (3.7). Letter must be signed and notarized buy a corporate officer of the manufacturing company.

G. Source Limitations: Obtain all components of roof system from a single manufacturer. Secondary products that are required shall be recommended and approved in writing by the roofing system Manufacturer. Upon request of the Architect or Owner, submit Manufacturer's written approval of secondary components in list form, signed by an authorized agent of the Manufacturer.

1.6 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to commencing Work of this section.

B. Review installation procedures and coordination required with related Work.

C. Inspect and make notes of job conditions prior to installation:
   1. Record minutes of the conference and provide copies to all parties present.
   2. Identify all outstanding issues in writing designating the responsible party for follow-up action and the timetable for completion.
   3. Installation of roofing system shall not begin until all outstanding issues are resolved to the satisfaction of the Architect.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging with labels intact until ready for installation.

B. Store all roofing materials in a dry place, on pallets or raised platforms, out of direct exposure to the elements until time of application. Store materials at least 4 inches above ground level and covered with "breathable" tarpaulins.

C. Stored in accordance with the instructions of the manufacturer prior to their application or installation. Store roll goods on end on a clean flat surface except store KEE-Stone FB 60 rolls flat on a clean flat surface. No wet or damaged materials will be used in the application.

D. Store at room temperature wherever possible, until immediately prior to installing the roll. During winter, store materials in a heated location with a 50 degree F (10 degree C) minimum temperature, removed only as needed for immediate use. Keep materials away from open flame or welding sparks.

E. Avoid stockpiling of materials on roofs without first obtaining acceptance from the Architect/Engineer.

F. Adhesive storage shall be between the range of above 50 degree F (10 degree C) and below 80 degree F (27 degree C). Area of storage shall be constructed for flammable storage.

1.8 COORDINATION

A. Coordinate Work with installing associated metal flashings as work of this section proceeds.

1.9 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 WARRANTY

A. Upon completion of the work, provide the Manufacturer's written and signed NDL Warranty, warranting that, if a leak develops in the roof during the term of this warranty, due either to defective material or defective workmanship by the installing contractor, the manufacturer shall provide the Owner, at the Manufacturer's expense, with the labor and material necessary to return the defective area to a watertight condition.
   1. Warranty Period:
      a. 30 years from date of acceptance.
      b. Warranty shall cover the calculated windspeed of 120 mph.
      c. Warranty must be provided solely by the manufacturer. No 3rd party insurance riders or 3rd party warranty holders will be accepted.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Garland Company, Inc. (The); 3800 E. 91st St., Cleveland, OH 44105. Local Representative: Doug Clark (925) 784-6701 Email: dclark@garlandind.com Web Site: www.garlandco.com.
   1. Materials to be furnished and provided by Alameda USD through CMAS.

B. The Products specified are intended and the Standard of Quality for the products required for this project. If other products are proposed the bidder must disclose in the bid the manufacturer and the products that they intend to use on the Project. If no manufacturer

and products are listed, the bid may be accepted only with the use of products specified.

1. Bidder will not be allowed to change materials after the bid opening date.
2. If alternate products are included in the bid, the products and specified overall performance requirements must be equal to or exceed the products and requirements specified. Supporting technical data shall be submitted to the Architect/ Owner for approval prior to acceptance.
3. In making a request for substitution, the Bidder/Roofing Contractor represents that it has:
    a. Personally investigated the proposed product or method, and determined that it is equal or superior in all respects to that specified.
    b. Will provide the same guarantee for substitution as for the product and method specified.
    c. Will coordinate installation of accepted substitution in work, making such changes as may be required for work to be completed in all respects.
    d. Will waive all claims for additional cost related to substitution, which consequently become apparent.
    e. Cost data is complete and includes all related cost under his/her contract or other contracts, which may be affected by the substitution.
    f. Will reimburse the Owner for all redesign cost by the Architect for accommodation of the substitution.
4. Architect/ Owner reserves the right to be the final authority on the acceptance or rejection of any or all bids, proposed alternate roofing systems or materials that has met ALL specified requirement criteria.
5. Failure to submit substitution package, or any portion thereof requested, will result in immediate disqualification and consideration for that particular contractors request for manufacturer substitution.
6. Any substitution requests must be provided to the architect 10 days before the original bid date. Substitutions outside of this timeline will not be considered.

2.2 COLD APPLIED 2-PLY SOLVENT FREE ASPHALT ROOFING -

A. Base (Ply) Sheet: One ply bonded to the prepared substrate with Interply Adhesive:
    1. StressBase 80 Plus:

B. Modified Cap (Ply) Sheet: One ply bonded to the prepared substrate with interplay adhesive.
    1. StressPly Plus FR Mineral:

C. Interply Adhesive: (Layer 1 and 2)
    1. Weatherking Plus WC: 2.5 gallons per square.

D. Flashing Base Ply: One ply bonded to the prepared substrate with Interply Adhesive:
    1. StressBase 80 Plus:

E. Flashing Cap (Ply) Sheet: One ply bonded to the prepared substrate with Interply Adhesive:
    1. StressPly Plus FR Mineral

F. Flashing Ply Adhesive:
    1. Weatherking Flashing Adhesive: 6 gallons per square.

G. Surfacing: Requires 5 days wait before applying.
    1. Surface Coatings
        a. Pyramic Plus LO: 2 coats of 1.5 gallons per square. (3 gal/square total)

2.3 ACCESSORIES:

A. Walkway Pads – TrafGuard by Wise Products Group.

B. Urethane Sealant Hybrid - Tuff-Stuff MS: One part, non-sag sealant as approved and furnished by the membrane manufacturer for moving joints.
   1. Tensile Strength, ASTM D 412: 250 psi
   2. Elongation, ASTM D 412: 450%
   3. Hardness, Shore A ASTM C 920: 35
   4. Adhesion-in-Peel, ASTM C 92: 30 pli

C. Sealant - Green-Lock Structural Adhesive: Single component, 100% solids structural adhesive as furnished and recommended by the membrane manufacturer.
   1. Elongation, ASTM D 412: 300%
   2. Hardness, Shore A, ASTM C 920: 50
   3. Shear Strength, ASTM D 1002: 300 psi

D. Coverboard – ½" Densdeck Prime or approved equal.

E. Coping; R-Mer Edge coping by The Garland Company.
   1. 0.040 Aluminum

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Inspect and approve the deck condition, slopes and fastener backing if applicable, parapet walls, expansion joints, roof drains, stack vents, vent outlets, nailers and surfaces and elements.

C. Verify that work penetrating the roof deck, or which may otherwise affect the roofing, has been properly completed.

D. If substrate preparation and other conditions are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. General: Clean surfaces thoroughly prior to installation.
   1. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
   2. Fill substrate surface voids that are greater than 1/4 inch wide with an acceptable fill material.
   3. Roof surface to receive roofing system shall be smooth, clean, free from loose gravel, dirt and debris, dry and structurally sound.
   4. Wherever necessary, all surfaces to receive roofing materials shall be power broom and vacuumed to remove debris and loose matter prior to starting work.
   5. Do not apply roofing during inclement weather. Do not apply roofing membrane to damp, frozen, dirty, or dusty surfaces.
   6. Fasteners and plates for fastening components mechanically to the substrate shall provide a minimum pull-out capacity of 300 lbs. (136 k) per fastener. Base or ply sheets attached with cap nails require a minimum pullout capacity of 40 lb. per nail.
   7. Prime decks where required, in accordance with requirements and recommendations of the primer and deck manufacturer.

B. Wood Deck:
   1. Dimensional wood deck shall be minimum 1 inch (25 mm) thick, knotholes and cracks larger than 1/4 inch shall be covered with sheet metal. All boards shall be appropriately nailed and have adequate end bearing to the centers of beams/rafters.

Lumber shall be kiln dried.

2. Plywood shall be a minimum 15/32 inch (11.9 mm) thick and conform to the standards and installation requirements of the American Plywood Association (APA).
3. If no roof insulation is specified, provide a suitable dry sheathing paper, followed by an approved base sheet nailed appropriately for the specified roof system, with 1 inch (25 mm) diameter caps and annular nails unless otherwise required by the applicable Code or Approval agency.
4. Insulation is to be mechanically attached in accordance with the insulation manufacturer's recommendations unless otherwise required by the applicable Code.
5. In all retrofit roof applications, it is required that deck be inspected for defects. Any defects are to be corrected per the deck manufacturer's recommendations and standards of the APA/Engineered Wood Association prior to new roof application.
6. Light metal wall ties or other structural metal exposed on top of the wood deck shall be covered with one ply of a heavy roofing sheet, such as HPR Glasbase Base Sheet, extending 2 inches to 6 inches (51 mm to 152 mm) beyond the metal in all directions. Nail in place before applying the base ply.

3.3 INSTALLATION - GENERAL

A. Install modified bitumen membranes and flashings in accordance with manufacturer's instructions and with the recommendations provided by the National Roofing Contractors Association's Roofing & Waterproofing Manual, the Asphalt Roofing Manufacturers Association, and applicable codes.

B. General: Avoid installation of modified bitumen membranes at temperatures lower than 40-45 degrees F. When work at such temperatures unavoidable use the following precautions:
   1. Take extra care during cold weather installation and when ambient temperatures are affected by wind or humidity, to ensure adequate bonding is achieved between the surfaces to be joined. Use extra care at material seam welds and where adhesion of the applied product to the appropriately prepared substrate as the substrate can be affected by such temperature constraints as well.
   2. Unrolling of cold materials, under low ambient conditions must be avoided to prevent the likelihood of unnecessary stress cracking. Rolls must be at least 40 degrees F at the time of application. If the membrane roll becomes stiff or difficult to install, it must be replaced with roll from a heated storage area.

C. Commence installation of the roofing system at the lowest point of the roof (or roof area), working up the slope toward the highest point. Lap sheets shingle fashion so as to constantly shed water

D. All slopes greater than 2:12 require back-nailing to prevent slippage of the ply sheets. Use ring or spiral-shank 1 inch cap nails, or screws and plates at a rate of 1 fastener per ply (including the membrane) at each insulation stop. Place insulation stops at 16 ft o.c. for slopes less than 3:12 and 4 feet o.c. for slopes greater than 3:12. On non-insulated systems, nail each ply directly into the deck at the rate specified above. When slope exceeds 2:12, install all plies parallel to the slope (strapping) to facilitate backnailing. Install 4 additional fasteners at the upper edge of the membrane when strapping the plies.

3.4 INSTALLATION COLD APPLIED ROOF SYSTEM

A. Base Ply: Cut base ply sheets into 18 foot lengths and allow plies to relax before installing. Install base sheet in Interply Adhesive: applied at the rate required by the manufacturer. Shingle base sheets uniformly to achieve one ply throughout over the prepared substrate. Shingle in proper direction to shed water on each large area of roofing.
   1. Lap ply sheet ends 8 inches. Stagger end laps 12 inches minimum.
   2. Solidly bond to the substrate and adjacent ply with specified cold adhesive at the rate of 2.5 gallons per 100 square feet.

3. Roll must push a puddle of adhesive in front of it with adhesive slightly visible at all side laps. Use care to eliminate air entrapment under the membrane.
4. Install subsequent rolls of modified across the roof as above with a minimum of 4 inch side laps and 8 inch staggered end laps. Lay modified membrane in the same direction as the underlayers but the laps shall not coincide with the laps of the base layers.
5. Extend plies 2 inches beyond top edges of cants at wall and projection bases.
6. Install base flashing ply to all perimeter and projection details.
7. Allow the one ply of base sheet to cure at least 30 minutes before installing the modified membrane. However, the modified membrane must be installed the same day as the base plies.

B. Modified Cap Ply(s): Cut cap ply sheets into 18 foot lengths and allow plies to relax before installing. Install in interplay adhesive applied at the rate required by the manufacturer. Shingle sheets uniformly over the prepared substrate to achieve the number of plys specified. Shingle in proper direction to shed water on each large area of roofing.
1. Lap ply sheet ends 8 inches. Stagger end laps 12 inches minimum.
2. Solidly bond to the base layers with specified cold adhesive at the rate of 2.5 gallons per 100 square feet.
3. Roll must push a puddle of adhesive in front of it with adhesive slightly visible at all side laps. Care should be taken to eliminate air entrapment under the membrane.
4. Install subsequent rolls of modified across the roof as above with a minimum of 4 inch side laps and 8 inch staggered end laps. Lay modified membrane in the same direction as the underlayers but the laps shall not coincide with the laps of the base layers.
5. Allow cold adhesive to set for 5 to 10 minutes before installing the top layer of modified membrane.
6. Extend membrane 2 inches beyond top edge of all cants in full moppings of the cold adhesive as shown on the Drawings.

C. Fibrous Cant Strips: Provide non-combustible perlite or glass fiber cant strips at all wall/curb detail treatments where angle changes are greater than 45 degrees. Cant may be set in approved cold adhesives, hot asphalt or mechanically attached with approved plates and fasteners.

D. Wood Blocking, Nailers and Cant Strips: Provide wood blocking, nailers and cant strips as specified in Section 06114.
1. Provide nailers at all roof perimeters and penetrations for fastening membrane flashings and sheet metal components.
2. Wood nailers should match the height of any insulation, providing a smooth and even transition between flashing and insulation areas.
3. Nailer lengths should be spaced with a minimum 1/8 inch gap for expansion and contraction between each length or change of direction.
4. Nailers and flashings should be fastened in accordance with Factory Mutual "Loss Prevention Data Sheet 1- 49, Perimeter Flashing" and be designed to be capable of resisting a minimum force of 200 lbs/lineal foot in any direction.

E. Metal Work: Provide metal flashings, counter flashings, parapet coping caps and thru-wall flashings as specified in Section 07620 or Section 07710. Install in accordance with the SMACNA "Architectural Sheet Metal Manual" or the NRCA Roofing Waterproofing manual.

F. Termination Bar: Provide a metal termination bar or approved top edge securement at the terminus of all flashing sheets at walls and curbs. Fasten the bar a minimum of 8 inches (203 mm) o/c to achieve constant compression. Provide suitable, sealant at the top edge if required.

G. Flashing Base Ply: Install flashing sheets by the same application method used for the base

ply.

1. Seal curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.
2. Prepare all walls, penetrations, expansion joints and where shown on the Drawings to be flashed with required primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.
3. Adhere to the underlying base ply with specified flashing ply adhesive unless otherwise specified. Nail off at a minimum of 8 inches (203 mm) o.c. from the finished roof at all vertical surfaces.
4. Solidly adhere the entire flashing ply to the substrate. Run first ply of membrane 4’ up wall and secure with a termination bar fastened at 6 inches (152 mm) O.C. and sealed at top. Apply second ply with a minimum 8” overlap of lower ply and upper ply. Fasten and secure with termination bar fastened at 6 inches O.C. and sealed.
5. Coordinate counter flashing, cap flashings, expansion joints and similar work with modified bitumen roofing work as specified.
6. Coordinate roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices with the roofing system work.
7. Secure the top edge of the flashing sheet using a termination bar only when the wall surface above is waterproofed, or nailed 4 inches on center and covered with an acceptable counter flashing.

H. Flashing Cap Ply:

1. Seal curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.
2. Prepare all walls, penetrations, expansion joints and where shown on the Drawings to be flashed with required primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.
3. Adhere to the underlying base flashing ply with specified flashing ply adhesive unless otherwise specified. Run flashing cap ply 4 feet up wall and fasten with termination bar fastened ever 6 inches O.C. Adhere additional cap ply on remaining wall section in specified adhesive with a minimum 8 inch overlap of lower flashing cap ply. Heat weld seam. Nail off at a minimum of 8 inches (203 mm) o.c. from the finished roof at all vertical surfaces.
4. Coordinate counter flashing, cap flashings, expansion joints and similar work with modified bitumen roofing work as specified.
5. Coordinate roof accessories, miscellaneous sheet metal accessory items with the roofing system work.
6. All stripping shall be installed prior to flashing cap sheet installation.
7. Heat and scrape granules when welding or adhering at cut areas and seams to granular surfaces at all flashings.
8. Secure the top edge of the flashing sheet using a termination bar only when the wall surface above is waterproofed, or nailed 4 inches on center and covered with an acceptable counter flashing.

I. Surface Coatings: Apply roof coatings in strict conformance with the manufacturer's recommended procedures.

J. Roof Walkways: Provide walkways in areas indicated on the Drawings.

3.5 INSTALLATION EDGE TREATMENT AND ROOF PENETRATION FLASHING

A. Equipment Support:

1. Minimum curb height is 8 inches (203 mm) above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).

3. Install base flashing ply covering curb set in bitumen with 6 inches (152 mm) on to field of the roof.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Attach top of membrane to top of curb and nail at 8 inches (203 mm) o.c. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
5. Use Tuff-Flash and polyester where necessary to fully seal detail areas.
6. Install pre-manufactured cover. Fasten sides at 24 inches (609 mm) o.c. with fasteners and neoprene washers. Furnish all joint cover laps with butyl tape between metal covers.
7. Set equipment on neoprene pad and fasten as required by equipment manufacturer.

B. Curb Detail/Air Handling Station:
1. Minimum curb height is 8 inches (203 mm) above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
3. Install base flashing ply covering curb set in bitumen with 6 inches (152 mm) on to field of the roof.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
5. Use Tuff-Flash and polyester where necessary to fully seal detail areas.
6. Install pre-manufactured counterflashing with fasteners and neoprene washers or per manufacturer's recommendations.
7. Set equipment on neoprene pad and fasten as required by equipment manufacturer.

C. Exhaust Fan:
1. Minimum curb height is 8 inches (203 mm) above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all plies over cant a minimum of 2 inches (50 mm).
3. Install base flashing ply covering curb with 6 inches (152 mm) on to field of the roof.
4. Install a second ply of modified flashing ply installed over the base flashing ply, 9 inches (228 mm) on to field of the roof. Attach top of membrane to top of wood curb and nail at 8 inches (203 mm) o.c. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
5. Install metal exhaust fan over the wood nailers and flashing to act as counterflashing. Fasten per manufacturer's recommendation.

D. Passive Vent/Air Intake:
1. Minimum curb height is 8 inches (203 mm) above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all plies over cant a minimum of 2 inches (50 mm).
3. Install base flashing ply covering curb with 6 inches (152mm) on to the field of the roof.
4. Install a second ply of modified flashing ply installed over the base flashing ply, 9 inches (228 mm) on to field of the roof. Attach top of membrane to top of wood curb and nail at 8 inches (203 mm) o.c. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
5. Install passive vent/air intake over the wood nailers and flashing to act as counterflashing. Fasten per manufacturer's recommendations.

E. Roof Drain:
1. Plug drain to prevent debris from entering plumbing.
2. Taper insulation and or coverboard to drain minimum of 24 inches (609 mm) from center of drain.
3. Run roof system plies over drain. Cut out plies inside drain bowl.

4. Set lead/copper flashing (30 inch square minimum) in 1/4 inch bed of mastic. Run lead/copper into drain a minimum of 2 inches (50 mm). Prime lead/copper at a rate of 100 square feet per gallon and allow to dry.
5. Install base flashing ply (40 inch square minimum) in bitumen.
6. Install modified membrane (48 inch square minimum) in bitumen.
7. Install clamping ring and assure that all plies are under the clamping ring.
8. Remove drain plug and install strainer.

F. Plumbing Stack:
1. Minimum stack height is 12 inches (609 mm).
2. Run roof system over the entire surface of the roof. Seal the base of the stack with elastomeric sealant.
3. Prime flange of new sleeve. Install properly sized sleeves set in 1/4 inch (6 mm) bed of roof cement.
4. Install base flashing ply in bitumen.
5. Install membrane in bitumen.
6. Caulk the intersection of the membrane with elastomeric sealant.
7. Turn sleeve a minimum of 1 inch (25 mm) down inside of stack.

G. Heat Stack:
1. Minimum stack height is 12 inches (609 mm).
2. Run roof system over the entire surface of the roof. Seal the base of the stack with elastomeric sealant.
3. Prime flange of new sleeve. Install properly sized sleeves set in 1/4 inch (6 mm) bed of roof cement.
4. Install base flashing ply in bitumen.
5. Install modified membrane in bitumen.
6. Caulk the intersection of the membrane with elastomeric sealant.
7. Install new collar over cape. Weld collar or install stainless steel draw brand.

3.6 CLEANING

A. Clean-up and remove daily from the site all wrappings, empty containers, paper, loose particles and other debris resulting from these operations.

B. Remove asphalt markings from finished surfaces.

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

3.7 PROTECTION

A. Provide traffic ways, erect barriers, fences, guards, rails, enclosures, chutes and the like to protect personnel, roofs and structures, vehicles and utilities.

B. Protect exposed surfaces of finished walls with tarps to prevent damage.

C. Plywood for traffic ways required for material movement over existing roofs shall be not less than 5/8 inch (16 mm) thick.

D. In addition to the plywood listed above, an underlayment of minimum 1/2 inch (13 mm) recover board is required on new roofing.

E. Special permission shall be obtained from the Manufacturer before any traffic shall be permitted over new roofing.

3.8 FIELD QUALITY CONTROL

A. Manufacturer Inspections:

1. An inspection shall be made by a representative of the material manufacturer a minimum of three (3) times per week during performance of work to ensure that said project is installed in accordance with the manufacture's specifications and illustrated details. Written reports including pictures and comments shall be turned over to the Architect and Owner, on each Monday following the prior week.
   a. The authorized material manufacturers field representative shall be responsible for:
      1) Keeping the Architect's representative informed after periodic inspections as to the progress and quality of the work observed.
      2) Calling to the attention of the contractor those matters observed which are considered to be in violation of the contract requirements.
      3) Reporting to the Architect's representative, in writing, any failure or refusal of the contractor to correct unacceptable practices called to his attention.
      4) Confirming, after completion of the work and based on his observation and test, that he has observed no application procedures in conflict with these specifications.

3.9 OWNER SUPPLIED MATERIALS

A. The Owner will only supply the quantity listed in the owner supplied materials section of this specification below. All additional materials and accessories will be the full responsibility of the contractor to provide and install per the specification and project requirements.

B. Any material or accessories required for the installation of the roof system in excess of the Owner provided material must be supplied by the Contractor and added into the bid cost proposal. It is up to the Contractor to determine the precise amount of material required for the completion of this project; and to provide excess material, as required. The cost to handle and fabricate flashing metal from the Owner provided flat stock is contractor's responsibility and to be added into the bid cost proposal.

C. All required flashings as required per each specification section for plumbing, electrical, gas, etc. will be the Contractors responsibility to provide and install as well as to be included in the bid cost.

D. All materials not specifically included in the owner supplied materials section will be the responsibility of the contractor to provide and install in compliance with section 07550.

E. Freight charges of owner supplied materials will be the responsibility of the Owner.

F. Contractor must coordinate and take delivery of materials, count all materials and ensure it matches the list below, unload and properly locate materials at the job site, and properly protect, cover and store at jobsite.

G. Contractor must be able to provide certification in writing from roof system manufacturer that the contractor is approved to install the specified roof system and provide all warranty requirements of section 07550.

1. Materials specifically provided by the Owner:
   a. StressPly Plus FR Mineral: 210 Rolls
   b. StressBase 80 Plus: 105 Rolls
   c. Pyramic Plus LO: 85 Buckets
   d. Weatherking Plus WC: 120 Buckets
   e. Weatherking Flashing Adh: 60 Buckets
   f. Tuff-Stuff MS: 4 Cases
   g. Garla-Prime VOC: 10 Buckets
   h. Freight to jobsite: 1

END OF SECTION

SECTION 07 56 30

FLUID APPLIED ROOFING RESTORATION

PART 1 GENERAL

1.1 SCOPE OF WORK

A. The work under this contract shall include all labor, non owner supplied materials, tools, transportation, equipment, services, and facilities necessary for, and reasonably incidental to, the completion of the work as shown on the drawings and/or described in the specifications, for the following scope of work:
   1. Mineral Modified Bitumen Surface Roof Restoration: Renovation work includes but is not limited to the following:
      a. Remove and dispose of all base flashings and coping metal
         1) Surface mounted counterflashing to be cut back and new skirt flashing to be installed. Reglet mounted counterflashing to be removed and reused.
      b. Install new gas line supports every 20'. Roof in supports and install metal cap cover.
      c. Install new base flashings with Versiply 40 and Versiply Mineral membranes using Green-Lock Flashing Adhesive.
      d. Patch and repair all blisters, mole runs, unadhered seams, and damaged membrane areas.
      e. Patch in removed areas using Versiply 40 and Versiply Mineral in Green-Lock Flashing Adhesive.
      f. Cut out caulking along counterflashing's and penetration details. Install new Green-Lock Sealant XL.
      g. Powerwash entire roof system with simplegreen or tsp and water solution.
      h. Apply Liquitec at 3 gallons per square to all details and membrane seams. Immediately roll grip polyester soft into the coating. Allow to cure.
      i. Apply base coat of Liquitec at 2 gallons per square over entire roof surface.
      j. Apply top coat of Liquitec at 2 gallons per square over entire roof surface.
      k. Install new R-Mer Edge Coping.
      l. Clean off all mastic/asphalt and paint all conduit pipes, vents, and hoods with Pyramic to ensure a clean final project. All conduit to be sealed and reattached with proper couplings. Lines should be straight and as tidy as possible. Any couplings that cannot be properly sealed should be brought to district attention.
      m. Test all drains and downspout prior to construction and once again after completion.

1.2 RELATED SECTIONS

A. Section 06100 - Rough Carpentry: Roof blocking installation and requirements.

B. Section 07620 - Sheet Metal Flashing and Trim: Metal cap flashing and expansion joints.

C. Section 07620 - Sheet Metal Flashing and Trim: Weather protection for base flashings.

D. Section 07710 - Manufactured Roof Specialties: Counter flashing gravel stops, and fascia, scuppers, gutters and downspouts.

1.3 REFERENCES

A. ASTM C 92 - Standard Test Methods for Sieve Analysis and Water Content of Refractory Materials.

B. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.

C. ASTM D 93 - Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester.

D. ASTM D 562 - Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer.

E. ASTM D 624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers

F. ASTM D 2240 - Standard Test Method for Rubber Property-Durometer Hardness.

G. ASTM D 4212 - Standard Test Method for Viscosity by Dip-Type Viscosity Cups.

H. ASTM D 4402 - Standard Test Method for Viscosity Determination of Asphalt at Elevated Temperatures Using a Rotational Viscometer.

I. ASTM E 1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces

J. SRI - Solar Reflectance Index calculated according to ASTM E 1980.

K. SMACNA Architectural Sheet Metal Manual.

L. National Roofing Contractors Association (NRCA) - Roofing and Waterproofing Manual.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Submit shop drawings including installation details of fluid applied roofing and flashing prior to job start.

D. LEED Submittals: Provide documentation of how the requirements of Credit will be met:
1. List of proposed materials with recycled content. Indicate post-consumer recycled content and pre-consumer recycled content for each product having recycled content.
2. Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content.
3. Product reflectivity and emissivity criteria to qualify for one point under the LEED credit category, Credit 7.2, Landscape & Exterior Design to Reduce Heat Island - Roof.

E. Verification Samples: For each product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, and color.

F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

G. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic inspection and maintenance of all completed roofing work. Provide product warranty executed by the manufacturer. Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with manufacturer's current Application and Installation Guidelines and the NRCA Roofing and Waterproofing Manual.

B. Manufacturer Qualifications: Manufacturer: Company specializing in manufacturing products specified in this section with documented ISO 9001 certification and minimum twelve years and experience.

C. Installer Qualifications: Company specializing in performing Work of this section with minimum five years documented experience and a certified Pre-Approved Garland Contractor.

D. Installer's Field Supervision: Maintain a full-time Supervisor/Foreman on job site during all phases of roofing work while roofing work is in progress.

E. Product Certification: Provide manufacturer's certification that materials are manufactured in the United States and conform to requirements specified herein, are chemically and physically compatible with each other, and are suitable for inclusion within the total roof system specified herein.

F. Source Limitations: Obtain all components of roof system from a single manufacturer. Secondary products that are required shall be recommended and approved in writing by the roofing system Manufacturer. Upon request of the Architect or Owner, submit Manufacturer's written approval of secondary components in list form, signed by an authorized agent of the Manufacturer.

1.6 PRE-INSTALLATION CONFERENCE

A. Convene a pre-roofing conference approximately two weeks before scheduled commencement of roofing system installation and associated work.

B. Require attendance of installers of deck or substrate construction to receive roofing, installers of rooftop units and other work in and around roofing which must precede or follow roofing work including mechanical work, Architect, Owner, roofing system manufacturer's representative.

C. Objectives include:
   1. Review foreseeable methods and procedures related to roofing work, including set up and mobilization areas for stored material and work area.
   2. Tour representative areas of roofing substrates, inspect and discuss condition of substrate, roof drains, curbs, penetrations and other preparatory work.
   3. Review structural loading limitations of deck and inspect deck for loss of flatness and for required attachment.
   4. Review roofing system requirements, Drawings, Specifications and other Contract Documents.
   5. Review and finalize schedule related to roofing work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.
   6. Review required inspection, testing, certifying procedures.
   7. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing.
   8. Record conference including decisions and agreements reached. Furnish a copy of records to each party attending.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging with labels intact until ready for installation.

B. Store all roofing materials in a dry place, on pallets or raised platforms, out of direct exposure to the elements until time of application. Store materials at least 4 inches above ground level and covered with "breathable" tarpaulins.

C. Stored in accordance with the instructions of the manufacturer prior to their application or installation. Store roll goods on end on a clean flat surface. No wet or damaged materials will be used in the application.

D. Storage temperatures should be between 60 degrees F to 80 degrees F (15.6 degrees to 26.7 degrees C). Indoor ventilated storage is recommended. Ensure jobsite storage is in a shaded and ventilated area. Do not store in direct sunlight Keep materials away from open flame or welding sparks.

E. Avoid stockpiling of materials on roofs without first obtaining acceptance from the Architect/Engineer.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Weather Condition Limitations: Product application must not be done when rain or other conditions such as fog or heavy dew are possible within a 24 hour period. Roof surface must be at least 6 Fahrenheit degrees or 3 Celsius degrees above the dew point and rising.

C. Proceed with roofing work only when existing and forecasted weather conditions will permit unit of work to be installed in accordance with manufacturer's recommendations and warranty requirements.

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

E. When applying materials with spray equipment, take precautions to prevent over spray and/or solvents from damaging or defacing surrounding walls, building surfaces, vehicles or other property. Care should be taken to do the following:
   1. Close air intakes into the building.
   2. Have a dry chemical fire extinguisher available at the jobsite.
   3. Post and enforce "No Smoking" signs.

F. Avoid inhaling spray mist; take precautions to ensure adequate ventilation.

G. Protect completed roof sections from foot traffic for a period of at least 48 hours at 75 degrees F (24 degrees C) and 50 percent relative humidity or until fully cured.

H. Take precautions to ensure that materials do not freeze.

I. Minimum temperature for application of White-Knight Plus/ White-Stallion Plus, White-Knight Plus WC and LiquiTec coatings is 50 degrees F (10 degrees C) and rising.

1.9 WARRANTY

A. Warranty Period: 15 years.
   1. Upon completion of the work, provide the Manufacturer's written and signed limited labor and materials Warranty, warranting that, if a leak develops in the roof during the term of this warranty, due either to defective material or defective workmanship by the installing contractor, the manufacturer shall provide the Owner, at the Manufacturer's expense, with the labor and material necessary to return the defective area to a watertight condition.

B. Warranty Period: Installer is to guarantee all work against defects in materials and workmanship for a period indicated following final acceptance of the Work.
   1. Warranty Period:
      a. 5 years from date of acceptance.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Garland Company, Inc. (The); 3800 E. 91st St., Cleveland, OH 44105. Local Representative: Doug Clark – (925) 784-6701; email:dclark@garlandind.com
   1. Materials to be furnished and provided by Alameda USD through CMAS.

2.2 MINERAL MODIFIED BITUMEN SURFACE ROOF RESTORATION

A. LiquiTec:
   1. Base: LiquiTec
   2. Coating: LiquiTec.
   3. Flashing: LiquiTec.
   4. Reinforcement:
      a. Partial Reinforcement: Apply in base coat on all membrane seams and details.
         1) Reinforcement Materials:
            a) Grip Polyester Soft.

B. Base Flashings and Roof Repairs:
   1. Base Sheet: Versiply 40
   2. Cap Sheet: Versiply Mineral
   3. Adhesive: Green-Lock Flashing Adhesive

2.3 **ACCESSORIES**:

A. Nails and Fasteners: Non-ferrous metal or galvanized steel, except that hard copper nails shall be used with copper; aluminum or stainless steel nails shall be used with aluminum; and stainless steel nails shall be used with stainless steel, Fasteners shall be self-clinching type of penetrating type as recommended by the deck manufacturer. Fasten nails and fasteners flush-driven through flat metal discs not less than 1 inch (25 mm) diameter. Omit metal discs when one-piece composite nails or fasteners with heads not less than 1 inch (25 mm) diameter are used.

B. Urethane Sealant - Tuff-Stuff MS: One part, non-sag sealant as approved and furnished by the membrane manufacturer for moving joints.
   1. Tensile Strength, ASTM D 412: 250 psi
   2. Elongation, ASTM D 412: 950%
   3. Hardness, Shore A ASTM C 920: 35
   4. Adhesion-in-Peel, ASTM C 92: 30 pli

C. Butyl Tape: 100% solids, asbestos free and compressive tape designed to seal as

recommended and furnished by the membrane manufacturer.

D. Glass Fiber Cant - Glass Cant: Continuous triangular cross Section made of inorganic fibrous glass used as a cant strip as recommended and furnished by the membrane manufacturer.

E. Coping:
   1. IMETCO: Snap on Perma-Edge Coping
      a. 0.040 Aluminum

2.4 EDGE TREATMENT AND ROOF PENETRATION FLASHINGS

A. Vents and Breathers: Heavy gauge aluminum and fully insulated vent that allows moisture and air to escape but not enter the roof system as recommended and furnished by the membrane manufacturer.

B. Pitch pans, Rain Collar 24 gauge stainless or 20oz (567gram) copper. All joints should be welded/soldered watertight. See details for design.

C. Drain Flashing should be 4lb (1.8kg) sheet lead formed and rolled.

D. Plumbing stacks should be 4lb (1.8kg) sheet lead formed and rolled.

E. Fabricated Flashing: Fabricated flashings and trim are specified in Section 07620.
   1. Fabricated flashings and trim shall conform to the detail requirements of SMACNA "Architectural Sheet Metal Manual" and/or the CDA Copper Development Association "Copper in Architecture - Handbook" as applicable.

F. Manufactured Roof Specialties: Manufactured copings, fascia, gravel stops, control joints, expansion joints, joint covers and related flashings and trim are specified in Section 07710.
   1. Manufactured roof specialties shall conform to the detail requirements of SMACNA "Architectural Sheet Metal Manual" and/or the NRCA "Roofing and Waterproofing Manual" as applicable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify that work penetrating the roof deck, or which may otherwise affect the roofing, has been properly completed.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 ROOF PREPARATION AND REPAIR

A. General: All necessary field and flashing repairs must be done according to good construction practices, including the removal of all wet insulation and defective materials as identified through a moisture detection survey such as an infrared scan and replacement with like-materials.
   1. Remove all vertical roof flashings from curbs and parapet walls down to the surface of the roof. Remove damaged existing flashings at roof drains and roof penetrations.
   2. Remove all wet, deteriorated, blistered or delaminated roofing membrane or insulation and fill in any low spots with like materials occurring as a result of removal work to create a smooth, even surface for application of new roof membranes.
   3. Install new wood nailers as necessary to accommodate insulation/recovery board or

new nailing patterns.

4. When mechanically attached, the fastening pattern for the insulation/recovery board shall be as recommended by the specific product manufacturer.
5. Existing roof surfaces shall be primed as necessary and allowed to dry prior to installing the roofing system.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Repair all defects such as deteriorated roof decks, saturated materials, loose or brittle membrane or membrane flashings, etc. Verify that existing conditions meet the following requirements :
   1. Existing membrane is either fully adhered or that the membranes mechanical fasteners are secured and functional.
   2. Application of roofing materials over a brittle, damaged or poor condition roof membrane is not permitted.

D. Remove all loose dirt and foreign debris from the roof surface. Do not damage roof membrane in cleaning process.

E. Clean and seal all parapet walls, gutters and coping caps, and repair any damaged metal where necessary. Seal watertight all fasteners, pipes, drains, vents, joints and penetrations where water could enter the building envelope.

F. Confirm local water run-off ordinances and restrictions prior to cleaning roof. Clean the entire roof surface by removing all dirt, algae, mold, moss, paint, oil, talc, rust or other foreign substance. Use a bio-degradable cleaner like Simple Green Oxy Solve when necessary and warm water. Scrub heavily soiled areas with a brush. Power wash roof thoroughly with an industrial surface cleaner equipped with one piece balanced spray rotating jets for streak free close contact cleaning. Rinse with fresh water to completely remove all residuals. Allow roof to dry thoroughly before continuing.

G. Repair existing roof membrane as necessary to provide a sound substrate for the liquid membrane. All surface defects must be repaired/renovated and be made watertight. Any repairs must be with be only with materials compatible with the fluid-applied roofing restoration system.

3.3 INSTALLATION

A. General Installation Requirements:
   1. Install in accordance with manufacturer's current Application and Installation Guidelines and the NRCA Roofing and Waterproofing Manual.
   2. Adequate coating thickness is essential to performance. If the applicator is unfamiliar in gauging application rates, we suggest that a controllable area be measured and the specified material be applied. In all cases, all minimum specified material must be applied and proper minimum dry film thicknesses must be achieved. Care must be taken to ensure that all areas completed including all flashings, roof penetrations, etc. are coated sufficiently to ensure a watertight seal.
   3. Cooperate with manufacturer, inspection and test agencies engaged or required to perform services in connection with installing the roof system.
   4. Insurance/Code Compliance: Where required by code, install and test the roofing system to comply with governing regulation and specified insurance requirements.
   5. Protect work from spillage of roofing materials and prevent materials from entering or clogging drains and conductors. Replace or restore adjacent work damaged by installation of the roofing system.
   6. Keep roofing materials dry during application.
   7. Coordinate counter flashing, cap flashings, expansion joints and similar work with

work specified in other Sections under Related Work.

8. Coordinate roof accessories and miscellaneous sheet metal accessory items, including piping vents and other devices with work specified in other Sections under Related Work.

B. Mineral Modified Bitumen Surface Roof Restoration: Renovation work includes:
   1. Surface preparation: Remove dirt, and debris.
      a. Previously coated roofs with well-adhered polyurethane or polyurea coating surfacing must be solvent-wiped with acetone after cleaning to reactivate surface for overcoating.
   2. Liquid Flashings:
      a. Fascia Edges: Cut back edges. Prime with Rust-Go Primer, apply Coating, embed fabric reinforcement apply Top Coating.
      b. Parapets and Vertical Surfaces: Prime, apply Coating, embed fabric reinforcement apply Top Coating
      c. Metal Flashings: Prime, apply Coating.
   3. Partially Reinforced System:
      a. Reinforced Coating (Grip Polyester Soft)
         1) Always begin with flashing laps and details
         2) Apply coating at 3.0 gallons per 100 SF, extending 4" on each side of lap.
         3) Immediately roll 6 inch wide fabric reinforcement into the coating and completely saturate surface ensuring full encapsulation of fabric without pinholes, voids or openings.
         4) Allow to cure thoroughly before applying field coating layers
   4. Base Coat: Apply base coat at 2 gal./sq and let cure.
   5. Coating: Apply coating to entire roof surface. Use special attention to coating flashings and other critical areas to build adequate membrane thickness
      a. LiquiTec:
         1) Apply Coating at 2.0 gallons per 100 SF over the entire roof surface.

3.4 REPAIR OF EDGE TREATMENT AND ROOF PENETRATION FLASHING

A. General
   1. Repair flashing in accordance with the requirements/recommendations of the Membrane manufacturer and as indicated on the manufacturer's standard drawings. Provide system with base flashing, edge flashing, penetration flashing, counter flashing, and all other flashings required for a complete watertight system.
   2. Install and repair flashings concurrently with the roofing as the job progresses.
   3. Terminate flashings as required by the membrane manufacturer.

B. Manufactured Roof Specialties: Manufactured copings, fascia, gravel stops, control joints, expansion joints, joint covers and related flashings and trim are provided as specified in Section 07710.
   1. Manufactured roof specialties shall conform to the detail requirements of SMACNA "Architectural Sheet Metal Manual" and/or the National Roofing Contractor's Association "Roofing and Waterproofing Manual" as applicable.

C. Repairs of Existing Roof Penetrations and Flashings
   1. Metal Edge:
      a. Inspect the nailers to assure proper attachment and configuration.
      b. Run one ply over the edge. Assure coverage of all wood nailers. Fasten plies with ring shank nails at 8 inches (203 mm) o.c.
      c. Install continuous cleat and fasten at 6 inches (152 mm) o.c.
      d. Install new metal edge hooked to continuous cleat and set in bed of roof cement. Fasten flange to wood nailers every 3 inches (76 mm) o.c. staggered.
      e. Prime metal edge at a rate of 100 square feet per gallon and allow to dry.

f. Strip in flange with base flashing ply covering entire flange in bitumen with 6 inches (152 mm) on to the field of roof. Assure ply laps do not coincide with metal laps.
g. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Seal outside edge with rubberized cement.

2. Scupper Through Roof Edge:
   a. Inspect the nailer to assure proper attachment and configuration.
   b. Run one ply over the edge. Assure coverage of all wood nailers. Fasten plies with ring shank nails at 8 inches (203 mm) o.c.
   c. Install a scupper box in a 1/4 inch (6 mm) bed of mastic. Assure all box seams are soldered and have a minimum 4 inch (101 mm) flange. Make sure all corners are closed and soldered. Prime scupper at a rate of 100 square feet per gallon and allow to dry.
   d. Fasten flange of scupper box to nailer every 3 inches (76mm) o.c. staggered.
   e. Strip in edge with base flashing ply covering entire area in bitumen with 6 inches (152 mm) on to the field of the roof.
   f. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Apply a three-course application of mastic and mesh at all seams.
3. Scupper Through Wall:
   a. Inspect the nailer to assure proper attachment and configuration.
   b. Run one ply over nailer, into scupper hole and up flashing as in typical wall flashing detail. Assure coverage of all wood nailers.
   c. Install a scupper box in a 1/4 inch (6 mm) bed of mastic. Assure all box seams are soldered and have a minimum 4 inch (101 mm) flange. Make sure all corners are closed and soldered. Prime scupper at a rate of 100 square feet per gallon and allow to dry.
   d. Fasten flange of scupper box every 3 inches (76 mm) o.c. staggered.
   e. Strip in flange of scupper box with base flashing ply covering entire area with 6 inch (152 mm) overlap on to the field of the roof and wall flashing.
   f. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Apply a three-course application of mastic and mesh at all seams.
4. Coping Cap:
   a. Minimum flashing height is 8 inches (203 mm) above finished roof height. Maximum flashing height is 24 inches (609 mm). Prime vertical wall at a rate of 100 square feet per gallon and allow to dry.
   b. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
   c. Install base flashing ply covering entire wall and wrapped over top of wall and down face with 6 inches (152 mm) on to field of the roof and set in cold asphalt. Nail membrane at 8 inches (203 mm) o.c.
   d. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Apply a three-course application of mastic and mesh at all seams and allow to cure and aluminize.
   e. Install coping cap per manufacturer's recommendations.
5. Surface Mounted Counterflashing/Coping Cap:
   a. Minimum flashing height is 8 inches (203 mm) above finished roof height. Prime vertical wall at a rate of 100 square feet per gallon and allow to dry.
   b. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
   c. Install base flashing ply covering wall set in bitumen with 6 inches (152 mm) on to field of roof.
   d. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Apply a three-course

application of mastic and mesh at all seams and allow to cure and aluminize.

e. Apply butyl tape to wall behind flashing. Secure termination bar through flashing, butyl tape and into wall. Alternatively use caulk to replace the butyl tape.
f. Secure counterflashing set on butyl tape above flashing. Fasten 8 inches (203 mm) o.c. and caulk top of counterflashing.
g. Attach tapered board to top of wall (minimum slope 1/4 -12). Do not use organic fiberboard or perlite.
h. Cover tapered board and all exposed wood with base flashing ply. Fasten inside and out at 8 inches (203 mm) o.c.
i. Install continuous cleat and fasten at 6 inches (152 mm) o.c. to outside wall.
j. Install new metal coping cap hooked to continuous cleat.
k. Fasten inside of cap 24 inch (609 mm) o.c. with approved fasteners and neoprene washers.

6. Surface Mounted Counterflashing:
   a. Minimum flashing height is 8 inches (203 mm) above finished roof height. Maximum flashing height is 24 inches (609 mm). Prime vertical wall at a rate of 100 square feet per gallon and allow to dry.
   b. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
   c. Install base flashing ply covering wall set in bitumen with 6 inches (152 mm) on to field of the roof.
   d. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
   e. Apply butyl tape to wall behind flashing. Secure termination bar through flashing, butyl tape and into wall. Alternatively use caulk to replace the butyl tape.
   f. Secure counterflashing set on butyl tape above flashing at 8 inches (203 mm) o.c. and caulk top of counterflashing.
7. Equipment Support:
   a. Minimum curb height is 8 inches (203 mm) above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
   b. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
   c. Install base flashing ply covering curb set in bitumen with 6 inches (152 mm) on to field of the roof.
   d. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Attach top of membrane to top of curb and nail at 8 inches (203 mm) o.c. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
   e. Install pre-manufactured cover. Fasten sides at 24 inches (609 mm) o.c. with fasteners and neoprene washers. Furnish all joint cover laps with butyl tape between metal covers.
   f. Set equipment on neoprene pad and fasten as required by equipment manufacturer.

D. Liquid Flashing:
1. Mask target area on roof membrane with tape.
2. Clean all non-porous areas with isopropyl alcohol.
3. Apply 32 wet mil base coat of liquid flashing over masked area.
4. Embed polyester reinforcement fabric into the base coat of the liquid flashing.
5. Apply 32 wet mil top coat of the liquid flashing material over the fabric extending 2 inches (51 mm) past the scrim in all directions.

3.5 CLEANING

A. Clean-up and remove daily from the site all wrappings, empty containers, paper, loose particles and other debris resulting from these operations.

B. Remove coating markings from finished surfaces.

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

3.6 PROTECTION

A. Provide traffic ways, erect barriers, fences, guards, rails, enclosures, chutes and the like to protect personnel, roofs and structures, vehicles and utilities.

B. Protect exposed surfaces of finished walls with tarps to prevent damage.

C. Plywood for traffic ways required for material movement over existing roofs shall be not less than 5/8 inch (16 mm) thick.

D. In addition to the plywood listed above, an underlayment of minimum 1/2 inch (13 mm) recover board is required on new roofing.

E. Special permission shall be obtained from the Manufacturer before any traffic shall be permitted over new roofing.

3.7 FIELD QUALITY CONTROL

A. Require attendance of roofing materials manufacturers' representatives at site during installation of the roofing system.

B. Perform field inspection and [and testing] as required under provisions of Section 01410.

C. Correct defects or irregularities discovered during field inspection.

3.8 FINAL INSPECTION

A. At completion of roofing installation and associated work, meet with Contractor, Architect, installer, installer of associated work, roofing system manufacturer's representative and others directly concerned with performance of roofing system.

B. Walk roof surface areas, inspect perimeter building edges as well as flashing of roof penetrations, walls, curbs and other equipment. Identify all items requiring correction or completion and furnish copy of list to each party in attendance.

C. If core cuts verify the presence of damp or wet materials, the installer shall be required to replace the damaged areas at his own expense.

D. Repair or replace deteriorated or defective work found at time above inspection as required to a produce an installation that is free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

E. Notify Architect upon completion of corrections.

F. Following the final inspection, provide written notice of acceptance of the installation from the roofing system manufacturer.

3.9 OWNER SUPPLIED MATERIALS

A. The Owner will only supply the quantity listed in the owner supplied materials section of this

specification below. All additional materials and accessories will be the full responsibility of the contractor to provide and install per the specification and project requirements.

B. Any material or accessories required for the installation of the roof system in excess of the Owner provided material must be supplied by the Contractor and added into the bid cost proposal. It is up to the Contractor to determine the precise amount of material required for the completion of this project; and to provide excess material, as required. The cost to handle and fabricate flashing metal from the Owner provided flat stock is contractor's responsibility and to be added into the bid cost proposal.

C. All required flashings as required per each specification section for plumbing, electrical, gas, etc. will be the Contractors responsibility to provide and install as well as to be included in the bid cost.

D. All materials not specifically included in the owner supplied materials section will be the responsibility of the contractor to provide and install in compliance with section 07550.

E. Freight charges of owner supplied materials will be the responsibility of the Owner.

F. Contractor must coordinate and take delivery of materials, count all materials and ensure it matches the list below, unload and properly locate materials at the job site, and properly protect, cover and store at jobsite.

G. Contractor must be able to provide certification in writing from roof system manufacturer that the contractor is approved to install the specified roof system and provide all warranty requirements of section 07550.

1. Materials specifically provided by the Owner:

a.	Versiply Mineral:	30 Rolls
b.	Versiply 40:	15 Rolls
c.	Liquitec:	200 Buckets
d.	Green-Lock Plus Flashing Adh	115 Buckets
e.	Grip Polyester Soft 6"	35 Rolls
f.	Freight to jobsite:	1

END OF SECTION

SECTION 07 61 00

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counter flashings, and other items indicated on drawings and as follows:
   1. Metal edge system with continuous cleats.
   2. Surface mounted counterflashing.
   3. Skirt flashing at curbs.
   4. “L” flashing and step flashing.
   5. Ladders.
   6. Hatches.
   7. Coping.

1.02 RELATED REQUIREMENTS

A. Section 07 55 50 – Modified Bitumen

1.03 REFERENCE STANDARDS

A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

C. ASTM A792 Steel Sheet, Aluminum-Zinc Alloy-Coated, by the Hot-Dip Process

D. ASTM B 32 - Standard Specification for Solder Metal.

E. ASTM B486 Paste Solder

F. ASTM B 749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.

G. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

H. ASTM D 2178 - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.

I. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.

J. FS QQ-L-201 Specification for Lead Sheet

K. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association.

1.04 SUBMITTALS

A. Submit under provisions of the General Conditions Section 00 70 00

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
   1. For manufactured and shop fabricated gravel stops, fascia, scuppers, and all other sheet metal fabrications.
   2. Indicate type, gauge and finish of metal.

C. Product data: Provide manufacturer's specification data sheets for each product :
   1. Metal material characteristics and installation recommendations.

2. Submit color chart prior to material ordering and/or fabrication so that equivalent colors to those specific can be approved.

D. Manufacturer's installation instructions for reglets.

E. Samples: Submit two samples 8x10 inch in size illustrating metal finish color.
1. Submit two samples, 12 x 12 inch in size illustrating typical external corner, internal corner, and valley, junction to vertical dissimilar surface, material and finish.

F. Certification:
1. Submit roof manufacturer's certifications that metal fasteners furnished are acceptable to roof manufacturer.
2. Submit roof manufacturer's certification that metal furnished is acceptable to roofing manufacturer as a component of roofing system and is eligible for roof manufacturer's system warranty.
3. Submit certification that metal and fastening system furnished is Tested and Approved by Factory Mutual for 1-90 Wind Up-Lift Requirements.

G. Provide approval letters from metal manufacturer for use of their metal within this particular roofing system type.

H. Proof of fabricator and installer qualifications.

I. ANSI-SPRI ES-1 test results for all coping and edge metal.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements, except as otherwise indicated.
1. Factory Mutual Loss Prevention Data Sheet 1-49 windstorm resistance: 1-90.

B. Manufacturer's Warranty: Pre-finished metal material shall require a written 20-year non-prorated warranty covering fade, chalking and film integrity. The material shall not show a color change greater than 5 NBS color units per ASTM D-2244 or chalking excess of 8 units per ASTM D-659. If either occurs material shall be replaced per warranty, at no cost to the Owner.

C. Contractor's Warranty: The Contractor shall provide the Owner with a notarized written warranty assuring that all sheet metal work including caulking and fasteners to be water-tight and secure for a period of five years from the date of final acceptance of the building. Warranty shall include all materials and workmanship required to repair any leaks that develop, and make good any damage to other work or equipment caused by such leaks or the repairs thereof.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened containers or packages with labels intact and legible.

B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Aluminum, ASTM B209, alloy 3105-H14, in thickness.040" nom.

2.02 ACCESSORIES

A. Fasteners:
   1. Corrosion resistant screw fastener as recommended by metal manufacturer. Finish exposed fasteners same as flashing metal.
   2. Fastening shall conform to Factory Mutual 1-90 requirements or as stated on section details, whichever is more stringent.

B. Plastic Cement: ASTM D 4586, Type I.

2.03 FABRICATION - GENERAL

A. Fabricate in accordance with referenced standards. Form sections true to shape, accurate in size, square, and free from distortion or defects. Form pieces as recommended by SMACNA standard for conditions required.
   1. Provide reinforcements and supports as required for secure anchorage.
   2. Make joints rigid. Seams mechanically strong and soldered or sealed to make watertight
   3. Fabricate corners in one piece with legs extending 30-inches each way to field joint. Lap, rivet, and solder or seal corner seams watertight.
   4. Turn up "end dam" flanges at ends of opening sill flashing pieces, lap with wall flashing and membranes to shed water.
   5. Fabricate cleats of same material as sheet, minimum 3/4 inches wide, interlockable with sheet.
   6. Hem exposed edges on underside 1/2 inch; miter and seam corners.
   7. Solvent clean all sheet metal. Coat surfaces to be in contact with roofing or otherwise concealed with specified asphaltic paint; 0.015-inch minimum uniform thickness.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

F. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

2.04 EDGE METAL SYSTEM AND METAL COPING SYSTEM

A. R-mer Edge and R-mer Coping system by The Garland Company or approved equal.

   1. ANSI SPRI ES-1 tested and certified.

2.05 ROOF-RELATED SHEET METAL AND FLASHINGS

A. Roof-Related Sheet Metal and Flashings: As indicated, as specified in related sections, as required by roofing material manufacturers and referenced standards. Coordinate work of this section with related sections. Provide complete systems without conflict or omission.

2.06 LADDERS, DRAINS AND HATCHES

A. Hatch: Bilco or approved equal.

   1. Type S, all aluminum construction.

B. Roof Drains: zurn Z-100 or equal.

C. Ladder: Alaco Ladder

1. Fixed ladders of all aluminum costruction.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

C. Beginning of installation means acceptance of existing conditions.

D. Field measure site conditions prior to fabricating work.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Install work watertight, without waves, warps, buckles, fastening stress, or distortion, allowing for expansion and contraction. Conform to referenced standards. Make metal joints watertight.

B. Fastening of metal to walls and wood blocking shall comply with SMACNA Architectural Sheet Metal Manual, Factory Mutual 1-90 wind uplift specifications and/or manufacturer's recommendations whichever is of the highest standard.

C. All accessories or other items essential to the completeness of sheet metal installation and water tight envelope of the building, whether specifically indicated or not, shall be provided.

D. Reglets: Install in accordance with manufacturer’s installation instructions.

E. Metal fascia and copings shall be secured to wood nailers at the bottom edge with a continuous cleat. Cleats shall be at least one gauge heavier than the metal it secures.

F. Install Sheet Membrane Waterproofing at closure flanges, under metal copings, caps and platforms; fully adhered, free of voids, blisters and buckling; roll as soon as practical following layout. Minimize exposure time to that period recommended by the manufacturer.

G. Flashing: Joints at 10-foot maximum spacing and at 2-1/2-feet from corners. Butt joints with 3/16-inch space centered over matching 8-inch long backing plate with sealer tape in laps.

H. Flanged flashings and roof accessories: Set on continuous sealer tape. Nail flanges through sealer tape and at 3-inch maximum spacing.

I. Isolate metal from dissimilar metal with 2 coats of specified asphaltic paint, sealer tape or other approved coating, specifically made to stop electrolytic action.. Use only stainless steel fasteners to connect isolated dissimilar metals.

J. Joints, fastenings, reinforcements and supports: Sized and located as required to preclude distortion or displacement due to thermal expansion and contraction. Conceal fastenings wherever possible.

K. Secure flashings in place using concealed fasteners. Use exposed fasteners only where

permitted.

L. Flexible Flashing Installation:
1. Prime substrates as recommended by flexible flashing manufacturer, allow to dry.
2. Install flexible flashings in maximum feasible lengths to minimize lap joints.
3. Peel release paper from roll to expose rubberized asphalt and position flashing to center over joint location before applying. Move along opening or joint, being careful to put flashing as evenly as possible over the opening. Avoid fishmouths.
4. Press flashing firmly into place with heavy hand pressure . Ensure continuous and intimate contact with substrate.
5. If wrinkles develop, carefully cut out affected area and replace as outlined above.

M. Apply plastic cement compound between metal flashings and felt flashings.

N. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

O. Seal prefinished metal joints watertight.

P. Solder other metal joints for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.

Q. Connect downspouts and rain water leaders to storm sewer system. Seal connection watertight.

R. Install hatches and ladders per manufacturer’s recommendations.

X. Install roof drains per manufacturer’s recommendations.

3.04 FIELD QUALITY CONTROL

A. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

B. Tolerances
1. Exposed surfaces: Free of dents, scratches, abrasions, or other visible defects; clean, ready for painting.
2. Set flashings and sheet metal to straight, true lines with exposed faces aligned in plane as indicated.

3.05 SHOP FABRICATED SHEET METAL

A. Installing Contractor shall be responsible for determining if the sheet metal systems are in general conformance with roof manufacturer's recommendations.

B. Metal work shall be shop fabricated to configurations and forms in accordance with recognized sheet metal practices.

C. Hem exposed edges.

D. Angle bottom edges of exposed vertical surfaces to form drip.

E. All corners for sheet metal shall be lapped with adjoining pieces fastened and set in sealant.

F. Joints for gravel stop fascia system, cap flashing, and surface-mount counterflashing shall be formed with a 1/4" opening between sections. The opening shall be covered by a cover plate or backed by an internal drainage plate formed to the profile of fascia piece. The cover plate shall be embedded in mastic, fastened through the opening between the sections and loose locked to the drip edges.

G. Install sheet metal to comply with Architectural Sheet Metal manual, Sheet Metal and Air

Conditioning Contractor's National Associations, Inc.

END OF SECTION