SECTION 07 22 16

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 5550 - Modified Bitumen Roofing

B. Section 07 6200 - 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. See Section 01 3300 - Submittals, for submittal procedures.

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 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 from 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 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 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 insure that insulation remains clean and dry, ready to receive roofing membrane.

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.
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.
4. Install new .040 aluminum 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.
9. Add Alternate: Apply Tuff-Coat to the interior stucco of parapet walls on each building. Apply in 2 coats of 1 gallon per 100 square feet.

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. <u>Design Requirements:</u>

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 the following to the Project representative for review and approval.

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 by 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 the 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 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 the 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.
         1) Warranty shall cover the calculated windspeed of 120 mph.
         2) Warranty must be provided solely by the manufacturer.
         3) 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, investigate 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 Viking 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

F. Tuff-Coat: Semi-Permeable waterproof wall coating: 2 coats of 1 gallon per 100 square feet.

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. The 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

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.

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.

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.

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.

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.

B. 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.

C. Flashing Base Ply: Install flashing sheets by 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.

D. 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 were 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 every 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.

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

F. 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 them 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:	500 Rolls
b.	StressBase 80 Plus:	250 Rolls
c.	Pyramic Plus LO:	200 Buckets
d.	Weatherking Plus WC:	300 Buckets
e.	Weatherking Flashing Adhesive:	70 Buckets
f.	Tuff-Stuff MS:	3 Cases
g.	Garla-Prime VOC:	10 Buckets

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.
8. Etc.

1.02 RELATED REQUIREMENTS

A. Section 07 5550 – 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. 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.

B. 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.

C. Manufacturer's installation instructions for reglets.

D 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.

E. 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.

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

G. Proof of fabricator and installer qualifications.

H. 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 rainwater 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