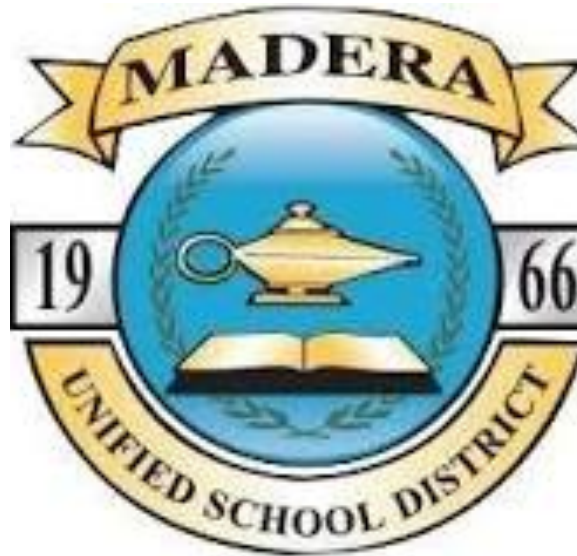


PROJECT MANUAL

Technical Specifications
for

Bid No.011922-Washington Elementary School Re-Roofing
Project



Madera Unified School District
1902 Howard Road Madera, CA 93637

SECTION 01110
SUMMARY OF WORK

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including the Conditions of the Contract and Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. Section includes removal and disposal of the existing roofing systems, coping, insulation, flashings, and all construction related debris. Installation of a new roofing systems as specified with all applicable details for a complete watertight warranted roofing assembly per the manufacturers instructions.
- B. Materials specified in section 01 64 00 Owner Furnished Contractor Installed (O.F.C.I.) will be the responsibility of the contractor to receive, store, protect, and maintain in good condition throughout the course of the project.
- C. Related Work Specified Elsewhere:
 - 1. Section 01 - Owner Furnished Contractor Installed
 - 2. Section 01 - Submittals
 - 3. Section 06 - Rough Carpentry
 - 4. Section 07 - Insulation Board
 - 5. Section 07: Composition Shingles
 - 6. Section 07: Roofing Restoration
 - 7. Section 07: Modified Built-up Roofing
 - 8. Section 07: Sheet Metal Flashing and Trim

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Bid No.011922-Washington Elementary School Re-Roofing Project
- B. Project Locations: Washington Elementary School 509 E. South St. Madera, CA 93637
- C. Owner: Madera Unified School District 1205 S. Madera Ave. Madera, CA 93637
- D. General scope of work but not limited to;
 - 1. Washington Low Slope Roof Areas E, G, & O as noted on the Site Plan:
 - 2. Includes removal and disposal of existing roofing system(s), insulation board, gutters, flashings, copings, etc. for a complete prepared roof surface.
 - 3. Install one layer of rosin sheathing over the entire roof deck.
 - 4. At roof section O only, install 1/4" tapered iso insulation board and a tapered rake nailer. Due to the low window height install Tuff Flash, webbing & granules.
 - 5. Install one layer of 1/2" wood fiber 6 side primed insulation board per ASCE 7-10 wind uplift calculations.

6. Install 4lb lead flashings with factory lead top counter-flashing. All electrical penetrations are to have a lead bonnet banded and caulked.
7. Install one layer of Stressbase 80 ply sheet in specified adhesive, trim all T joints.
8. Install new 24 gauge galvanized sheet metal 1/4" low rise gravel stop with 22 gauge cleat.
9. Install new 24 gauge galvanized sheet metal ridge cap with 22 gauge cleat, fasten the roof side with rubber grommet screws 24" on center.
10. Properly prepare, prime, and paint gravel stop MLK blue to match the existing campus color.
11. Install one layer of Stressply Plus FR Mineral cap sheet in specified adhesive, trim all T joints.
12. Install Garla-Flex mastic at all gravel stop locations.
13. Install Garla-Block Primer at all roof areas at a rate of 1/2 gallon per square.
14. Apply Pyramic base coat to the entire roof / base flashing surface, pipe penetrations, vents, etc. at a rate of 1.5 gallons per 100 sq ft and back roll the entire application.
15. Apply Pyramic top coat to the entire roof / base flashing surface, pipe penetrations, vents, etc. in a cross hatch pattern to the base coat at a rate of 1.5 gallons per 100 sq ft and back roll the entire application. Ensure complete coverage, additional coats may be needed for complete uniform coverage.
16. Install Pyramic base / top coat to the wall support curb pans, lead flashings, and lead counter flashing, and new Tuff Stuff sealant.
17. Allow all mastic and roof work to properly cure prior to the application of the roof coating. Approximately 30 days. All mastic work is to have granules applied when it is installed.
18. Install new steel drain baskets at all locations.
19. Washington Low Slope Roof Areas C, F, & M as noted on the Site Plan:
20. Preparation of existing roof system for restoration.
21. Pressure wash existing roofing system, duct work, and gutter systems allow to dry for 24 hours or until it is completely dry and ready to accept the new roof coating system.
22. Cut the existing roofing system back from gravel stop edge 2", scrape all loose asphalt and debris for a clean surface. Prime the metal and 6" back onto the existing roof surface with Garla Prime VOC allow to completely dry. Install one layer of Flashing Bond mastic, apply one layer of Garmesh 6" reinforcement, apply one more layer of Flashing Bond mastic, fully embed roofing granules into fresh mastic, allow to cure prior to the base coat / top coat application.
23. Three course all base flashing laps at roof areas with parapet walls with one layer of Flashing Bond mastic, one layer of 6" Garmesh, one layer of Flashing Bond mastic, and embed roofing granules into the fresh mastic, allow to cure prior to application of the base coat / top coat.
24. Repair all loose membrane, buckles, blisters, etc. at edge flashing, base flashing, and through field along with all details as needed for a complete prepared roof surface.
25. Install new drain baskets at all roof drain locations. Check and tighten if needed all drain bolts.

26. Cut open, mechanically attach, and three course all blisters and repair all details per specification as needed for a complete prepared roof surface.
27. Install Garla-Block Primer at all roof areas at a rate of 1/2 gallon per square.
28. Install Pyramic Acrylic Coating per specification at a total rate (3) gallons per square in two coats at all built up roof areas, vents, duct work, and sheet metal items. Back roll the base coat and the top coat as needed to promote full adhesion, clean appearance, complete coverage, and proper mil thickness. Top coat is to be completed in a cross hatch pattern. Additional coats may be needed for the proper coverage and appearance.
29. Install new vent tops at all locations with damaged or missing roof vents.
30. Washington Steep Slope Roof Areas A, B, & D as noted on the Site Plan:
31. Includes removal and disposal of existing roofing system(s), insulation board, gutters, flashings, copings, etc. for a complete prepared roof surface.
32. Includes two hundred (200) square feet of decking replacement included in the base bid price. A per square foot price will be inserted into the bid form for anything needed and approved by the district over 200 square feet. Before and after photos of all dryrot replacement must be submitted with billing as justification, payment will not be made without proper documentation.
33. Install one layer of R-Mer Seal self adhering underlayment over the entire roof surface.
34. Install 24 gauge galvanized edge metal and strip in with one layer of R-Mer Seal self adhering underlayment.
35. Install new 24 gauge galvanized sheet metal gutter and downspouts at all existing locations. Install downspout screens at all downspout locations.
36. Properly prepare, prime, and paint all gutters and downspouts MLK blue.
37. Install all new 4lb lead flashings at pipe penetrations. Install a factory lead cap counter flashing at all penetrations except those connected. Install at all connected penetrations a 4lb lead collar counter flashing, band, flare the top out, seal with Tuff Stuff sealant.
38. Install roof vents & roof jacks at all locations, do not re-use sheet metal vents.
39. Install a new composition shingle roofing system per all manufacturers instructions.
40. Install a continuous ridge vent at all buildings as noted on the site plan.
41. HVAC units - Install new 24 gauge galvanized sheet metal saddle, step flashing, apron flashing and side skins.

1.4 WORK COMPLETED BY THE DISTRICT

- A. No work will be completed by the district.

1.5 TYPE OF CONTRACT

- A. Work will be completed under a single prime contract.
- B. Owner Supplied Contractor Installed (O.F.C.I.). Materials will be clearly noted at the back of each specification section as to what is being supplied by the owner. All O.F.C.I. materials are to be installed as part of this contract by the contractor. All other materials needed to complete this scope of work and are not specifically listed in the owner supplied materials section will be the responsibility of the contractor to supply and install.

1.6 USE OF PREMISES

- A. General: Contractor will have limited use of premises for construction operations.
- B. Use of site: Limit use of premises to work areas required. Do not disturb portions of the project site beyond areas in which the work is indicated.
- C. The building interior is off limits to the contractor. All access shall be from the exterior.
- D. The point of exterior access must be approved by the owner.
- E. Entrances: Keep all entrances serving the building clear and available to the owner, owner's employees, and emergency vehicles.
- F. Use of existing building: Maintain existing building in a weather tight condition throughout the construction period. Repair damage caused by construction operations. Protect building and occupants during construction.
- G. Vehicle Parking: Contractor parking is available on site and will need to be approved by the owner.
- H. Assume full responsibility for protection and safekeeping of materials stored on premises. Coordinate the location of materials and equipment to be stored on premises. Provide barricades, barriers, and enclosures as required to ensure safety.

1.7 OWNERS OCCUPANCY REQUIREMENTS

- A. The owner will occupy the building during the entire construction phase. Cooperate with the owner during construction operations to minimize owner conflicts and facilitate owner usage. Perform the work as to not interfere with owners operations.
- B. A minimum of 72 hours notice is needed for all activities that will affect the owners operations.

1.8 WORK RESTRICTIONS

- A. On site work hours: Work shall generally be performed from the hours of 7:00 am – 5:00 pm Monday through Friday except as otherwise indicated or approved by the owner.
- B. Weekend hours, early morning hours, utility shut down, and noisy activity requires owner's authorization a minimum of 72 hours in advance.

1.9 UNIT PRICES

- A. The following unit prices will be used to add or deduct from the total contract amount.
 - 1. Replacement dry rot or damaged roof decking.

10. SCHEDULE OF ALTERNATES

- A. None

1.11 PROJECT CONDITIONS

- A. Proceed with roofing work only when existing and forecasted weather conditions will permit a unit of work to be installed in accordance with manufacturer's recommendations and warranty requirements.
- B. Do not apply roofing insulation or membrane to damp deck surface.
- C. Do not expose materials subject to water or solar damage in quantities greater than can be weatherproofed during same day.

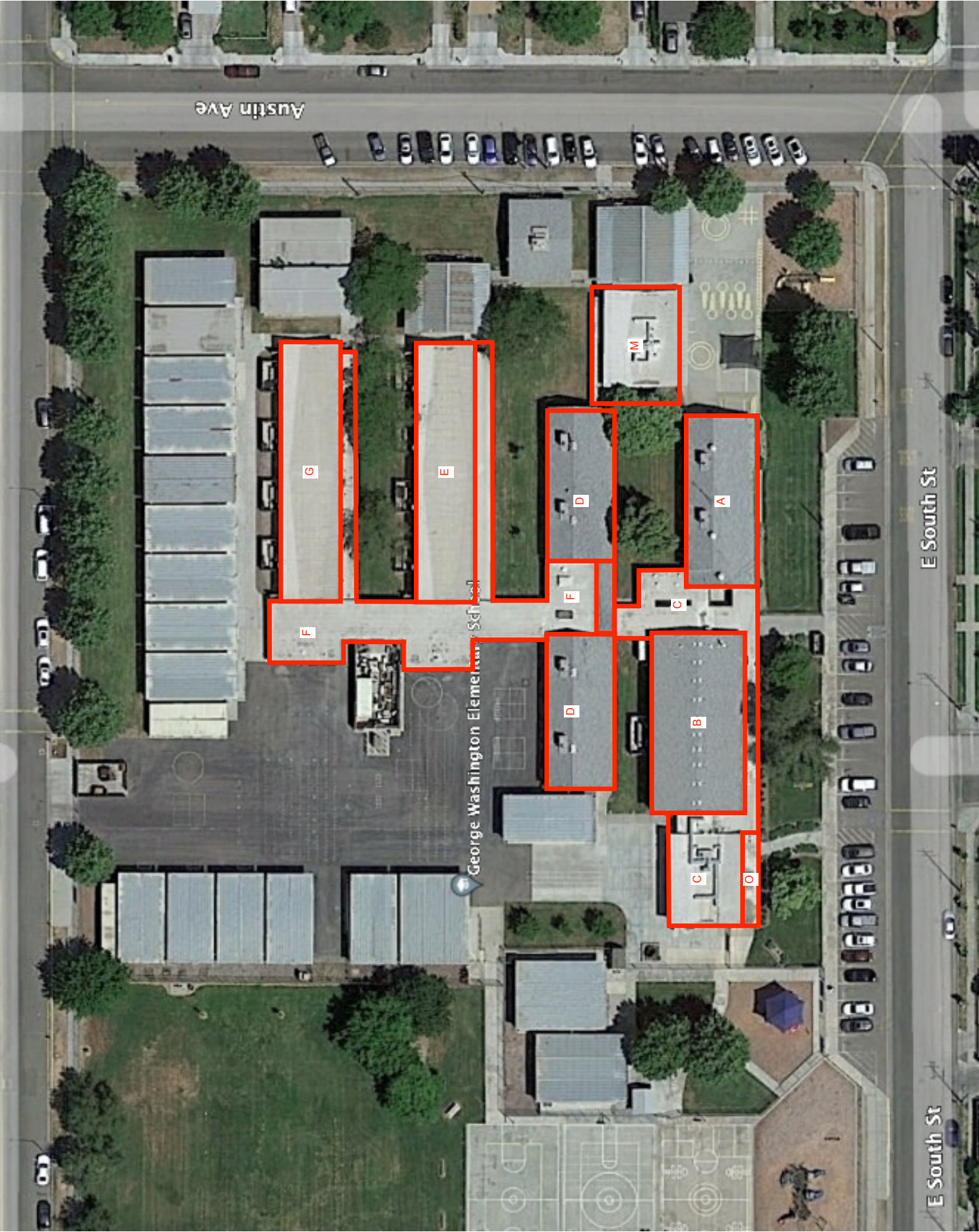
1.12 SEQUENCING AND SCHEDULING

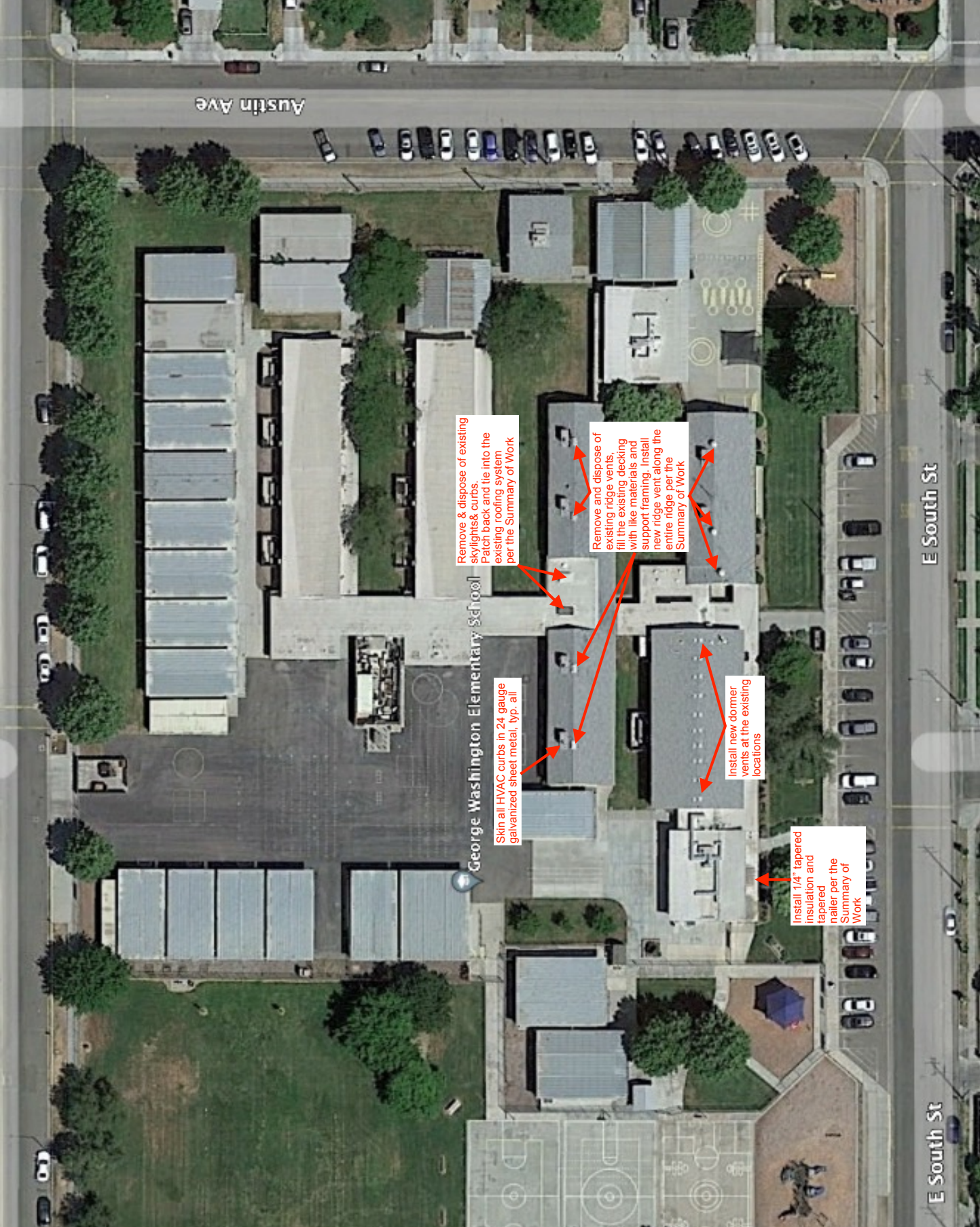
- A. Sequence installation of roofing with related units of work specified in other sections to ensure that roof assemblies, including roof accessories, flashing, trim and joint sealers, are protected against damage from effects of weather, corrosion and adjacent construction activity.
- B. Complete all roofing field assembly work each day. Phased construction will not be accepted. Phased construction refers to the application of the roof insulation board, ply sheet membrane, and cap sheet membrane installed in the same day.
- C. Due to the cure time needed for the roofing system prior to the acrylic coating scheduling of work past the completion date of **August 5, 2022** will need to be reviewed and agreed upon by all parties. Work can only be completed during weekends or off hours past the project completion date unless otherwise reviewed and approved by the district. All coating work and 100% project completion shall be no later than 9/30/2022. Including punch list and final inspection. All days after 9/30/22 will have liquidated damages applied. specifically approved by the Owner.

1.13 PROJECT TIMELINE

- A. Project Start: June 6, 2022
- B. Project Completion: August 5, 2022

END OF SECTION 01 11 00 – SUMMARY OF WORK





Remove & dispose of existing skylights & curbs. Patch back and tie into the existing roofing system per the Summary of Work

Remove and dispose of existing ridge vents. Fill the existing decking with like materials and support framing. Install new ridge vent along the entire ridge per the Summary of Work

Skim all HVAC curbs in 24 gauge galvanized sheet metal, typ. all

Install new dormer vents at the existing locations

Install 1/4" tapered insulation and tapered nailer per the Summary of Work

George Washington Elementary School

Austin Ave

E South St

E South St

SECTION 01 30 00 SUBMITTALS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Contract General Conditions.
- B. See also contract general conditions for additional requirements especially those regarding requests for ALTERNATIVES OR EQUALS and for SUBSTITUTIONS.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including:
 - 1. Contractor's construction schedule
 - 2. Submittal schedule
 - 3. Shop Drawings
 - 4. Product Data
 - 5. Samples.
- B. Administrative Submittals: Refer to other Division1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:
 - 1. Permits
 - 2. Applications for payment
 - 3. Performance and payment bonds
 - 4. Insurance certificates
 - 5. List of Subcontractors.

1.03 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
 - a. The Architect shall return without action any submittals requiring coordination with other submittals until related submittals are coordinated.
 - 3. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.
 - a. See General Conditions and Supplementary General Conditions for additional requirements.
 - b. If an intermediate submittal is necessary, process the same as the initial submittal.
 - c. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.

- B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
1. Provide a space approximately 4" x 5" on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.
 2. Include the following information on the label for processing and recording action taken:
 - a. Project name
 - b. Date
 - c. Name and address of Architect
 - d. Name and address of Contractor
 - e. Name and address of subcontractor
 - f. Name and address of supplier
 - g. Name of manufacturer
 - h. Number and title of appropriate Specification Section
 - i. Drawing number and detail references, as appropriate.
- C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Architect using a transmittal form. Submittals received from sources other than the Contractor will be returned without action.

On the transmittal Record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.

1.05 SHOP DRAWINGS

- A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.
- B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
- Dimensions
Identification of products and materials included
Compliance with specified standards
Notation of coordination requirements
Notation of dimensions established by field measurement.
- C. Sheet Size: Except for templates, patterns and similar full size Drawings, submit Shop Drawings on sheets at least 8 1/2" x 11" but no larger than 30" x 42".
- D. Submittals: Submit one correctable translucent reproducible print and six (6) blue or blackline print for the Architect's review; the reproducible and one print will be returned.

Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

1.06 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."
1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:
Manufacturer's printed recommendations,
Compliance with recognized trade association standards,
Compliance with recognized testing agency standards,
Application of testing agency labels and seals,
Notation of dimensions verified by field measurement,
Notation of coordination requirements.
 2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
- B. Submittals: Submit a minimum of six (6) copies of each required submittal as well as additional copies as required by the Architect, (the actual number of submittals and distribution required shall be determined by the Trustees Representative at the Preconstruction Conference). The Architect will return two sets marked with action taken and corrections or modifications required.
- C. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities.
1. Do not proceed with installation until an applicable copy of Product Data applicable is in the installer's possession.
 2. Do not permit use of unmarked copies of Product Data in connection with construction.

1.07 SAMPLES

- A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.
1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to include the following:
Generic description of the Sample
Sample source
Product name or name of manufacturer
Compliance with recognized standards
Availability and delivery time.
 2. Submit Samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
- B. Preliminary submittals: Where Samples are for selection of color, pattern, texture or similar characteristics from a range of standard choices, submit a full set of choices for

the material or product.

Preliminary submittals will be reviewed and returned with the Architect's mark indicating selection and other action.

- C. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit 3 sets; one will be returned marked with the action taken.

Maintain sets of Samples, as returned, at the Project site, for quality comparisons throughout the course of construction.

- D. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work.

Field Samples specified in individual Sections are special types of Samples. Field Samples are full-size examples erected on site to illustrate finishes, coatings, or finish materials and to establish the standard by which the Work will be judged.

1.08 ARCHITECTS ACTION

- A. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Architect will review each submittal, mark to indicate action taken, and return promptly.

Compliance with specified characteristics is the Contractor's responsibility.

- B. Action Stamp: The Architect will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:

1. Final Unrestricted Release: Where submittals are marked "Approved," that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.
2. Final-But-Restricted Release: When submittals are marked "Approved as Noted," that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.
3. Returned for Resubmittal: When submittal is marked "Not Approved, Revise and Resubmit," do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.
 - a. Do not permit submittals marked "Not Approved, Revise and Resubmit" to be used at the Project site, or elsewhere where Work is in progress.
 - b. Note: Any work performed prior to receiving a FULLY APPROVED submittal shall be done at the contractors own risk and is subject to being replaced if any of the submittal requirements are not met.

PART 2 – PRODUCTS NOT USED

PART 3 – EXECUTION NOT USED

END OF SECTION 01300

**SECTION 06 10 00
ROUGH CARPENTRY**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.
- B. Related work specified elsewhere:
 - 1. Section 01 - Summary of Work
 - 2. Section 01 - Owner Furnished Contractor Installed
 - 3. Section 01 - Submittals
 - 4. Section 06 - Rough Carpentry
 - 5. Division 07: Modified Built Up Roofing
 - 6. Division 07: Sheet Metal Flashing and Trim

1.2 SUMMARY:

- A. This portion of the specification sets forth the general requirements, including the quality and type of materials required for the installation of all pressure treated and non pressure treated lumber used for wood curbs, nailing strips, miscellaneous blocking material, unexposed fillers, fascia, edging strips, deck replacement, etc

1.3 STORAGE:

- A. All material specified herein shall be stored (after delivery to the site) so that it will be fully protected from damage and weather, and shall be stacked to prevent damage. All lumber shall be fully protected to maintain the original required moisture content as specified in item titled "Moisture Content".

1.4 OTHER REQUIREMENTS:

- A. Dimensions indicated on the drawings are nominal dimensions (except where details show actual sizes) and shall be subject to the standard reductions required for surfacing or tolerances permitted by the grading rules. Unless otherwise indicated on drawings, all material shall be S4S (surfaced four sides).

1.5 PROTECTION:

- A. All finished work shall be adequately protected against damage from any source.

1.6 COORDINATION:

- A. Carpenters shall coordinate their work with that of the other trades so that progress continues without interruption.

PART 2 - PRODUCTS

2.1 WOOD - FRAMING AND CURBS:

A. GRADING RULES, GRADES, AND SPECIES

1. Lumber: Southern Pine, yellow pine, Douglas fir, spruce, ponderosa pine, larch or Hemlock and shall meet the following minimum grade requirement of construction standard (75% #1 and 25% #2); free from warping and visible decay. Lumber shall be graded according to the standard grading rules of the Southern Pine Inspection Bureau, the West Coast Lumber Inspection Bureau, or the Western Wood Products Association.

B. MOISTURE CONTENT

1. All lumber shall be air-dried or kiln-dried before treatment, so that the moisture content is not more than 19%. After treatment, it shall be kiln-dried at temperatures not exceeding 160 degrees F. (71 degrees C) so that the moisture content is not more than 19% at time of shipment

C. DECAY-RESISTANT TREATMENT:

1. Lumber in contact with roofing or acting as fascias, and all other exterior lumber, shall be pressure-treated with a waterborne preservative in accordance with AWPAs Specification P5. Creosote and oil-borne preservatives are not acceptable.
2. Treating processes, material conditions, plant equipment, and other pertinent requirements shall conform to AWPAs Specifications C1 and C2 for specific kind of lumber and type of preservative to be used. Retention shall be as required for intended use.
3. All treated lumber shall bear the mark of a code recognized third party agency such as the AWPAs.

D. PLYWOOD:

Grade: CDX or Cyme exterior Grade. Description: 5/8" thick

E. WOOD SIDING:

1. T 111 or approved equal.

2.2 MECHANICAL FASTENERS:

A. WOOD TO STEEL:

1. Acceptable Manufacturers:
 - a. Roofgrip screw with Climaseal coating; plastic disc - Buildex Div. of ITW, Itasca, IL.
 - b. Dekfast screw with Senti coating: plastic disc - Construction Fasteners, Inc., Wyomissing, PA.
 - c. Fabco Fastening Systems, West Newton, PA: Insul-Fixx screw with Fabcote coating; plastic plate, Plate-Fixx screw with Fabcote coat; plastic disc.
 - d. Kwik-Deck screw with Oxyseal coating; plastic disc - Atlas Bolt & Screw Div., Trans Union Fastener Corp., Ashland, OH.
 - e. Olympic #12-11 Standard Steel Deck Screw or #14-10 Heavy Duty All Purpose Screw with CR-10 coating; three inch diameter plastic - Olympic Manufacturing Group, Inc., Agawam, MA.

- f. Glasfast (plastic disc) - Owens-Corning Fiberglas Corp., Toledo, OH.
- g. Perma Fastener screw with permaseal coating; plastic plate - International Permalite, Inc., Oak Brook, IL.

2. Screw Length: Sufficient to engage steel, wood deck 1 inch.

B. WOOD TO WOOD:

1. Type: Galvanized, common, annular ring nail. Length: Sufficient to penetrate underlay blocking 1-1/4 inches.

2. Acceptable Manufacturers:

- a. Hillwood Manufacturing Co., Cleveland, OH.
- b. Independent Nail, Inc., Bridgewater, MA.
- c. W.H. Maze Co., Peru, IL.
- d. National Nail Corp., Grand Rapids, MI.

C. WOOD TO MASONRY:

1. Acceptable Manufacturers:

- a. Tapcon 1/4" diameter, Phillips pan head anchor - Buildex Div. of ITW, Itasca, IL.
- b. Confas - Construction Fasteners, Inc., Wyomissing, PA.
- c. Con-fixx - Fabco Fastening Systems, West Newton, PA.
- d. #14-10 Heavy Duty all Purpose Screw – Olympic Manufacturing Group, Inc., Agawam, MA.
- e. Tru-Fast fastener (stainless steel) - The Tru-Fast Corp., Bryan, OH.

2. Length: Sufficient to provide 1-1/2 inch embedment.

D. WOOD TO HOLLOW MASONRY:

1. Acceptable Manufacturers:

- a. Sleeve Anchor by Hilti Fastening Systems, Tulsa, OK.
- b. Rawly Hollow Masonry Anchor by the Rawplug Co., Inc., New Rochelle, NY.

2. Length: As recommended by manufacturer

PART 3 - EXECUTION

3.1 CARPENTRY:

- A. At roof edge to receive metal fascia, around all roof top penetration perimeters, and under any flashing component that is to have a roof flange mechanically fastened to roofing substrate; mechanically attach wood blocking. Blocking thickness: Equal to common 1 x 4", 1 x 6" 2x4", 2x6", 2x8", 2x10", 2x12".
- B. Fasteners shall be installed in two rows staggered. Spacing in any one row shall not exceed 24 inches. Within eight feet of outside corners, spacing shall not exceed twelve inches in any one row.
- C. Where required, offset blocking layers twelve inches, weave corners.

- D. When preservative treated wood is cut, the cut end shall be treated in accordance with AWPA Specification M4.
- E. Lumber shall be accurately cut to the work requirements and shall be well fastened.
- F. Bolted fastenings shall have washers of adequate size under both heads and nuts. Nails shall be of correct size and quantity for proper fastening. Oversized nails that will result in splitting shall not be used. All fasteners shall be galvanized per ASTM A 153.

END OF SECTION

SECTION 07 22 00

ROOF DECK AND INSULATION

PART 1 – GENERAL

1. RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including the Conditions of the Contract and Division 01 Specification Sections apply to this section.

2. SUMMARY

- A. Section includes roof insulation over the properly prepared deck substrate.
- B. Related Sections:
 - 1. Section 01 - Summary of Work
 - 2. Section 01 - Owner Furnished Contractor Installed
 - 3. Section 01 - Submittals
 - 4. Section 06 - Rough Carpentry
 - 5. Section 07 - Composition Shingles
 - 6. Section 07 - Roofing Restoration
 - 7. Section 07 - Modified Bitumen Roofing
 - 8. Section 07 - Sheet Metal Flashing and Trim

3. REFERENCES

- A. American Society for Testing and materials (ASTM):
 - 1. ASTM A167 Standard Specification for Stainless and Heat-Resisting Chromium Nickel Steel Plate, Sheet and Strip.
 - 2. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.
 - 3. ASTM B29 Standard Specification for Refined Lead.
 - 4. ASTM B32 Standard Specification for Solder Metal.
 - 5. ASTM C165 Standard Test Method for Measuring Compressive Properties of Thermal Insulation.
 - 6. ASTM C208 Standard Specification for Cellulosic Fiber Insulation Board.
 - 7. ASTM C209 Standard Test Method for Cellulosic Fiber Insulating Board.
 - 8. ASTM C272 Standard Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions.
 - 9. ASTM C1396 Standard Specification for Gypsum Wallboard.
 - 10. ASTM C518 Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 11. ASTM C578 Standard Specification for Perlite Thermal Insulation Board.
 - 12. ASTM C728 Standard Test Methods for Fire Test of Roof Coverings.
 - 13. ASTM C1289 Standard Specification for Faced Rigid Polyisocyanurate Thermal Insulation.
 - 14. ASTM D5 Standard Test Method for Penetration of Bituminous Materials.
 - 15. ASTM D36 Standard Test Method for Softening Point of Bitumen (Ring and Ball Apparatus).
 - 16. ASTM D312 Standard Specification for Asphalt Used in Roofing.
 - 17. ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.
 - 18. ASTM D1621 Standard Test Method for Compressive Properties of Rigid Cellular Plastics.

19. ASTM D1622 Standard Test Method for Apparent Density of Rigid Cellular Plastics.
 20. ASTM D2126 Standard Test Method for Response off Rigid Cellular Plastics to Thermal Humid Aging.
 21. ASTM D2178 Standard Specification for Asphalt Glass Felts used in Roofing and Waterproofing.
 22. ASTM D4601 Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.
 23. ASTM D5147 Standard Sampling and Testing Modified Bituminous Sheet Material.
- B. Cast Iron Soil Pipe Institute, Washington, D.C. (CISPI)
 - C. Factory Mutual Research (FM):
 1. Roof Assembly Classifications.
 - D. National Roofing Contractors Association (NRCA):
 1. Roofing and Waterproofing Manual.
 - E. Underwriters Laboratories, Inc. (UL):
 1. Fire Hazard Classifications.
 - F. Warnock Hersey (WH):
 1. Fire Hazard Classifications.
 - G. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
 - H. Steel Deck Institute, St. Louis, Missouri (SDI)
 - I. Southern Pine Inspection Bureau, Pensacola, Florida (SPIB)
 - J. Insulation Board, Polyisocyanurate (FS HH-I-1972)
 - K. Insulation Board, Thermal (Fiberboard) (FS LLL-1-535B)

1.4. SUBMITTALS

- A. Product Data: Provide manufacturer's specification data sheets for each product in accordance with Division 01 Section Submittal Procedures. 013000.
- B. Provide approval letters from insulation manufacturer for use of their insulation within this particular roofing system type.
- C. Provide a sample of each insulation type.
- D. Shop Drawings
 1. Submit manufacturer's shop drawings indicating complete installation details of tapered insulation system, tapered insulation crickets, including identification of each insulation block, sequence of installation, layout, drain locations, roof slopes, thicknesses, crickets and saddles.
 2. Shop drawing shall include: Outline of roof, location of drains, a complete board layout of tapered insulation components, thickness and the average "R" value for the completed insulation system.
- E. Certification
 1. Submit roof manufacturer's certification that insulation fasteners furnished are acceptable to roof manufacturer.
 2. Submit 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.

1.5. QUALITY ASSURANCE

- A. Fire Classification, ASTM E-108.
- B. Manufacturer's Certificate: Certify that roof system furnished is approved by Factory Mutual, Underwriters Laboratories, Warnock Hersey or approved third party testing facility in accordance with ASTM E108, Class A for external fire and meets local or nationally recognized building codes.
- C. Manufacturer's Certificate: Certify that the roof system is adhered properly to meet or exceed the requirements of FM 1-90.
- D. Pre-installation meeting: Refer to Division 07 roofing specifications for pre-installation meeting requirements.

1.6. DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site with seals and labels intact, in manufacturer's original containers, dry and undamaged.
- B. Store all insulation materials in a manner to protect them from the wind, sun and moisture damage prior to and during installation. Any insulation that has been exposed to any moisture shall be removed from the project site.
- C. Keep materials enclosed in a watertight, ventilated enclosure (i.e. tarpaulins).
- D. Store materials off the ground. Any warped, broken or wet insulation boards shall be removed from the site.

PART 2 – PRODUCTS

2.1. PRODUCTS, GENERAL

- A. Refer to Division 01 Section "Common Product Requirements."
- B. Basis of Design: Materials, manufacturer's product designations, and/or manufacturer's names specified herein shall be regarded as the minimum standard of quality required for work of this Section. Comply with all manufacturer and contractor/fabricator quality and performance criteria specified in Part 1.
- C. Substitutions: Products proposed as equal to the products specified in this Section shall be submitted in accordance with Bidding Requirements and Division 01 provisions.
 - 1. Proposals shall be accompanied by a copy of the manufacturer's standard specification section. That specification section shall be signed and sealed by a professional engineer licensed in the state in which the installation is to take place. Substitution requests containing specifications without licensed engineer certification shall be rejected for non-conformance.
 - 2. Include a list of three (3) projects of similar type and extent, located within a one hundred mile radius from the location of the project. In addition, the three projects must be at least five (5) years old and be available for inspection by the Architect, Owner or Owner's Representative.
 - 3. Equivalency of performance criteria, warranty terms, submittal procedures, and contractual terms will constitute the basis of acceptance.
 - 4. The Owner's decision regarding substitutions will be considered final. Unauthorized substitutions will be rejected.

2.2. INSULATION MATERIALS

- A. Thermal Insulation Properties and Approved Insulation Boards.
1. Rigid Polyisocyanurate Roof Insulation; ASTM C1289:
 - a. Qualities: Rigid, closed cell polyisocyanurate foam core bonded to heavy duty glass fiber mat facers.
 - b. Thickness: **N/A**
 - c. R-Value: **N/A**
 - d. Attachment: Mechanically attached per roofing manufactures ASCE 7-16 Wind Uplift requirements.
 - e. Compliances: UL, WH or FM listed under Roofing Systems Federal Specification HH-I-1972, Class 1.
 - f. Acceptable Products:
 - 1) ENRGY-3; Johns Manville
 - 2) H-Shield; Hunter
 - 3) EnergyGuard; GAF
 - 4) Approved Equivalent
 2. Tapered Polyisocyanurate Roof Insulation; ASTM C1289:
 - a. Qualities: Factory Tapered, closed cell polyisocyanurate foam core bonded to heavy duty glass fiber mat facers.
 - b. Thickness: **1/4"**
 - c. Average R-Value: **Average**
 - d. Tapered Slope: **1/4" at roof section O only**
 - e. Attachment: Mechanically or adhesive attached per roofing manufactures ASCE 7-16 Wind Uplift requirements.
 - f. Compliances: UL, WH or FM listed under Roofing Systems Federal Specification HH-I-1972, Class 1
 - g. Acceptable Products:
 - 1) ENRGY 3; Johns Manville
 - 2) EnergyGuard; GAF
 - 3) H-Shield; Hunter
 - 4) Approved Equivalent
 3. High Density Six Side Primed Fiberboard Roof insulation; ASTM C208
 - a. Qualities: Rigid, composed of interlocking fibers factory blended treated with asphalt on six sides.
 - b. Board Size: **Four feet by eight feet (4' x 8')**
 - c. Thickness: **1/2"**
 - d. Attachment: Attached per roofing manufactures ASCE 7-16 Wind Uplift requirements.
 - e. Compliances: UL, WH, FM listed under Roofing Systems. Federal Specification LLL-I-535-B.
 - f. Acceptable Manufacturers:
 - 1) Blue Ridge; Celotex
 - 2) Temple Inland
 - 3) GAF Building Materials Corporation
 - 4) Georgia-Pacific
 - 5) Approved Equivalent
 4. Dens-Deck Prime Roof Board
 - a. Qualities: Nonstructural glass mat faced, noncombustible, water-resistant treated gypsum core panel.
 - b. Board Size: Four feet by Eight feet (4'x8').
 - c. Thickness: **N/A**
 - d. R-Value: **N/A**
 - e. Attachment: Mechanically attached per roofing manufacturers ASCE 7-16 wind uplift requirements.
 - f. Compliances: UL, WH or FM listed under Roofing Systems.

2.3. RELATED MATERIALS

- A. Fiber Cant and Tapered Edge Strips: Performed rigid insulation units of sizes/shapes indicated, matching insulation board or of perlite or organic fiberboard, as per the approved manufacturer.
 - 1. Acceptable Manufacturers:
 - a. The Garland Company, Inc.
 - b. Celotex
 - c. Johns Manville
 - d. GAF
 - e. Approved Equivalent
- B. Protection Board: Pre-molded semi-rigid asphalt composition board one half (1/2) inch.
- C. Roof Board Joint Tape: Six (6) inches wide glass fiber mat with adhesive compatible with insulation board facers.
- D. Asphalt: ASTM D312, Type III Steep Asphalt.
- E. Roof Deck Insulation Adhesive: Insul-Lock HR - Dual-component, high rise foam adhesive with 45% rapidly renewable material content as recommended by insulation manufacturer and approved by FM indicated ratings.
 - 1. Tensile Strength (ASTM D412).....250 psi
 - 2. Density (ASTM D1875).....8.5 lbs./gal.
 - 3. Viscosity (ASTM D2556).....22,000 to 60,000 cP.
 - 4. 2 `Peel Strength (ASTM D903).....17 lb/in.
 - 5. 3 `Flexibility (ASTM D816).....Pass @ -70°F
- F. Fasteners: Corrosion resistant screw fastener as recommended by roof membrane manufacturer.
 - 1. Factory Mutual Tested and Approved with three (3) inches coated disc for I-90 rating, length required to penetrate metal deck one inch.
 - 2. Screws: Concealor #14-13 DP1 as specified per ASCE 7 calculations.

PART 3 – EXECUTION

1. EXECUTION, GENERAL

- A. Comply with requirements of Division 01 Section "Common Execution Requirements."

2. INSPECTOR OF SURFACES

- A. Roofing contractor shall be responsible for preparing an adequate substrate to receive insulation.
 - 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.
 - 6. Broom clean substrate immediately prior to application.
 - 7. Use additional insulation to fill depressions and low spots that would otherwise cause ponding water.
 - 8. Verify that temporary roof has been completed.

3. INSTALLATION

- A. Comply with built-up roofing manufacturer's written instructions, as submitted and reviewed by Architect during the submittal process, for installing roof insulation.
- B. Install one lapped rosin sheet course and mechanically fasten to substrate according to built-up roofing manufacturer's written instructions and as called for in these specifications and on the drawings.
- C. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of built-up roofing with vertical surfaces or angle changes greater than 45 degrees.
- D. Install tapered insulation under area of roofing to conform to slopes indicated. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
 - 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- E. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- F. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- G. Mechanically Fastened and Adhered Insulation: Install first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - 1. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of the roof.
 - a. Field: 16 screws per 4 foot by 8 foot panel (2 square feet per screw).
 - b. Perimeter: 24 screws per 4 foot by 8 foot panel (1.33 square feet per screw).
 - c. Corners: 32 screws per 4 foot by 8 foot panel (1 square foot per screw).
 - 2. Set each subsequent layer of insulation in insulation adhesive adhered per the roofing system manufactures recommendations.
- H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck. Tape joints if required by roofing manufacturer.
- I. Apply insulation adhesive to underside and immediately bond cover board to substrate.

- J. Approved insulation board shall be fully attached to the deck with an approved mechanical fastening system. As a minimum, the amount of fasteners shall be in accordance with manufacturer's recommendation ASCE 7-16. Otherwise, a minimum of one fastener per two square feet shall be installed.
- K. Filler pieces of insulation require at least two fasteners per piece if size of insulation is less than four square feet.
- L. Spacing pattern of fasteners shall be as per manufacturer's recommendations to meet the ASCE 7-16 requirements. Placement of any fastener from edge of insulation board shall be a minimum of three inches, and a maximum of six (6) inches.
- M. Minimum penetration into deck shall be as recommended by the fastener manufacturer. There is a one (1) inch minimum for metal, wood and structural concrete decks where not specified by the manufacturer. For gypsum and cement-wood fiber decks, penetration shall be determined from pull-out test results with a minimum penetration of one and one-half (1 ½) inches.
- N. Gypsum and cementitious wood fiber decks: Where the roof deck is visible from the building interior, the contractor shall ensure no penetration of fasteners through underside of the deck. Any holes or spalling caused by fastener installation shall be repaired by the roofing contractor. Where the new roof system thickness exceeds an amount so that a minimum of 1 ½ of penetration cannot be achieved with an Olympic TB Fastener, or approved equivalent, then (and only then) toggle bolts may be used to secure installation to the deck.
- O. Tape joints of insulation as per manufacturer's requirements.
- P. Attachment with Insulation Adhesive Approved by Factory Mutual (FM).
- Q. Ensure all surfaces are clean, dry, free of dirt, debris, oils, loose ore embedded gravel, unadhered coatings, deteriorated membrane and other contaminants that may inhibit adhesion.
- R. Apply insulation adhesive directly to the substrate using a ribbon pattern with one quarter to one half (1/4-1/2) inch wide beads 12 inches o.c., using either the manual applicator or an automatic applicator, at a rate of one (1) gallon per one hundred (150) square feet per cartridge.
- S. Immediately place insulation boards into wet adhesive. Do not slide boards into place. Do not allow the adhesive to skin over before installing insulation boards.
- T. Briefly step each board into place to ensure contact with the adhesive. Substrates with irregular surfaces may prevent the insulation board from making positive contact with the adhesive. Relief cuts or temporary weights may be required to ensure proper contact.
- U. All boards shall be cut and fitted where the roof deck intersects a vertical surface. The boards shall be cut to fit a minimum of one quarter (1/4) inch away from the vertical surface.
- V. Tape joints of insulation as per manufacturer's requirements.

4. CLEANING

- A. Remove debris and cartons from roof deck. Leave insulation clean and dry, ready to receive roofing membrane.

5. CONSTRUCTION WASTE MANAGEMENT

- A. Remove and properly dispose of waste products generated during installation. Comply with requirements of authorities having jurisdiction.

END OF SECTION

SECTION 07 31 13
ASPHALT SHINGLES

1. GENERAL

1.1. SECTION INCLUDES

- A. Includes all labor, materials, and equipment to install a composition shingle roofing system over the properly prepared substrate.
- B. Includes removal and disposal of existing roofing system(s), insulation boards, gutters, flashings, sheet metal items, copings, etc. for a complete prepared roof surface to receive the new roofing system.
- C. See section 01110 Summary of Work for a detailed scope of work.

1.2. RELATED SECTIONS

- A. Section 01 - Summary of Work
- B. Section 06 - Rough Carpentry
- C. Section 07 - Roofing Restoration
- D. Section 07 - Modified Bituminous Roofing
- E. Section 07 - Sheet Metal Flashing & Trim
- F. Section 09 - Painting

1.3. REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM C209 - Standard Test Methods for Cellulosic Fiber Insulating Board.
 - 2. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
 - 3. ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
 - 4. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
 - 5. ASTM D1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - 6. ASTM D2126 - Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
 - 7. ASTM D3018 - Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules.
 - 8. ASTM D3161 - Standard Test Method for Wind-Resistance of Asphalt Shingles (Fan-Induced Method).
 - 9. ASTM D3462 - Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules.
 - 10. ASTM D4586 - Standard Specification for Asphalt Roof Cement, Asbestos- Free.
 - 11. ASTM D4601 - Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.
 - 12. ASTM D4869 - Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing.
 - 13. ASTM D6757 - Standard Specification for Underlayment Felt Containing Inorganic Fibers Used in Steep-Slope Roofing.
 - 14. ASTM D7158 - Standard Test Method for Wind Resistance of Asphalt Shingles (Uplift

- Force/Uplift Resistance Method).
- 15. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- 16. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
- 17. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings.
- B. Florida Building Code (FBC).
 - 1. FL14807 - Underlayments.
 - 2. FL14809 - Asphalt Shingles.
 - 3. FL 23186 - Underlayments.
- C. ICC Evaluation Service (ICC-ES).
 - 1. ICC Approval - ESR-1561: Roofing Felt and Underlayment.
 - 2. ICC Approval - ESR-3150: Asphalt Shingles.
 - 3. ICC-ES AC188: Acceptance Criteria for Roof Underlayments.
- D. Intertek Testing Services (ITS).
 - 1. Fire Resistance Directory, Current Edition.
 - 2. Code Compliance Research Report - CCRR-1082: Roofing Felt and Underlayment.
- E. Underwriters Laboratory (UL):
 - 1. UL 790 - Standard Test Methods for Fire Tests of Roof Coverings.
 - 2. UL 2218 - Impact Resistance of Prepared Roof Covering Materials.

1.4. SUBMITTALS

- A. Submit under provisions of Section 01 - Administrative Requirements.
- 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. Samples for Selection: For the following products, of sizes indicated: For each product specified, two complete sets of color samples representing manufacturer's full range of available colors and patterns.
 - 1. Asphalt Shingles: Full size.
 - 2. Asphalt Starter Shingles: Full size.
 - 3. Polymer Modified Fiberglass Hip and Ridge Shingles: Full size.
 - 4. Polymer Modified Self-Adhering Fiberglass Reinforced Underlayment: 12 inches (305 mm) square.
 - 5. Nails Used for Fastening Shingles: 5 of each nail type and size.
- D. Samples for Verification: For the following products, of sizes indicated: For each product specified, two samples representing actual product, color, and patterns.
 - 1. Asphalt Shingles: Full size.
 - 2. Asphalt Starter Shingles: Full size.
 - 3. Polymer Modified Fiberglass Hip and Ridge Shingles: Full size.
 - 4. Polymer Modified Self-Adhering Fiberglass Reinforced Underlayment: 12 inches (305 mm) square.
 - 5. Nail Used for Fastening Shingles: 5 of each nail type and size.

1.5. QUALITY ASSURANCE

- A. Primary Roofing Materials Manufacturer Requirements:
 - 1. Manufacturer specified asphalt shingles for a minimum of ten years.
 - 2. Manufacturer shall be an associate member in good standing of either the National Roofing Contractors Association (NRCA), Western States Roofing Contractors Association (WSRCA), or the Midwest Roofing Contractors Association (MRCA).

- B. Installer Qualifications: Approved by the manufacturer to install the specified products and provide the specified warranties.
- C. Fire-Resistance Characteristics: Where indicated, provide asphalt shingles and related roofing materials identical to those of assemblies tested for fire resistance per test method below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
- D. Exterior Fire-Test Exposure: Class A; ASTM E108 or UL 790, for application and roof slopes indicated.
- E. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7. 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.

1.8. PROJECT MEETINGS

- A. Pre-Construction Meeting:
 - 1. Prior to the start of the roofing project, the Owner will hold a job-site meeting and roof tour to review the scope of work.
 - 2. Authorized representatives of the Owner, the Roofing Contractor (Project Superintendent), the asphalt shingle manufacturer, other Subcontractors whose work complements, penetrates, or is mounted on the roof or will use the roof as a work platform, will be in attendance.
 - 3. The agenda for the meeting shall include:
 - a. A review of the submittals.
 - b. Distribution of approved submittals.
 - c. A walkover inspection of the roof.
 - d. Establishment of a schedule for the work.
 - e. Selection of staging and storage locations.
- B. Final Inspection: Following the completion of the work, a final inspection shall be scheduled by Owner's Representative. Any uncompleted work shall be noted on a punch list. Final payment shall be made only after punch list is completed.

1.9. WARRANTY

- A. Standard Warranty: Shingles subjected to terms and conditions of the standard Manufacturer's Limited Warranty. Wind warranty coverage is subject to the shingles being sealed.
 - 1. Warranty Length: 50 years.
 - 2. Limited Term Resistance to Wind: 130 mph (209 kph).
- B. Provide a three (3) year workmanship warranty.

- C. Upon project completion and acceptance by Owner, the Roofing Contractor shall promptly provide executed copies of the specified warranties.
- D. Furnish a list containing the names and contact telephone numbers of the Roofing Contractor's Service Manager, Superintendent, and Project Manager and the Roofing Contractor's current mailing address.

2.PRODUCTS

2.1. MANUFACTURERS

- A. Acceptable Manufacturer: Malarkey Roofing Products, which is located at: 3131 N. Columbia Blvd. P. O. Box 17217; Portland, OR 97217; Toll Free Tel: 800-545-1191; Tel: 503-283-1191; Fax: 503-289-7644; Email: [request info \(jkouba@malarkeyroofing.com\)](mailto:request info (jkouba@malarkeyroofing.com)); Web: <https://malarkeyroofing.com>
- B. Substitutions: Not permitted.

2.2. SHINGLES

- A. High Profile Laminate Shingles:
 - 1. Legacy (272) as manufactured by Malarkey Roofing Products.
 - a. Malarkey Legacy shingles hold a Class A Fire Rating.
 - b. As manufactured, Legacy meets the requirements of:
 - 1. ASTM D7158 Class H, ASTM D3462, ASTM D3161 Class F, ASTM D3018 Type I, ASTM E108 Class A, UL 2218 Class 4 Impact Resistance, ICC-ES AC438, and CSA A123.5.
 - 2. ICC Approval: ESR-3150.
 - 3. FBC Approval: No. 14809.
 - 4. Listed with UL and Intertek/WHI.
 - c. Performance:
 - 1. Limited Material Warranty: 50 years.
 - 2. Limited Wind Warranty: 15 years. 110 mph (177 kph).
 - 3. Enhanced Wind Warranty Available: 130 mph (209 kph).
 - 4. Legacy Silverwood is listed with CRRC and compliant with CEC Title 24, Part 6 Cool Roof Requirements.
 - 5. NEX polymer mix includes recycled rubber and plastics.
 - 6. SEBS polymer modified asphalt laminate adhesive.
 - 7. SEBS asphalt seal-down adhesive.
 - 8. 3M Smog-Reducing Granules.
 - 9. Enlarged nailing area of The Zone.
- B. Color: Color shall be selected from the manufacturer's standard colors.

2.3. UNDERLAYMENT

- A. R-Mer Seal, Self-Adhering Underlayment by The Garland Company:
 - 1. Product: R-Mer Seal by The Garland Company.
 - 2. Substitutions not permitted.
 - 3. As manufactured, meets requirements of ASTM D1970.
 - 4. Self-adhering sheet shall be nominal 45 mils (1.14 mm) thick.
 - 5. Self-adhering sheet shall be 36 inches (0.91 meter) in width.
 - 6. One (1) roll covers two (2) squares of roof.

2.4. RELATED PRODUCTS

- A. Endura Vent Eave and Ridge Vents, below deck ventilation system.
- B. NEX Polymer Modified 8 inches (203 mm) High-Profile Hip and Ridge: Malarkey No. 222 EZ-Ridge Scotchgard.

- C. Full-Width Perforated Starter Shingle: Malarkey Smart Start No. 210.
- D. Plastic Roof Cement conforming to ASTM D4586.
- E. Fasteners: Hot Dip Galvanized nails with minimum 3/8 inch (9.5 mm) head.
- F. Dormer Vents: Construction Metals Inc. low profile stamped dormer, Simpson LPD20.

2.5. SHEET METAL FLASHING & TRIM

- A. Sheet Metal Flashing and Trim: Comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim."
- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item.
 - 1. Step Flashings: 24 gauge minimum. Fabricate with a headlap of 2 inches (50 mm) and a minimum extension of 5 inches (125 mm) over the underlying asphalt shingle and up the vertical surface.
 - 2. Cricket Flashings: 24 gauge minimum. Fabricate with concealed flange extending a minimum 24 inches (600 mm) beneath upslope asphalt shingles and 6 inches (150 mm) above the roof plane.
 - 3. Open Valley Flashings: 24 gauge minimum. Fabricate in lengths not exceeding [10 feet (3 m)] with 1-inch- (25-mm-) high inverted-V profile at center of valley and equal flange widths of 10 inches (250 mm).
 - 4. Drip Edges: 24 gauge minimum. Fabricate in lengths not exceeding [10 feet (3 m)] with 2-inch (50-mm) roof deck flange and 1-1/2-inch (38-mm) fascia flange with 3/8-inch (9.6-mm) drip at lower edge.
 - 5. Vent Pipe Flashings: ASTM B 749, Type L51121, at least 1/16 inch (1.6 mm) thick. Provide 4lb lead sleeve sized to slip over the pipe and install the factory lead counter flashing cap.

3.EXECUTION

3.1. DELIVERY, STORAGE, AND HANDLING

- A. New and dry roof materials delivered to the job site in containers unopened and undamaged. Manufacturer's products stamped with labels, names, and run codes of manufacture and testing laboratory.
- B. Store underlayment materials on ends only. Discard rolls which may have been flattened, creased, or otherwise damaged. Place materials on pallets or wood sleepers. Do not stack palletized materials.
- C. Cover underlayment rolls with weatherproof materials secured to prevent materials from becoming exposed to moisture. Use breathable tarps.
- D. Disperse materials stored on the roof surface to avoid concentrated loading. Set larger concentrations over structural members.

3.2. ENVIRONMENTAL REQUIREMENTS

- A. Application of roofing materials shall not be performed when weather conditions interfere with good roofing practices.

3.3. UNDERLAYMENT AND EDGING

- A. Apply specified underlayment as follows:
 - 1. Apply a single layer of polymer modified underlayment laid parallel to eaves, lapping to the 4 inch (102 mm) ply line, and 6 inches (152 mm) on ends, end laps staggered 6 feet (1829 mm) from course to course.
- B. Valleys: Only those valley installations listed in the manufacturer's installation instructions shall be permitted.
 - 1. Regardless of valley method used, begin application by centering a full-width valley liner of self-adhering underlayment to the roof deck in all valleys.
 - 2. The field underlayment is then woven through the valley over the layer of self-adhering underlayment or lapped 6 inches (152 mm) on each side. If fastening the field underlayment, be aware no fasteners are allowed within 6 inches (152 mm) of the valley centerline.
- C. Pipe Flashing: Apply ASTM D1970 underlayment around the pipe, sealing it to the field underlayment prior to installing the metal pipe flashing. Install and secure the metal jack so the bottom flange laps over onto the shingles. Side and top flanges shall have shingles lapping onto the flange. Shingles that lap onto flanges shall be sealed to the metal with asphalt roof cement conforming to ASTM D4586.
- D. Perimeter Flashing: Use non-corrosive, 24-gauge sheet metal drip edge flashing. Install prior to underlayment on eave edges of roof and then along rake edges over the ends of installed underlayment. Install drip edge with flanges large enough (recommend 4-inch (102 mm) flanges) to completely cover roof edges. Secure with galvanized (or compatible) roofing nails, centered on the top flange at 8 to 10 inches (203 to 254 mm) O.C. or according to local code requirements.

3.4. METAL FLASHING INSTALLATION

- A. General: Install metal flashings and other sheet metal to comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim."
- B. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."
- C. Apron Flashings: Extend lower flange over and beyond each side of downslope asphalt shingles and up the vertical surface.
- D. Step Flashings: Install with a head lap of 2 inches and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.
- E. Cricket Flashings: Install against the roof-penetrating element extending concealed flange beneath upslope asphalt shingles and beyond each side.
- F. Open Valley Flashings: Install centrally in valleys, lapping ends at least 8 inches in direction to shed water. Fasten upper end of each length to roof deck beneath overlap.
- G. Secure hemmed flange edges into metal cleats spaced 2 inches apart and fastened to roof deck.
- H. Rake Drip Edges: Install rake drip edge flashings over underlayment and fasten to roof deck.
- I. Eave Drip Edges: Install eave drip edge flashings below underlayment and fasten to roof sheathing.
- J. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.5. APPLICATION OF SHINGLES

- A. Laminate Shingle Application; 8 inches (203 mm) Offset - Diagonal Pattern:
1. Starter courses: Use Malarkey starter shingles or 3-tab shingles with the tabs cut off; apply to eave and rake edges of roof.
 2. Cut 6 inches (152 mm) off the length of the starter strip and apply at a lower corner of roof. The starter course shall overhang the edge metal 1/4 to 3/4 inch (6 mm to 19 mm). Fasten with four (4) nails, 1-1/2 inches to 3 inches (38 to 76 mm) up from the eave with one fastener 1 inch (25 mm) from each end and the remaining two evenly spaced on the same line as the end fasteners.
 3. Continue starter course across the roof with a full-length shingles, butting them loosely together to avoid buckling.
 4. First course: Start with a full shingle applied directly over the starter course at the same lower corner of the roof, and secure with fasteners.
 5. Second course: Cut 8 inches (203 mm) off one end of a full shingle and apply the remaining piece over the underlying, first course shingle. Align the bottom edge along a line level with the "sawtooth" overlay in the preceding course, exposing the first course 5-5/8 inches (143 mm). Secure with fasteners.
 6. Succeeding Courses: Courses three through five are begun with partial shingles, each progressively 8 inches (203 mm) shorter, establishing the overall diagonal pattern or stair-step effect. (Pieces cut from shingles along one rake edge can be used to finish off courses on the opposite rake.)
 7. Apply a full shingle adjacent to each of the first five courses to extend the pattern. Butt the shingles loosely together to prevent buckling.
 8. Courses six through ten repeat the process beginning with a full shingle and repeating the 1-to-5 course cycle on up the roof.
 9. Strike a chalk line every six courses or so to ensure straight courses. Shingles may be laid from either lower corner of the roof. Start at the rake edge and follow layout and cutting instructions as required for proper application. Installation of shingles with a 4 inch (102 mm) offset is also acceptable. Offsets must be no less than 4 inches (102 mm).
- B. Valley Installation:
1. Valley Underlayment: Center a full-width strip of self-adhering underlayment (or equivalent conforming to ASTM D1970) in the valley and apply it directly to the roof deck. Ensure this valley liner is tight to the deck without bridging in the center of the valley. Lace the field underlayment into and through the valley from both sides or overlap the valley liner a minimum of 6 inches (152 mm) on each side. When fastening, none should be placed closer than 6 inches (152 mm) from the valley centerline.
 2. Open metal valleys: Install minimum 24 inches (610 mm) wide, 26-gauge, metal valley flashing over the valley liner, and secure with fasteners no more than 1 inch (25 mm) from the outside edges at a spacing of 10 inches (254 mm) to 12 inches (305 mm) on center. For additional sealing, a continuous, 6-inch (152 mm) wide stripping ply of self-adhering Arctic Seal may be applied over the fasteners. Overlaps in the metal should be a minimum of 4 inches (102 mm) and embedded in a continuous bead of sealant. Do not fasten the metal laps. Lay a first course of shingles along the eave of one roof area and over the valley, making sure the end of the last shingle meets or goes beyond the centerline of the metal valley. Complete the installation of shingles on that roof section. After all shingles have been installed in the valley, snap a chalk line 2 inches (51 mm) from the center of the metal valley, and trim shingles to the chalk line, matching the centerline angle. Crop the tops of each shingle course at a 1 inch (25 mm), 45 degree cut. Embed the ends of the cut valley shingles in a continuous 3 inch (76 mm) wide bead of mastic. Install shingles on the adjoining roof as described above.
 3. "Bleeder," "Point," or "California-cut" valleys are not acceptable.

3.6. FASTENERS

- A. Laminate Nailing Pattern: Nails must be placed within the nailing zone, 1 inch (25 mm) in from each end of the shingle and the remaining nails evenly spaced on the same line as the end nails. Fasteners shall be seated flush to the shingle surface and not overdriven to cut into shingles. When fastening, butt shingles loosely together to prevent buckling.
 - 1. Fasteners per shingle: Four (4).
 - 2. Fasteners per shingle/high wind areas: Six (6), including starter shingles.
 - 3. Steep slope fastening (roof decks, greater than 21:12): Six (6), including starter shingles, and hand-sealing underneath.

3.7. 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 073113.
- 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 073113.
 - 1. Materials specifically provided by the Owner:
 - a. See Section 016400 Owner Supplied Materials

END OF SECTION

**SECTION 07 55 00
MODIFIED BITUMINOUS MEMBRANE ROOFING**

1. GENERAL

1.1. SECTION INCLUDES

- A. Includes all labor, materials, and equipment to install a modified bitumen roof system over the properly prepared substrate.
- B. Includes a new cold applied 2-ply asphalt roofing system with all accessories as needed for a complete warrantable roofing system.

1.2. RELATED SECTIONS

- A. Section 01 - Summary of Work
- B. Section 01 - Owner Furnished Contractor Installed
- C. Section 01 - Submittals
- D. Section 06 - Rough Carpentry
- E. Section 07 - Insulation Board
- F. Section 07 - Sheet Metal Flashing and Trim

1.3. 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 1970 - Specification for Sheet Materials, Self-Adhering Polymer Modified Bituminous, Used as Steep Roofing Underlayment for Ice Dam Protection.
- E. ASTM D 1079 Standard Terminology Relating to Roofing, Waterproofing and Bituminous Materials.
- F. ASTM D 1863 Standard Specification for Mineral Aggregate Used as a Protective Coating for Roofing.
- G. ASTM D 2178 Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.
- H. ASTM D 2822 Standard Specification for Asphalt Roof Cement.
- I. ASTM D 4601 Standard Specification for Asphalt Coated Glass Fiber Base Sheet Used in Roofing.
- J. ASTM D 5147 Standard Test Method for Sampling and Testing Modified Bituminous Sheet Materials.
- K. ASTM D 6162 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber

Reinforcements.

- L. ASTM D 6163 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.
- M. ASTM D 6164 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
- N. ASTM E 108 - Standard Test Methods for Fire Test of Roof Coverings
- O. Factory Mutual Research (FM): Roof Assembly Classifications.
- P. National Roofing Contractors Association (NRCA): Roofing and Waterproofing Manual.
- Q. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal Manual.
- R. Underwriters Laboratories, Inc. (UL): Fire Hazard Classifications.
- S. Warnock Hersey (WH): Fire Hazard Classifications.
- T. ANSI-SPRI ES-1 Wind Design Standard for Edge Systems used with Low Slope Roofing Systems.
- U. ASCE 7, Minimum Design Loads for Buildings and Other Structures
- V. UL - Fire Resistance Directory.
- W. FM Approvals - Roof Coverings and/or RoofNav assembly database.
- X. California Title 24 Energy Efficient Standards.

1.4. 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: Submit calculations from manufacturers engineering department prior to the start of the project. All items below must be addressed per ASCE 7-16 and approved as part of the submittal package specific to the geographical location of this project.
 - 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 7-16, Method 2 for Components and Cladding.
 - 2. Importance Category:
 - a. III
 - 3. Importance Factor of:
 - a. 1.0
 - 4. Wind Speed: 120 mph
 - 5. Ultimate Pullout Value: 540 pounds per each of the fastener
 - 6. Exposure Category:
 - a. C.
 - 7. Design Roof Height: 20 feet.

8. Minimum Building Width: 30 feet.
9. Roof Pitch: 1/4 :12.
10. Roof Area Design Uplift Pressure:
 - a. Zone 1 - Field of roof 20 psf
 - b. Zone 2 - Eaves, ridges, hips and rakes 33.6 psf
 - c. Zone 3 - Corners 33.6 psf
2. Snow Load: N/A psf.
3. Live Load: 20 psf, or not to exceed original building design.
4. 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: Submit all supporting data as noted below prior to the start of the project.
 1. Miami-Dade County:
 - a. Torch and Mop Membrane Systems Over
 1. Steel Decks N.O.A.
 - b. Roofing Underlayments
 1. Garland Underlayments N.O.A.
 - c. Roofing Cements and Coatings
 1. Garland Coatings and Mastics N.O.A.
 2. Cool Roof Rating Council:
 - a. CRRRC Directory: CRRRC 0700-0028
 3. Underwriters Laboratories:
 - a. Certification: 11040005 / 11040025
 4. Warnock Hersey
 - a. ITS Directory of Listed Products
 5. FM Approvals:
 - a. RoofNav Website

1.5. 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 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 7-16 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. Report shall be signed and sealed by a Professional Engineer registered in the State of the Project who has provided roof system attachment analysis for not less than 5 consecutive years.

- E. Recycled or Bio-Based Materials: Provide third party certification through UL Environment of roof System membranes containing recycled or bio based materials
- F. 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.
- G. Provide written certification from the roofing system manufacturer certifying the applicator is currently authorized to install the specified roof system and ability to provide the specified warranty.
- H. Sample Warranty: Provide an unexecuted copy of the warranty specified for this project clearly stating the terms required of the owner, contractor, and manufacturer.
- I. Manufacturer's Certificates: Provide to certify products meet or exceed specified requirements.
- J. Inspection Certification: Submit a letter signed by an officer of the manufacturer certifying that the manufacture will provide weekly project inspections throughout the course of construction.
- K. Test Reports: Submit test reports, prepared by an independent testing agency, for all modified bituminous sheet roofing, indicating compliance with ASTM D5147.
- L. Manufacturer's Fire Compliance Certificate: Certify that the roof system furnished is approved by Factory Mutual (FM), Underwriters 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.
- M. 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.

1.6. 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. 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.

1.7. 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 Owner and Architect.

1.8. 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.

1.9. COORDINATION

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

1.10. 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.

1.11. 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. 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. 3 years from date of acceptance.

2.PRODUCTS

2.1. MANUFACTURERS

- A. Acceptable Manufacturer: The Garland Company, Inc.; 3800 E. 91st St., Cleveland, OH 44105. Local Representative: Richard Jones Phone: (559) 647-1196.
rjones@garlandind.com Web Site: www.garlandco.com.
- B. Requests for substitutions will not be considered for this project. District Standard.

2.2. COLD APPLIED 2-PLY ROOF SYSTEM

- A. Insulation Base Layers:
 1. Polyisocyanurate roof board insulation. Install in multiple layers staggering all seams per manufactures details. Install with mechanical fasteners per ASCE 7-16 wind uplift calculations.
 2. R- Value: N/A, minimum thickness N/A
- B. Insulation Top Layer:
 1. One layer of six side primed ½" woodfiber insulation board installed over one layer of rosin sheathing paper. Install per ASCE 7-16 wind uplift requirements.
- C. Base (Ply) Sheet: One ply bonded to the prepared substrate with Interply Adhesive:
 1. StressBase 80:
- D. Modified Cap (Ply) Sheet: One ply bonded to the prepared substrate with Interply Adhesive:
 1. StressPly Plus FR Mineral:
- E. Interply Adhesive:
 1. Green-Lock Plus:
- F. Flashing Base Ply: One ply bonded to the prepared substrate with Flashing Ply Adhesive:
 1. StressBase 80:
- G. Flashing Cap (Ply) Sheet: One ply bonded to the prepared substrate with Flashing Ply Adhesive:
 1. StressPly Plus FR Mineral:
- H. Flashing Ply Adhesive:
 1. Green-Lock Flashing Adhesive:
- I. Surfacing:
 1. Pyramic Plus Lo Acrylic Coating

2.3. ACCESSORIES:

- A. Roof Insulation Base Layer(s): Provide roof insulation as specified in accordance with Section 072200. (Base layer is to be mechanically attached per ASCE 7-16)
- B. Tapered Insulation System / Crickets: Per the final approved plan set slope to drain minimum 1/2" per foot.
- C. Roof Insulation Top Layer: Provide one layer of ½" six side primed Blue Ridge Structodek High Density Fiberboard Roof Insulation. ASTM C 208, Type II.

- D. Vapor Retarder: Red Rosin Paper; Install layer rosin sheet shingled uniformly to achieve one ply over the entire prepared substrate. Shingle in direction of slope of roof to shed water on each area of roof.
 - 1. Red Rosin Paper by WR Meadows
 - a. Weight – 12 lb./roll
 - b. Size – 500 square feet p/roll
 - c. 36" wide by 167' long
- E. 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.
- F. Walkway Pads - As recommended and furnished by the membrane manufacturer set in approved adhesive to control foot traffic on roof top surface and provide a durable system compliant non-slip walkway.
 - 1. TrafGuard Roof Walkway Pads by Viking Products Group
 - a. 1/2" x 3' x 4'
 - b. In absence of a clear defined walkway plan in the project documents install walk way pads in a path from all roof access points to and around all HVAC and serviceable mechanical equipment, to and around roof hatches, and as designated by the owner.
- G. 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
- H. 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
- I. Butyl Tape: 100% solids, asbestos free and compressive tape designed to seal as recommended and furnished by the membrane manufacturer.
- J. 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.
- K. Roof Deck Insulation Adhesive: Insul-Lock HR - Dual-component, high rise foam adhesive with 45% rapidly renewable material content as recommended by roofing manufacturer and approved by FM indicated ratings.
 - 1. Tensile Strength (ASTM D412).....250 psi
 - 2. Density (ASTM D1875).....8.5 lbs./gal.
 - 3. Viscosity (ASTM D2556).....22,000 to 60,000 cP.
 - 4. 2 "Peel Strength (ASTM D903).....17 lb/in.
 - 5. 3 "Flexibility (ASTM D816).....Pass @ -70°F

2.4. EDGE TREATMENT AND ROOF PENETRATION FLASHINGS

- A. Pre-Manufactured Edge Metal Finishes:
 - 1. Exposed and unexposed surfaces for mill finish flashing, fascia, and coping cap, as

- shipped from the mill
2. Exposed surfaces for coated panels:
 - a. Steel Finishes: fluorocarbon finish. Epoxy primer baked both sides, .2-.25 mils thickness as approved by finish coat manufacturer.
Weathering finish as referred by National Coil Coaters Association (NCCA).
Provided with the following properties.
 1. Pencil Hardness: ASTM D3363, HB-H / NCCA II-2.
 2. Bend: ASTM D-4145, O-T / NCCA II-19
 3. Cross-Hatch Adhesion: ASTM D3359, no loss of adhesion
 4. Gloss (60 deg. angle): ASTM D523, 25+/-5%
 5. Reverse Bend: ASTM D2794, no cracking or loss of adhesion
 6. Nominal Thickness: ASTM D1005
 - B. Flashing Boot - Rubbertite Flashing Boot: Neoprene pipe boot for sealing single or multiple pipe penetrations adhered in approved adhesives as recommended and furnished by the membrane manufacturer.
 - C. 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.
 - D. Pitch pans, Rain Collar 24 gauge stainless or 20oz (567gram) copper. All joints should be welded/soldered watertight. See details for design.
 - E. Drain Flashings should be 4lb (1.8kg) sheet lead formed and rolled.
 - F. Plumbing stacks should be 4lb (1.8kg) sheet lead formed and rolled. All plumbing stacks are to have the factory lead caps / counter flashing installed. Caulking and banding will not be acceptable on open top pipe penetrations. On field fabricated flashings where a lead cap can't be applied a lead umbrella flashing is to be installed. Caulking and banding will be required with the specified sealant.
 - G. Liquid Flashing - Tuff-Flash: An asphaltic-polyurethane, low odor, liquid flashing material designed for specialized details unable to be waterproofed with typical modified membrane flashings.
 1. Tensile Strength, ASTM D 412: 400 psi
 2. Elongation, ASTM D 412: 300%
 3. Density @77 deg. F 8.5 lb/gal typical
 - H. Fabricated Flashings: 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.
 - I. Manufactured Roof Specialties: Shop fabricated 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.

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.
 - 8. 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.
 - 9. 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).
 - 10. 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.
 - 11. 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. INSULATION INSTALLATION

- A. Comply with built-up roofing manufacturer's written instructions, as submitted and reviewed by Architect during the submittal process, for installing roof insulation.
- B. (Wood Decks Only) Install one lapped rosin sheet course and mechanically fasten to substrate according to built-up roofing manufacturer's written instructions and as called for in these specifications and on the drawings.
- C. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of built-up roofing with vertical surfaces or angle changes greater than 45 degrees.
- D. Install tapered insulation under area of roofing to conform to slopes indicated.
- E. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
 - 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- F. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- G. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- H. Mechanically Fastened and Adhered Insulation: Install first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - 1. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
 - a. Field: 16 screws per 4 foot by 8 foot panel (2 square feet per screw).
 - b. Perimeter: 24 screws per 4 foot by 8 foot panel (1.33 square feet per screw).
 - c. Corners: 32 screws per 4 foot by 8 foot panel (1 square foot per screw).
 - 2. Set each subsequent layer of insulation in Insuloc Insulation Adhesive by The Garland Company.

- I. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and adhere to base layer insulation. Tape joints if required by roofing manufacturer.
1. Apply insulation adhesive to underside and immediately bond cover board to substrate.

3.5. INSTALLATION COLD APPLIED ROOF SYSTEM

1. 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.
 2. Lap ply sheet ends 8 inches. Stagger end laps 12 inches minimum.
 3. Solidly bond to the substrate and adjacent ply with specified cold adhesive at the rate of 2 to 2-1/2 gallons per 100 square feet.
 4. 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.
 5. 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.
 6. Extend plies 2 inches beyond top edges of cants at wall and projection bases.
 7. Install base flashing ply to all perimeter and projection details.
 8. 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 interply adhesive applied at the rate required by the manufacturer. Shingle sheets uniformly over the prepared substrate to achieve the number of plies 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 to 2-1/2 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. Install Tuff Stuff Urethane sealant at the top edge as 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. Secure the tops of all flashings that are not run up and over curb through termination bar fastened at 6 inches (152 mm) O.C. and sealed at top.
 5. Seal all vertical laps of flashing ply with a three-course application of trowel-grade mastic and fiberglass mesh.
 6. Coordinate counter flashing, cap flashings, expansion joints and similar work with modified bitumen roofing work as specified.
 7. Coordinate roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices with the roofing system work.
 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.
- 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. 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.

9. Three course all vertical laps and the top edge of the base flashing sheet with Flashing Bond Mastic & Garmesh Webbing. Install white roofing granules into the fresh mastic.
- I. Roof Walkways: Provide walkways in areas indicated on the drawings / plans or at a minimum;
 - a. Install walk way pads in a path from all roof access points to and around all HVAC and serviceable mechanical equipment, to and around roof hatches, and as designated by the owner.

3.6. INSTALLATION OF SURFACING

- A. Prior to installation of surface coating, obtain approval from manufacturer as to work completed. On average, at least 30 days are required prior to final surfacing.
 1. Reflective Coating:
 - a. Allow all cold applied mastics and coating to properly dry and cure before coating application.
 - b. Install primer coat at a rate of 1/2 gallon per 100 square feet.
 - c. Paint all exposed roofing with manufacturer's base coat acrylic coating installed at a rate of one and a half (1.5) gallons per square, back roll entire installation required.
 - d. Paint all exposed roofing with manufacturer's Energy Star top coat acrylic coating installed at a rate of one and a half (1.5) gallon per square, complete coverage for a clean neat appearance is required. Additional coats may be required to achieve complete coverage and proper mil thickness. Coating to be applied in a cross hatch pattern to the base coat.

3.7. INSTALLATION EDGE TREATMENT AND ROOF PENETRATION FLASHING

- A. Fabricated Flashings: Fabricated flashings and trim are provided as specified in Section 07620.
 1. Fabricated flashings and trim shall conform to the detail requirements of SMACNA "Architectural Sheet Metal Manual" and/or the Copper Development Association "Copper in Architecture - Handbook" as applicable.
- B. Metal Edge:
 1. Inspect the nailers to assure proper attachment and configuration.
 2. 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.
 3. Install continuous cleat and fasten at 6 inches (152 mm) o.c.
 4. 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.
 5. Prime metal edge at a rate of 100 square feet per gallon and allow to dry.
 6. 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.
 7. 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.
- C. Roof Edge With Gutter:
 1. Inspect the nailer to assure proper attachment and configuration. Increase slope at metal edge by additional degree of slope in first board.
 2. 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.
 3. Install gutter and strapping.
 4. Install continuous cleat and fasten at 6 inches (152 mm) o.c.
 5. Install new metal edge hooked to continuous cleat and set in bed of roof cement. Fasten flange to wood nailer every 3 inches (76 mm) o.c. staggered.
 6. Prime metal edge at a rate of 100 square feet per gallon and allow to dry.
 7. Strip in flange with base flashing ply covering entire flange in bitumen with 6 inches

8. (152 mm) onto the field of the roof. Assure ply laps do not coincide with metal laps. 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.
- D. Scupper Through Wall (Overflow):
1. Inspect the nailer to assure proper attachment and configuration.
 2. Run one ply over nailer up the overflow, into the scupper hole and up flashing as in typical wall flashing detail. Assure coverage of all wood nailers.
 3. Install 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.
 4. Fasten flange of scupper box every 3 inches (76 mm) o.c. staggered.
 5. Strip in flange 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.
 6. 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.
- E. Coping Cap:
1. 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.
 2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
 3. Attach tapered board to top of wall.
 4. 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 roof and set in cold asphalt. Nail membrane at 8 inches (203 mm) o.c.
 5. 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 install white roofing granules in fresh mastic.
 6. Install continuous cleat and fasten at 6 inches (152 mm) o.c. to outside wall.
 7. Install new metal coping cap hooked to continuous cleat.
 8. Fasten inside cap 24 inches (609 mm) o.c. with approved fasteners and neoprene washers through slotted holes, which allow for expansion and contraction.
- F. Surface Mounted Counterflashing:
1. 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.
 2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
 3. Install base flashing ply covering wall 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 install white roofing granules in fresh mastic.
 5. 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.
 6. Secure counterflashing set on butyl tape above flashing at 8 inches (203 mm) o.c. and caulk top of counterflashing.
- G. 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 install white roofing granules in fresh roofing mastic.
 5. 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.
 6. Set equipment on neoprene pad and fasten as required by equipment manufacturer.
- H. 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 install white roofing granules into fresh mastic.
 5. Install pre-manufactured counterflashing with fasteners and neoprene washers or per manufacturer's recommendations.
 6. Set equipment on neoprene pad and fasten as required by equipment manufacturer.
- I. Skylight:
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 wood nailer and apply a three-course application of mastic and mesh. Allow to cure and install white roofing granules in fresh mastic.
 5. Install pre-manufactured lens and fasten flashing sides at 8 inches (203 mm) o.c. with fasteners and neoprene washers.
- J. 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 install white roofing granules into fresh mastic.
 5. Install metal exhaust fan over the wood nailers and flashing to act as counterflashing. Fasten per manufacturer's recommendation.
- K. Roof Drain:
1. Plug drain to prevent debris from entering plumbing.
 2. Taper insulation to drain minimum of 24 inches (609 mm) from center of drain.
 3. Install two base flashing plies (40 inch square minimum) in bitumen.
 4. Set lead/copper flashing (30 inch square minimum) in 1/4 inch (6 mm) 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. Run roof system plies over drain. Cut out plies inside drain bowl.
 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.

- L. 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. Install a factory lead counter flashing cap over the top of the pipe. Caulking and banding or rolling the lead inside the pipe will not be accepted.
- M. 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 band.

3.8. 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.

3.9. 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.

3.10. FIELD QUALITY CONTROL

- A. Inspection: Provide manufacturer's field observations at start-up and two (2) days per week through project completion. Provide a final inspection upon completion of the Work.
1. Warranty shall be issued upon manufacturer's acceptance of the installation.
 2. Field observations shall be performed by a representative employed full-time by the manufacturer and whose primary job description is to assist, inspect and approve membrane installations for the manufacturer.
 3. Provide observation reports from the representative indicating procedures followed, weather conditions and any discrepancies found during inspection.
 4. Provide a final report from the representative, certifying that the roofing system has been satisfactorily installed according to the project specifications, approved details

and good general roofing practice.

3.11. SCHEDULES

A. Base (Ply) Sheet:

1. StressBase 80: 80 mil SBS (Styrene-Butadiene-Styrene) rubber modified roofing base sheet reinforced with a fiberglass scrim, performance requirements according to ASTM D 5147.
 - a. Tensile Strength, ASTM D 5147
 1. 2 in/min. @ 0 +/- 3.6 deg. F MD 100 lbf/in XD 100 lbf/in
 2. 50mm/min. @ -17.78 +/- 2 deg. C MD 17.5 kN/m XD 17.5 kN/m
 - b. Tear Strength, ASTM D 5147
 1. 2 in/min. @ 73.4 +/- 3.6 deg. F MD 110 lbf XD 100 lbf
 2. 50mm/min. @ 23 +/- 2 deg. C MD 489 N XD 444 N
 - c. Elongation at Maximum Tensile, ASTM D 5147
 1. 2 in/min. @ 0 +/- 3.6 deg. F MD 4 % XD 4 %
 2. 50mm/min @ -17.78 +/- 2 deg. C MD 4 % XD 4 %
 - d. Low Temperature Flexibility, ASTM D 5147, Passes -40 deg. F (-40 deg. C)

B. Modified (Cap) Sheet:

1. StressPly Plus FR Mineral: 155 mil SBS (Styrene-Butadiene-Styrene) mineral surfaced, rubber modified roofing membrane reinforced with a fiberglass and polyester composite scrim. ASTM D 6162, Type III Grade G
 - a. Tensile Strength, ASTM D 5147
 1. 2 in/min. @ 73.4 +/- 3.6 deg. F MD 310 lbf/in XD 310 lbf/in
 2. 50 mm/min. @ 23 +/- 2 deg. C MD 54.25 kN/m XD 54.25 kN/m
 - b. Tear Strength, ASTM D 5147
 1. 2 in/min. @ 73.4 +/- 3.6 deg. F MD 500 lbf XD 500 lbf
 2. 50 mm/min. @ 23 +/- 2 deg. C MD 2224 N XD 2224 N
 - c. Elongation at Maximum Tensile, ASTM D 5147
 1. 2 in/min. @ 73.4 +/- 3.6 deg. F MD 8% XD 8%
 2. 50 mm/min. @ 23 +/- 2 deg. C MD 8% XD 8%
 - d. Low Temperature Flexibility, ASTM D 5147, Passes -30 deg. F (-34 deg. C)

C. Interply Adhesive:

1. Green-Lock Plus Membrane Adhesive: Cold applied solvent free membrane adhesive: zero V.O.C. compliant performance requirements:
 - a. Non-Volatile Content ASTM D 4586 100%
 - b. Density ASTM D 1475 12.3 lbs./gal. (1.47 g/cm3)
 - c. Viscosity Brookfield Spindle T-E at 5 rpm 124,000 cPs.
 - d. Flash Point ASTM D 93 400 deg. F min. (232 deg. C)
 - e. Slope: up to 3:12

D. Flashing Base Ply:

1. StressBase 80: 80 mil SBS (Styrene-Butadiene-Styrene) rubber modified roofing base sheet reinforced with a fiberglass scrim, performance requirements according to ASTM D 5147.
 - a. Tensile Strength, ASTM D 5147
 1. 2 in/min. @ 0 +/- 3.6 deg. F MD 100 lbf/in XD 100 lbf/in
 2. 50 mm/min. @ -17.78 +/- 2 deg. C MD 17.5 kN/m XD 17.5 kN/m
 - b. Tear Strength, ASTM D 5147
 1. 2 in/min. @ 73.4 +/- 3.6 deg. F MD 110 lbf XD 100 lbf
 2. 50 mm/min. @ 23 +/- 2 deg. C MD 489 N XD 444 N
 - c. Elongation at Maximum Tensile, ASTM D 5147
 1. 2 in/min. @ 0 +/- 3.6 deg. F MD 4 % XD 4 %
 2. 50 mm/min. @ -17.78 +/- 2 deg. C MD 4 % XD 4 %
 - d. Low Temperature Flexibility, ASTM D 5147
 1. Passes -40 deg. F (-40 deg. C)

- E. Flashing Ply Adhesive:
 - 1. Green-Lock Plus Flashing Adhesive: Cold applied solvent free flashing adhesive: zero V.O.C.
 - a. Non-Volatile Content ASTM D 4586 100%
 - b. Density ASTM D 1475 11.8 lbs./gal. (1.17 g/cm3)
 - c. Viscosity Brookfield 400,000 cPs.
 - d. Flash Point ASTM D 93 400 deg. F min. (232 deg. C)
- F. Flashing (Cap) Sheet:
 - 1. StressPly Plus FR Mineral: 155 mil SBS (Styrene-Butadiene-Styrene) mineral surfaced, rubber modified roofing membrane reinforced with a fiberglass and polyester composite scrim. ASTM D 6162, Type III Grade G
 - a. Tensile Strength, ASTM D 5147
 - 1. 2 in/min. @ 73.4 +/- 3.6 deg. F MD 310 lbf/in XD 310 lbf/in
 - 2. 50 mm/min. @ 23 +/- 2 deg. C MD 54.25 kN/m XD 54.25 kN/m
 - b. Tear Strength, ASTM D 5147
 - 1. 2 in/min. @ 73.4 +/- 3.6 deg. F MD 500 lbf XD 500 lbf
 - 2. 50 mm/min. @ 23 +/- 2 deg. C MD 2224 N XD 2224 N
 - c. Elongation at Maximum Tensile, ASTM D 5147
 - 1. 2 in/min. @ 73.4 +/- 3.6 deg. F MD 8% XD 8%
 - 2. 50 mm/min. @ 23 +/- 2 deg. C MD 8% XD 8%
 - d. Low Temperature Flexibility, ASTM D 5147, Passes -30 deg. F (-34 deg. C)
- G. Primer:
 - 1. Acrylic Primer:
 - a. Garla-Block: Water-Based Acrylic Primer.
 - 1. Solids by weight 21%
 - 2. Application Temperature 50-95 degrees
- H. Coating:
 - 1. White Elastomeric Roof Coating:
 - a. Pyramic Plus Lo Acrylic Roof Coating: White, Water-Based, Acrylic-Urethane, Non Toxic, Fire Retardant Roof Coating.
 - 1. Non Volatile 63%
 - 2. Density 11.7lb. / gal
 - 3. VOC >50 gal./l
 - 4. Reflectance 0.83
 - 5. Emittance 0.90
 - 6. SRI 104

3.12. 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 075500.
- 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. See Specification Section 016400 OFCI

END OF SECTION

SECTION 07 56 40
FLUID APPLIED ROOFING RESTORATION

1.GENERAL

1.1. SECTION INCLUDES

- A. Includes all labor, materials, and equipment to install an acrylic restoration coating over the properly prepared substrate.
- B. See section 011100 Summary of Work for a detailed scope of work.

1.2. RELATED SECTIONS

- A. Section 01110 – Summary of Work
- B. Section 06100 - Rough Carpentry
- C. Section 07620 - Sheet Metal Flashing and Trim

1.3. REFERENCES

- A. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.
- B. ASTM C 1250 - Standard Test Method for Nonvolatile Content of Cold Liquid-Applied Elastomeric Waterproofing Membranes.
- C. ASTM D 1863 - Standard Specification for Mineral Aggregate Used on Built-Up Roofs.
- D. ASTM D 4479 - Standard Specification for Asphalt Roof Coatings - Asbestos-Free.
- E. ASTM E 1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces
- F. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- G. SRI - Solar Reflectance Index calculated according to ASTM E 1980.
- H. South Coast AQMD Standards.
- I. SMACNA Architectural Sheet Metal Manual.
- J. ANSI/SPRI ES-1 - Testing and Certification Listing of Shop Fabricated Edge Metal
- K. National Roofing Contractors Association (NRCA) - Roofing and Waterproofing Manual.

1.4. SYSTEM DESCRIPTION

- A. Mineral Surface Roof Restoration: Renovation work includes:
 - 1. Surface preparation: Pressure wash the existing surface remove dirt, and debris.
 - 2. Fascia/Gravel Stop Edges: Cut back edges, prime, three course with mastic & mesh, install white roofing granules into fresh mastic.
 - 3. Parapets and Vertical Surfaces: Repair as needed, prime, three course with mastic & mesh all laps, corners & transitions. Install white roofing granules into fresh mastic.
 - 4. Metal Flashings: Repair/Replace metal flashings, pitch pockets, etc.
 - 5. Roof Repairs: Repair blisters, stressed or cracked membrane. Cut back, patch with

- primer/mastic/membrane.
- 6. Primer: Prime entire roof surface.
- 7. Coating: Install white acrylic coating over the entire roof surface.

1.5. SUBMITTALS

- A. Submit under provisions of Section 013000.
- 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 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. 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. Provide written certification from the roofing system manufacturer certifying the applicator is currently authorized to install the specified roof system and ability to provide the specified warranty.
- H. Sample Warranty: Provide an unexecuted copy of the warranty specified for this project clearly stating the terms required of the owner, contractor, and manufacturer.
- I. 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.

1.6. QUALITY ASSURANCE

- A. Perform Work in accordance with 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.

1.7. 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.

1.8. 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. 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.

1.9. 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.
- B. Weather Condition Limitations: Do not apply roofing system during inclement weather or when a 40 percent chance of precipitation or greater is expected.
- 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 is 40 degrees F (4 degrees C) and rising for solvent based materials and 50 degrees F (10 degrees C) and rising for water based.

1.10. WARRANTY

- A. Upon completion of the work, provide the Manufacturer's Warranty.
 - 1. Warranty Period:
 - a. 5 years from date of acceptance.
- B. 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. 3 years from date of acceptance.

2.PRODUCTS

2.1. MANUFACTURERS

- A. Acceptable Manufacturer: Garland Company, Inc. (The), which is located at: 3800 E. 91st St.; Cleveland, OH 44105; Local Representative: Richard Jones: (559) 647-1196
rjones@garlandind.com Web Site: www.garlandco.com
- B. Requests for substitutions will not be considered for this project.

2.2. ROOF RESTORATION SYSTEM MINERAL SURFACE ROOFS

- A. Asphalt Primer: Install primer at a rate of ½ gallon per 100 square feet at all areas to be three coursed.
 - 1. Garla Prime VOC
- B. Acrylic Primer: Install at a rate of 1/2 gallon per 100 square feet to all roof areas.
- C. Coating Base Coat: Install at a rate of 1.5 gallons per 100 square feet.
 - 1. Coating: Pyramic Plus Lo
- D. Coating Top Coat. Install at a rate of 1.5 gallons per 100 square feet.
 - 1. Coating: Pyramic Plus Lo
- E. Mastic: Install three course treatment at all penetrations and wall flashing laps.
 - 1. Flashing Bond Mastic
- F. Mesh: Install three course treatment at all penetrations and wall flashing laps.
 - 1. Garmesh 6"

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: 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. Pitch Pocket Sealer - Seal-Tite: Two part, 100% solids, self-leveling, polyurethane sealant for filling pitch pans as recommended and furnished by the membrane manufacturer.
 - 1. Durometer, ASTM D 2240: 40-50 Shore
 - 2. Elongation, ASTM D 412: 250%
 - 3. Tensile Strength, ASTM D 412: 200 @ 100 mil

2.4. EDGE TREATMENT AND ROOF PENETRATION FLASHINGS

- A. Flashing Boot - Rubbertite Flashing Boot: Neoprene pipe boot for sealing single or multiple pipe penetrations adhered in approved adhesives as recommended and furnished by the membrane manufacturer.
- B. 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.
- C. Pitch pans, Rain Collar 24 gauge stainless or 20oz (567gram) copper. All joints should be welded/soldered watertight. See details for design.
- D. Drain Flashings should be 4lb (1.8kg) sheet lead formed and rolled.
- E. Plumbing stacks should be 4lb (1.8kg) sheet lead formed and rolled.

- F. Liquid Flashing - Tuff-Flash: An asphaltic-polyurethane, low odor, liquid flashing material designed for specialized details unable to be waterproofed with typical modified membrane flashings.
 - 1. Tensile Strength, ASTM D 412: 400 psi
 - 2. Elongation, ASTM D 412: 300%
 - 3. Density @77 degrees F 8.5 lb/gal typical
- G. Fabricated Flashings: 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.
- H. 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.

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:
 - 1. Repair existing roof flashings at curbs and parapet walls
 - 2. Remove all wet, deteriorated, blistered or delaminated roofing membrane or insulation and fill in any low spots 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. 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; replace saturated insulation board, replace loose or brittle membrane or membrane flashings. Verify that exiting 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 roof membrane is not recommended.
- 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. Clean the entire roof surface by removing all dirt, algae, paint, oil, talc, rust or foreign

substance. Use a 10 percent solution of TSP (tri-sodium phosphate), Simple Green and warm water. Scrub heavily soiled areas with a brush. Rinse with fresh water to remove all TSP solution. 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 (cracks, blisters, tears) must be repaired with similar materials.

3.3. INSTALLATION

- A. General Installation Requirements:
 - 1. Install in accordance with manufacturer's instructions. Apply to minimum coating thickness required by the manufacturer.
 - 2. Cooperate with manufacturer, inspection and test agencies engaged or required to perform services in connection with installing the roof system.
 - 3. Insurance/Code Compliance: Where required by code, install and test the roofing system to comply with governing regulation and specified insurance requirements.
 - 4. Protect work from spillage of roofing materials and prevent materials from entering or clogging drains and conductors. Replace or restore work damaged by installation of the roofing system.
 - 5. All primers must be top coated within 24 hours of application. Re-prime if more time passes after priming.
 - 6. Keep roofing materials dry during application. Phased construction can be allowed as long as no, more than 7 days pass between coats excluding primers.
 - 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 Surface Roof Restoration: Renovation work includes:
 - 1. Surface preparation: Pressure wash the existing surface remove dirt, and debris.
 - 2. Fascia/Gravel Stop Edges: Cut back edges 2", prime with Garla-Prime VOC allow to dry, three course with Flashing Bond mastic & Garmesh, install white roofing granules into fresh mastic.
 - 3. Parapets and Vertical Surfaces: Repair as needed, prime with Garla Prime VOC, three course with Flashing Bond mastic & Garmesh all laps, corners & transitions. Install white roofing granules into fresh mastic.
 - 4. Metal Flashings: Repair/Replace metal flashings, pitch pockets, etc.
 - 5. Roof Repairs: Repair blisters, stressed or cracked membrane. Cut back, patch with Garla Prime VOC primer/ Flashing Bond mastic/Stressply membrane.
 - 6. Primer: Prime entire roof surface with Garla-Block primer.
 - 7. Coating: Install Pyramic white acrylic coating over the entire roof surface at a rate of 1.5 gallons per 100 sq ft base coat and 1.5 gallons per 100 sq ft top coat.
 - a. Apply Pyramic Acrylic Coating in a uniform manner.
 - b. Use special attention to coating flashings and other critical areas to build adequate membrane thickness.
 - c. Use multiple coats on verticals to prevent sagging.
 - d. Apply at 3.0 gallons per 100 sq ft. over the entire roof surface in two coats.

3.4. INSTALLATION EDGE TREATMENT AND ROOF PENETRATION FLASHING

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

- 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. Metal Edge:
1. Inspect the nailers to assure proper attachment and configuration.
 2. 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.
 3. Install continuous cleat and fasten at 6 inches (152 mm) o.c.
 4. 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.
 5. Prime metal edge at a rate of 100 square feet per gallon and allow to dry.
 6. 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.
 7. 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.
- D. Coping Cap:
1. 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.
 2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
 3. 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.
 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 seams and allow to cure and install white roofing granules into the fresh mastic.
 5. Install coping cap per manufacturer's recommendations.
- E. Surface Mounted Counterflashing:
1. 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.
 2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
 3. Install base flashing ply covering wall 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 install white roofing granules into the fresh mastic.
 5. 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.
 6. Secure counterflashing set on butyl tape above flashing at 8 inches (203 mm) o.c. and caulk top of counterflashing.
- F. 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 install white roofing granules into

- the fresh mastic.
 - 5. Install pre-manufactured counterflashing with fasteners and neoprene washers or per manufacturer's recommendations.
 - 6. Set equipment on neoprene pad and fasten as required by equipment manufacturer.
- G. Roof Drain Alternate:
 - 1. Plug drain to prevent debris from entering plumbing.
 - 2. Taper insulation to drain minimum of 24 inches (609 mm) from center of drain.
 - 3. Install two base flashing plies (40 inch square minimum) in bitumen.
 - 4. Set lead/copper flashing (30 inch square minimum) in 1/4 inch (6 mm) 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. Run roof system plies over drain. Cut out plies inside drain bowl.
 - 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.
- H. 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.

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 asphalt 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 a minimum of two (2) days per week.
- B. Perform field inspection as required under provisions of manufacturers requirements.

- 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 produce an installation that is free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- E. 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. PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

3.10. SCHEDULES

- A. Coating:
 - 1. Pyramic: White Elastomeric Roof Coating
 - a. Pyramic Plus Lo Acrylic Roof Coating: White, Non Toxic, Fire Retardant Roof Coating.
 - 1. Non Volatile 63%
 - 2. Density 11.7lb. / gal
 - 3. VOC <50 gal./l
 - 4. Reflectance 0.83
 - 5. Emittance 0.90
 - 6. SRI 104

3.11. OWNER SUPPLIED MATERIALS

- A. The district will only supply the quantity listed in the owner supplied materials section 016400. 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 district 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 break flashing metal from the District 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 075640.
 - E. Freight charges of owner supplied materials will be the responsibility of the owner. Contractor must unload delivery of materials, properly protect, cover and store at job site.
 - F. 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 075640.
- B. Materials specifically provided by the Owner;
- 1. See specification section 01 64 00 Owners Supplied Materials

END OF SECTION

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

1. GENERAL

1. RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

2. SUMMARY

- A. Section Includes:
 - 1. Manufactured through-wall flashing with counter flashing.
 - 2. Formed low-slope roof sheet metal fabrications.
 - 3. Formed wall, coping, and soffit sheet metal fabrications.
 - 4. Formed equipment support flashing
 - 5. Surface mounted counter flashing
 - 6. Manufactured reglets and counter flashing
 - 7. Formed gutter and downspouts
- B. Related Requirements:
 - 1. Division 06 "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Division 07 "Membrane Roofing" for materials and installation of sheet metal flashing and trim integral with roofing.
 - 3. Division 07 "Metal Roofing" for materials and installation of sheet metal flashing and trim integral with roofing.
 - 4. Division 07 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.

3. COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leak proof, secure, and noncorrosive installation.

4. PREINSTALLATION MEETINGS

- A. Pre Installation Conference: Conduct conference at Project site.
 - 1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.

3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

5. SUBMITTALS

- A. Product Data: For each type of product.
 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: For sheet metal flashing and trim.
 1. Include plans, elevations, sections, and attachment details.
 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
 4. Include details for forming, including profiles, shapes, seams, and dimensions.
 5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 6. Include details of termination points and assemblies.
 7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
 8. Include details of roof-penetration flashing.
 9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counter flashings as applicable.
 10. Include details of special conditions.
 11. Include details of connections to adjoining work.
 12. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches
- C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.
- D. Samples for Verification: For each type of exposed finish.
 1. Sheet Metal Flashing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
 2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches (300 mm) long and in required profile. Include fasteners and other exposed accessories.

6. INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Certificates: For each type of coping and roof edge flashing that is SPRI ES-1 tested.
- C. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- D. Sample Warranty: For special warranty.

7. CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

8. QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
 - 1. For copings and roof edge flashings that are SPRI ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.

9. DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

10. WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: **20** years from date of Substantial Completion.

2.PRODUCTS

1. PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- D. SPRI Wind Design Standard: Manufacture and install roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
 - 1. Design Pressure: As indicated on Drawings.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2. SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 (Z275) coating designation; prepainted by coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Surface: Smooth, flat and with manufacturer's standard clear acrylic coating on both sides.
 - 2. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 3. Color: Match Architect's sample
 - 4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

3. UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 45 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
 - 1. The Garland Company Inc., 3800 E. 91st Street Cleveland OH 44105; R-Mer Seal self-adhering underlayment.
 - 2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.

- 3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.
- B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

4. MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 - 2. Fasteners for Zinc-Tin Alloy-Coated Stainless-Steel Sheet: Series 300 stainless steel.
- C. Solder:
 - 1. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead with maximum lead content of 0.2 percent.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
- H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

5. FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 2. Obtain field measurements for accurate fit before shop fabrication.
 - 3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 - 4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
 - 2. Use lapped expansion joints only where indicated on Drawings.
- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.
- G. Do not use graphite pencils to mark metal surfaces.

6. ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than dimension indicated on Drawings. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.
 - 1. Gutter Profile: Style B according to cited sheet metal standard.
 - 2. Expansion Joints: Butt type with cover plate.
 - 3. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen at each downspout location.
 - 4. Gutters with Girth up to 15 Inches: Fabricate from the following materials:

- a. Galvanized Steel: 22 gauge thickness.
- B. Downspouts: Fabricate downspouts per plans and details or per size per CA plumbing code. Fabricate from the following materials unless otherwise shown on drawings.
 - 1. Galvanized Steel: 22 gauge thickness.
- C. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim, and built-in overflows. Fabricate from the following materials:
 - 1. Galvanized Steel: 22 gauge thickness.

7. WALL SHEET METAL FABRICATIONS

- A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12-foot long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch high, end dams. Fabricate from the following materials:
 - 1. Galvanized Steel: 22 gauge thickness.
- B. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend **4 inches** beyond wall openings. Form head and sill flashing with 2-inch high, end dams. Fabricate from the following materials:
 - 1. Galvanized Steel: 22 gauge thickness.
- C. Wall Expansion-Joint Cover: Fabricate from the following materials:
 - 1. Galvanized Steel: 22 gauge thickness.

8. MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Gutters: Fabricate from the following materials:
 - 1. Pre-Finished Steel: 22 gauge thickness.
- B. Downspouts: Fabricate from the following materials:
 - 1. Steel: Schedule 40
- C. Edge Metal / Gravel Stop: Fabricate from the following materials:
 - 1. Pre-Finished Steel: 24 gauge thickness.
- D. Cleat Flashing: Fabricate from the following materials:
 - 1. Galvanized Steel: 22 gauge thickness.
- E. Curb Covers / Pans: Fabricate from the following materials:
 - 1. Galvanized Steel: 22 gauge thickness.

- F. Scuppers: Fabricate from the following materials:
 - 1. Galvanized Steel: 22 gauge thickness.
- G. Equipment Support Flashing: Fabricate from the following materials:
 - 1. Galvanized Steel: 22 gauge thickness.
- H. Overhead-Piping Safety Pans: Fabricate from the following materials:
 - 1. Galvanized Steel: 22 gauge thickness.

3.EXECUTION

1. EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 - 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

2. UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.
- B. Apply slip sheet, wrinkle free, directly on substrate before installing sheet metal flashing and trim.

3. INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 5. Torch cutting of sheet metal flashing and trim is not permitted.
 6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of **10 feet** with no joints within 24 inches of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not solder metallic-coated steel sheet.
 2. Do not pre-tin zinc-tin alloy-coated stainless steel.
 3. Do not use torches for soldering.
 4. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

5. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
 6. Copper Soldering: Tin edges of uncoated sheets, using solder for copper.
 7. Copper-Clad Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for copper-clad stainless steel.
- H. Rivets: Rivet joints in zinc where necessary for strength.

4. ROOF-DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Hanging Gutters: Join sections with riveted and soldered joints or joints sealed with sealant as shown and specified on drawings or summary/scope of work. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.
1. Fasten gutter spacers to front and back of gutter.
 2. Anchor and loosely lock back edge of gutter to continuous cleat, eave or apron flashing.
 3. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches apart.
 4. Anchor gutter with gutter brackets and straps spaced not more than 24 inches apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.
 5. Anchor gutter with spikes and ferrules spaced not more than 24 inches apart.
 6. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.
 7. Install continuous gutter screens on gutters with noncorrosive fasteners, removable for cleaning gutters.
- C. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch below gutter discharge.
- D. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints minimum of 4 inches in direction of water flow.

5. ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.
- C. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.

1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24-inch centers.
 2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.
- D. Copings: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.
- E. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- F. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of interlocking folded seam or blind rivets and sealant, anchor and washer at 36-inch centers unless otherwise indicated.
- G. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

6. WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of through-wall flashing is specified in Section 042000 "Unit Masonry." Section 092400 "Cement Plastering."
- C. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

7. MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.
- B. Overhead-Piping Safety Pans: Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

8. ERECTION TOLERANCES

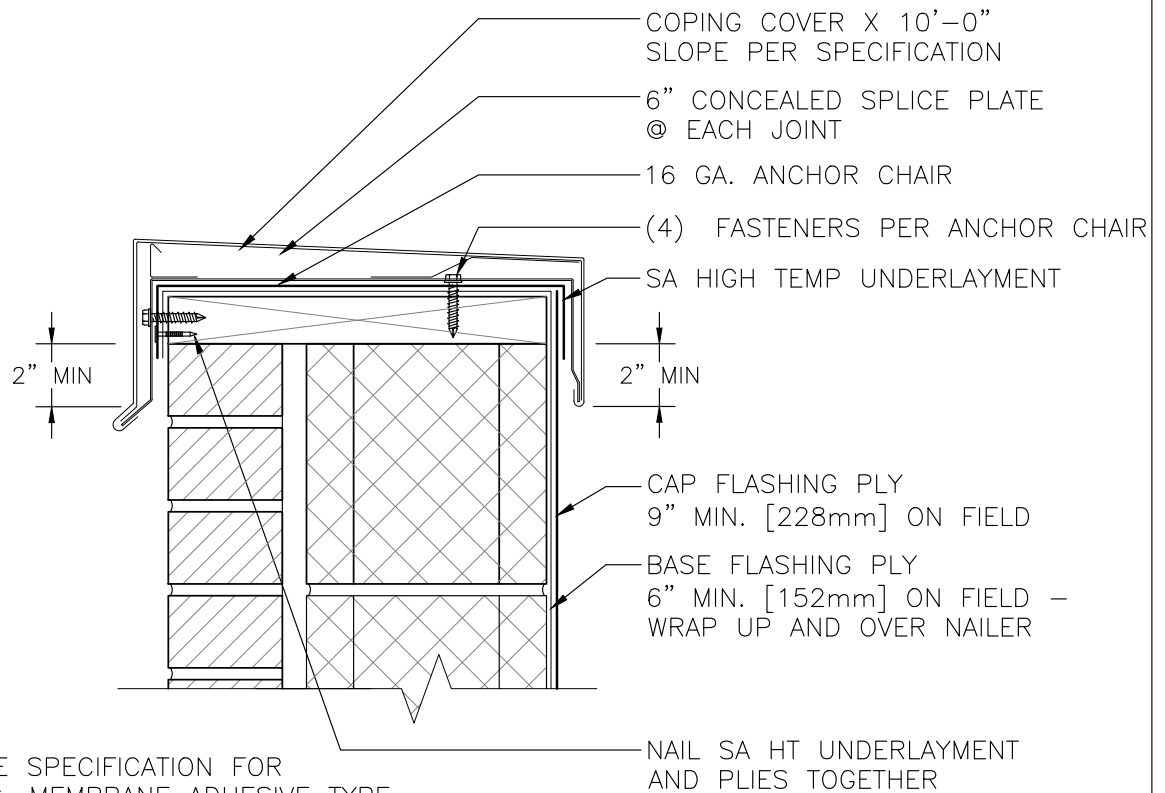
- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

9. CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00



NOTE:
REFERENCE SPECIFICATION FOR
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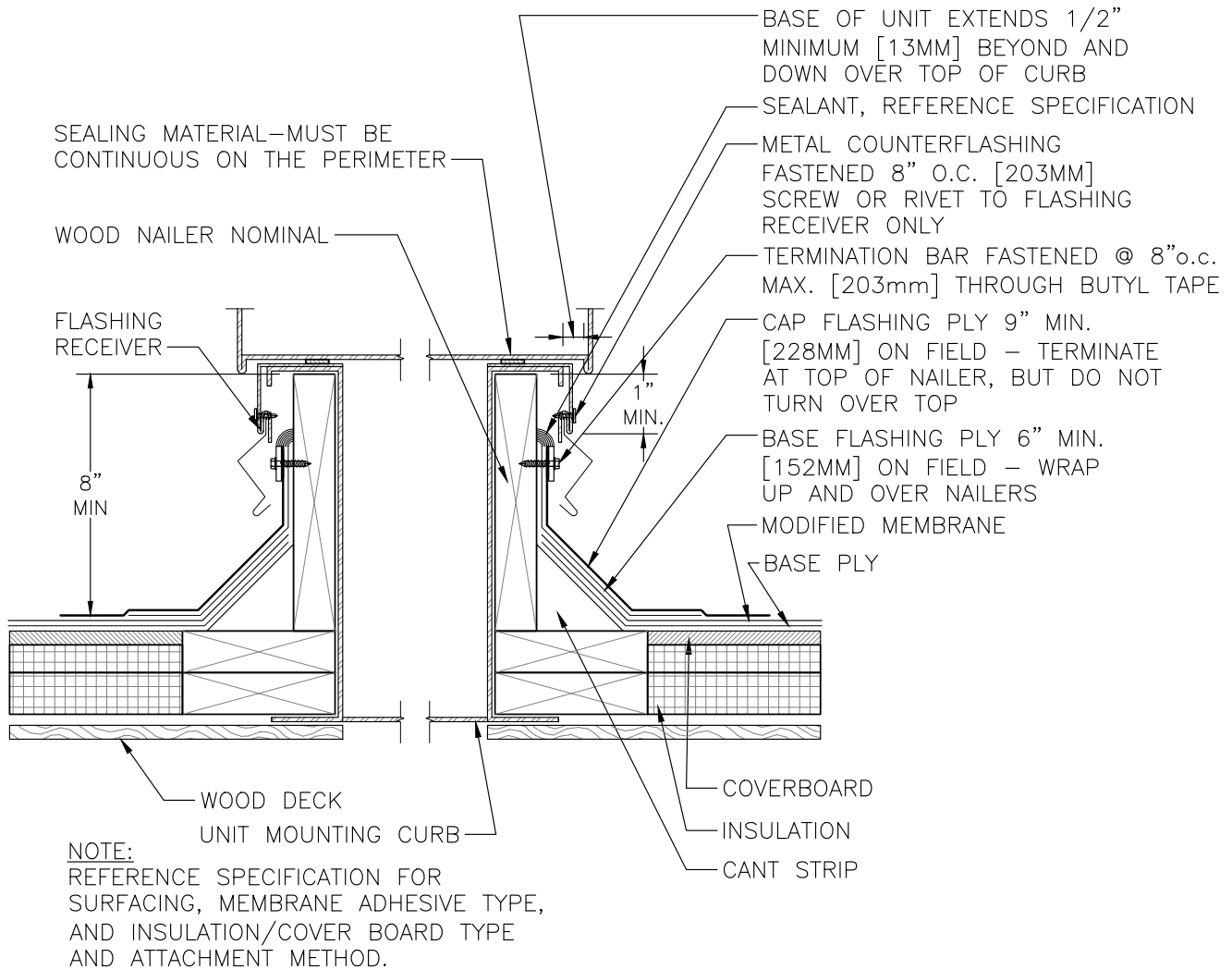
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COPING CAP AT MASONRY WALL



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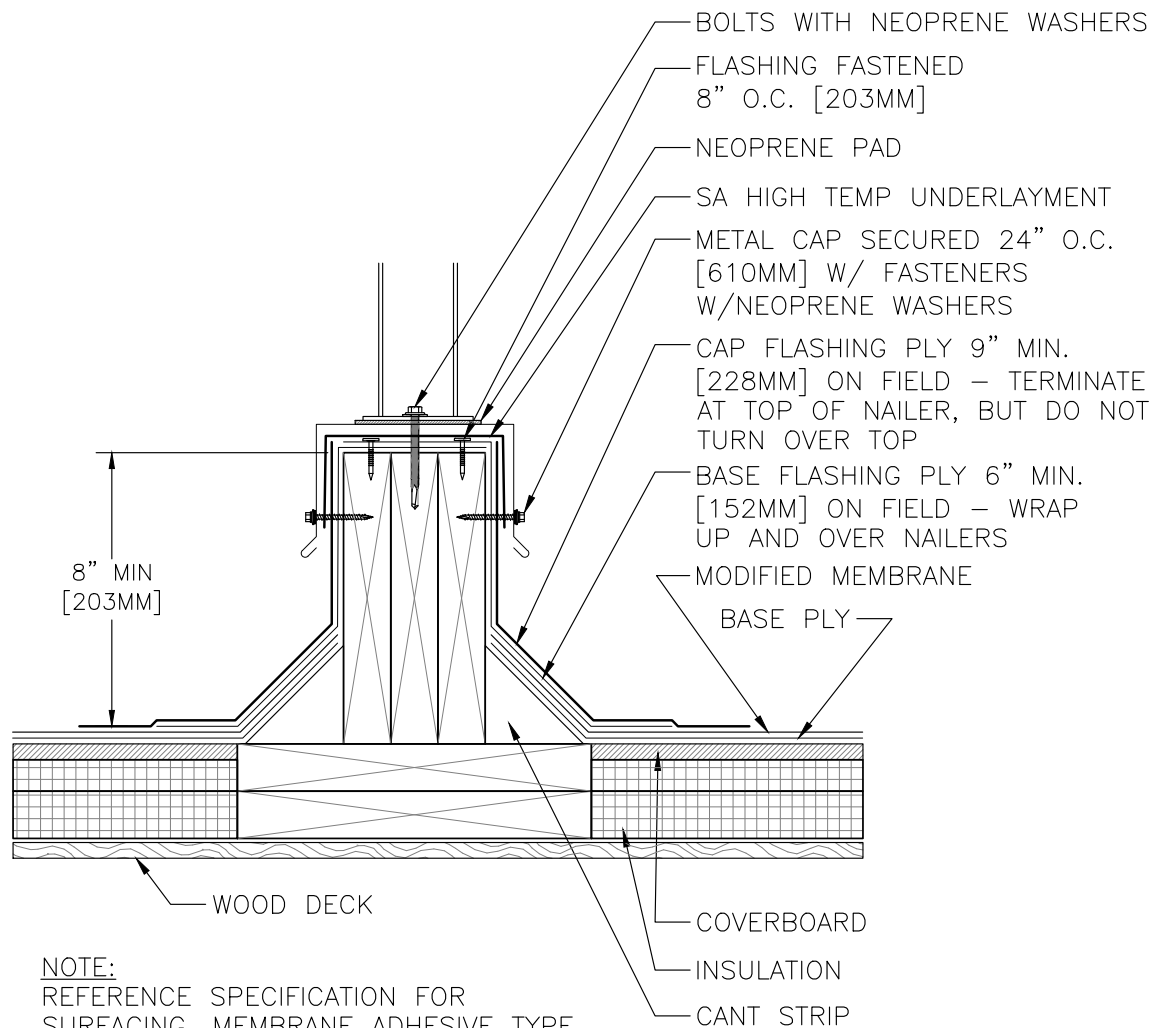
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CURB DETAIL / AIR HANDLING STATION



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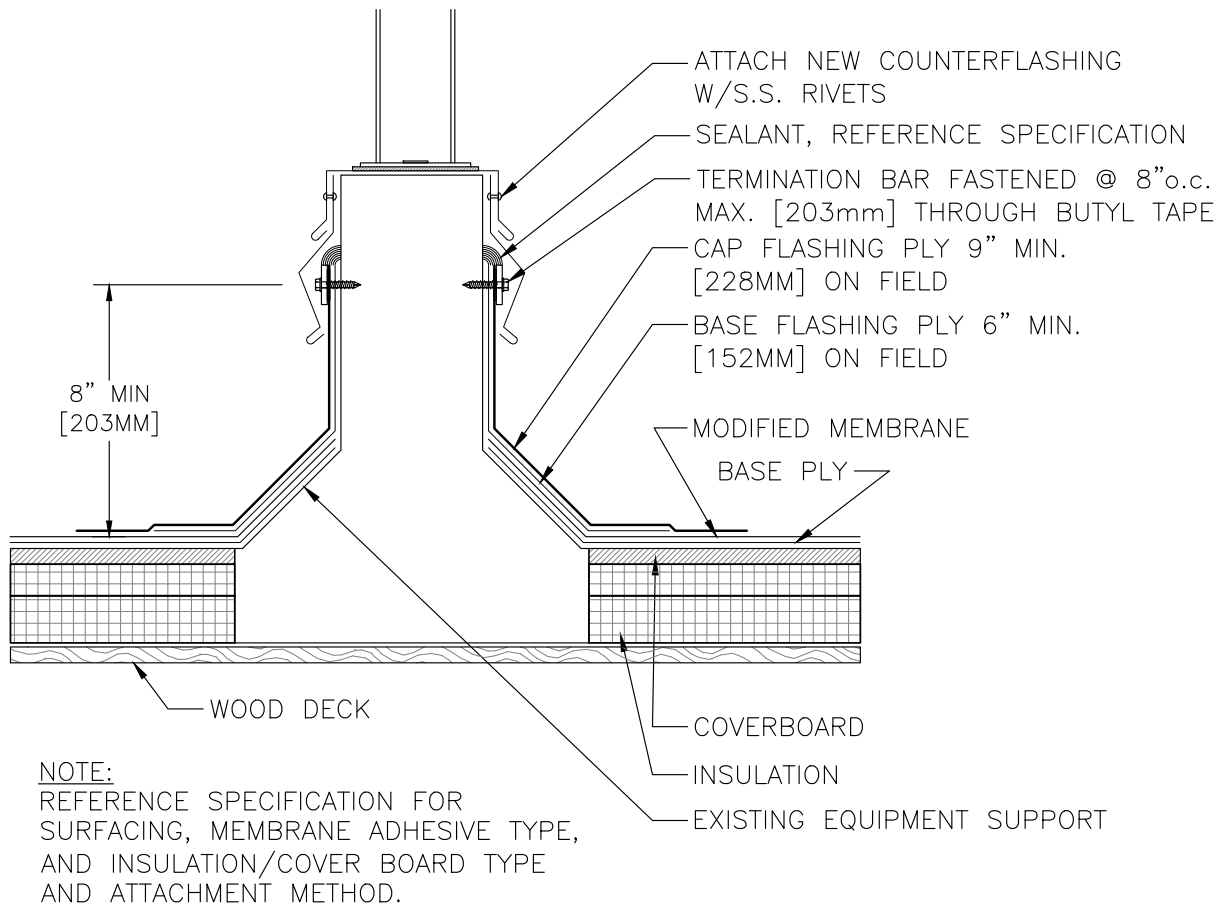
EQUIPMENT SUPPORT - NEW CONSTRUCTION



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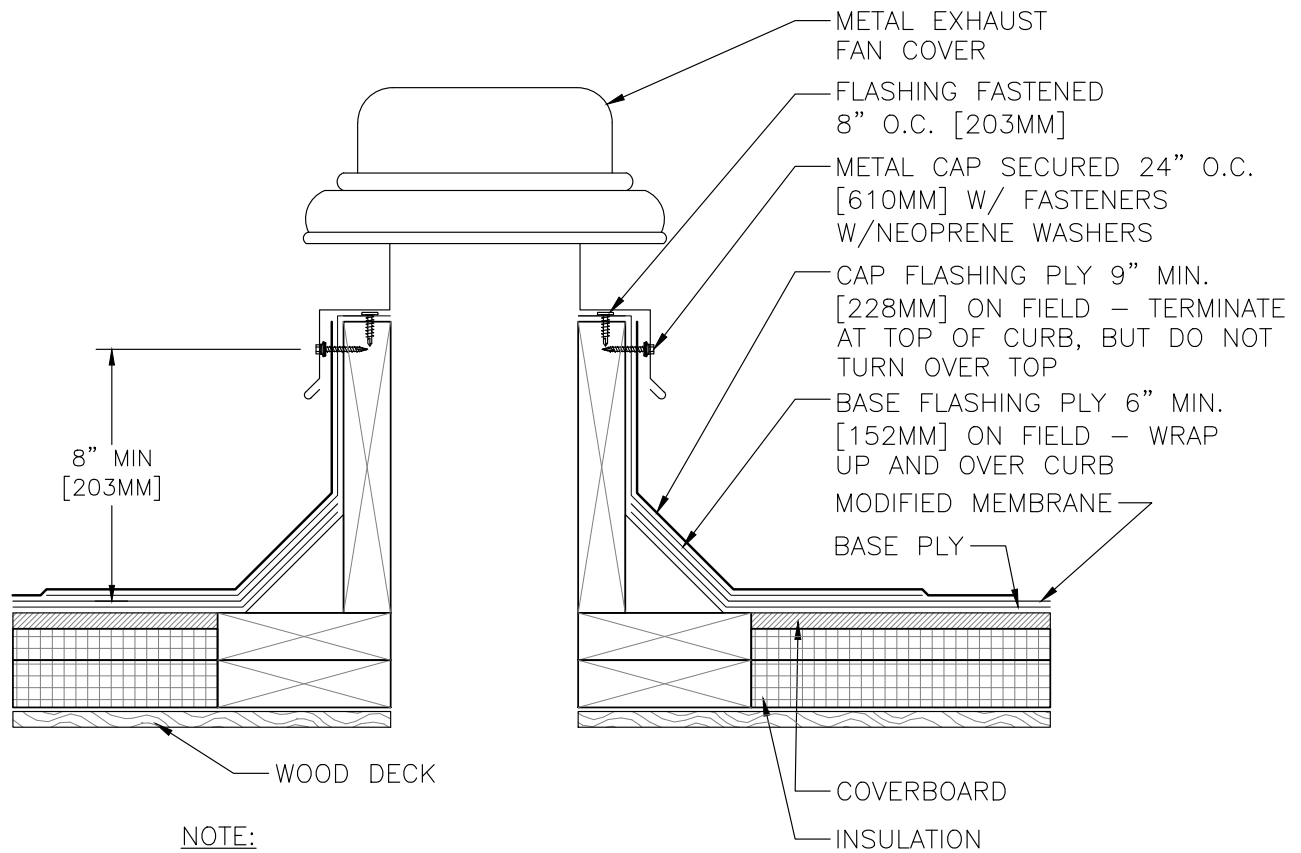
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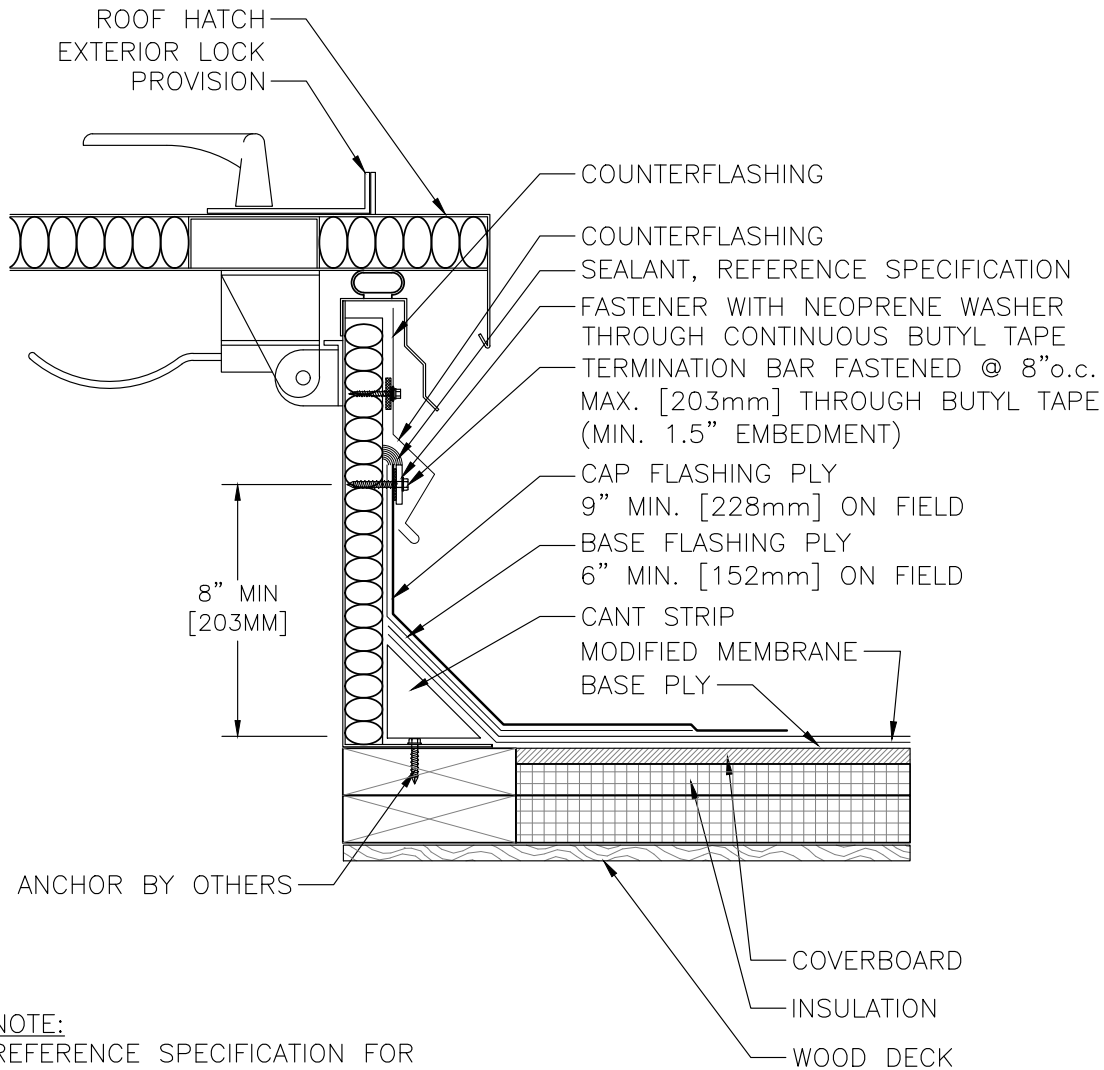
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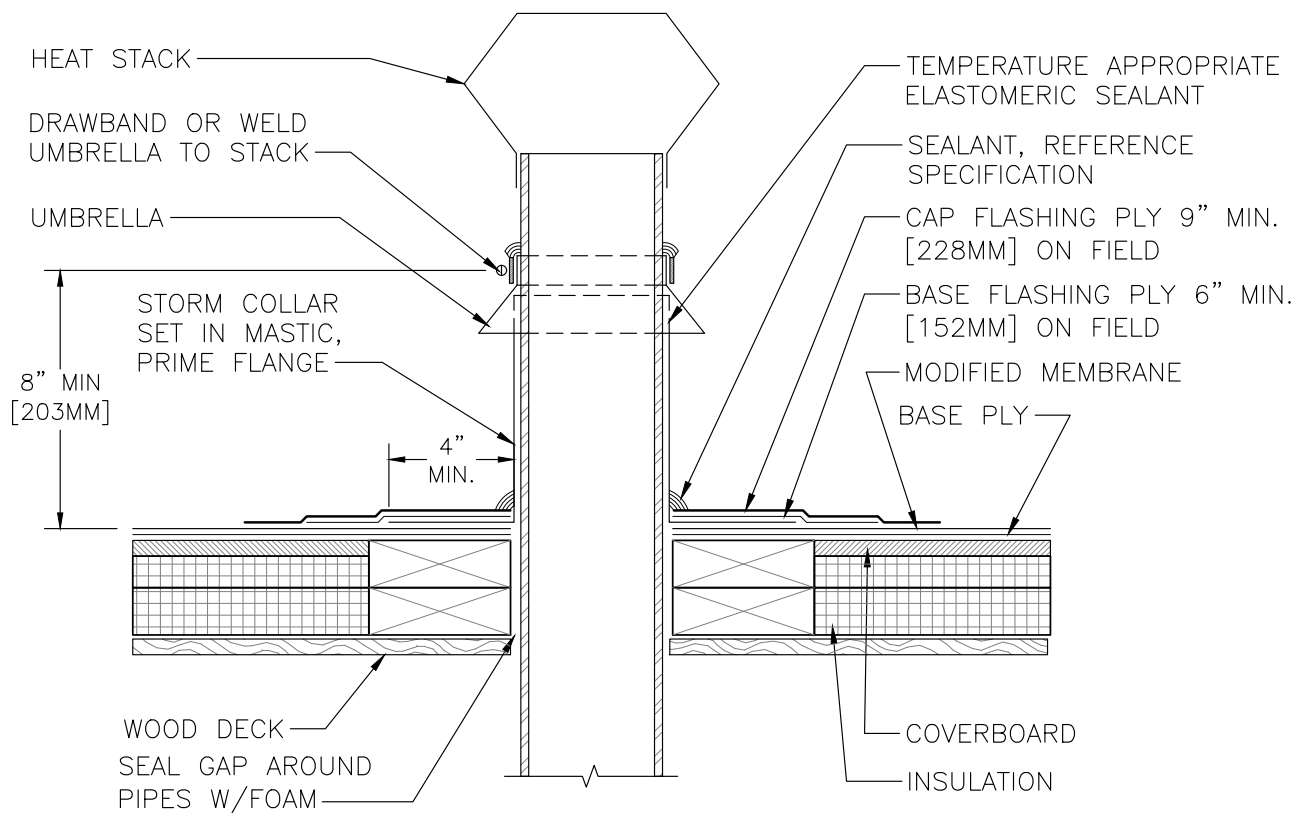
HATCH DETAIL



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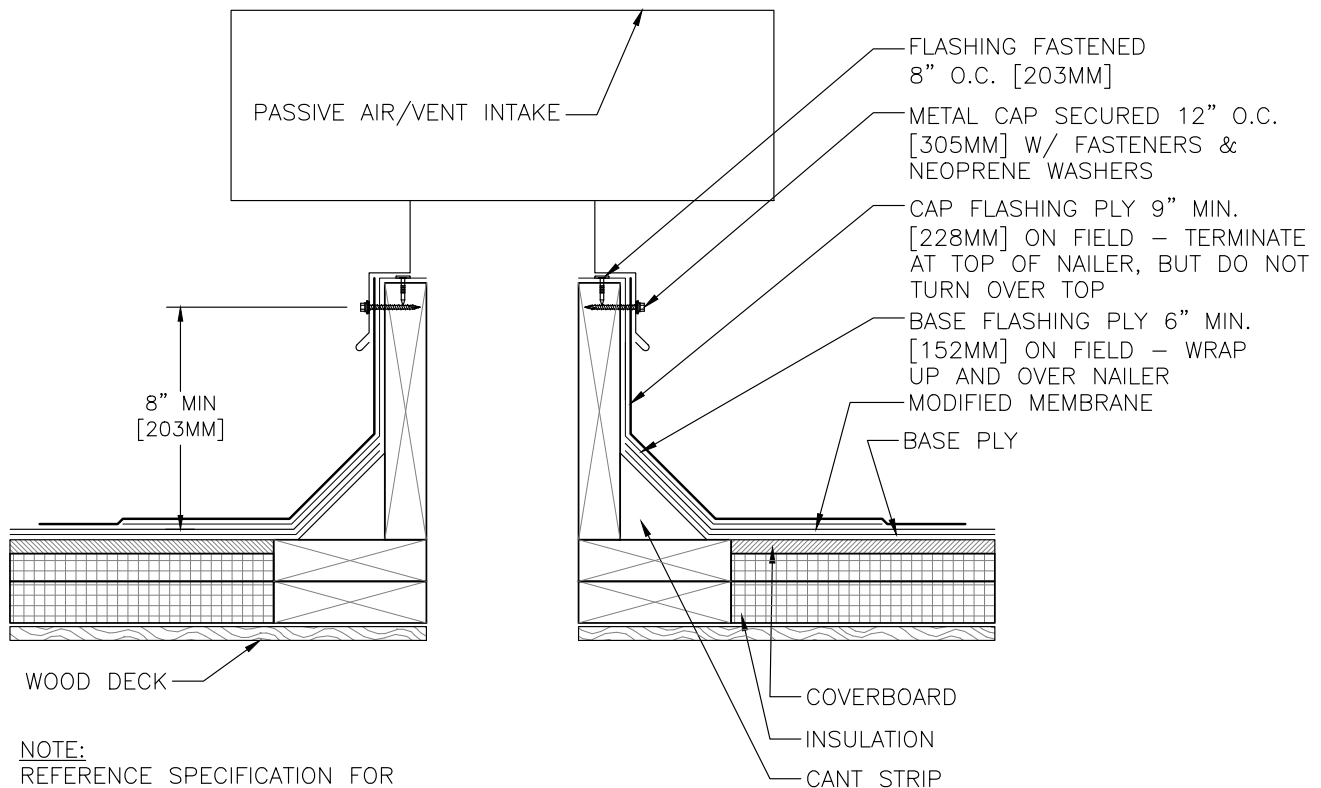
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HEAT STACK



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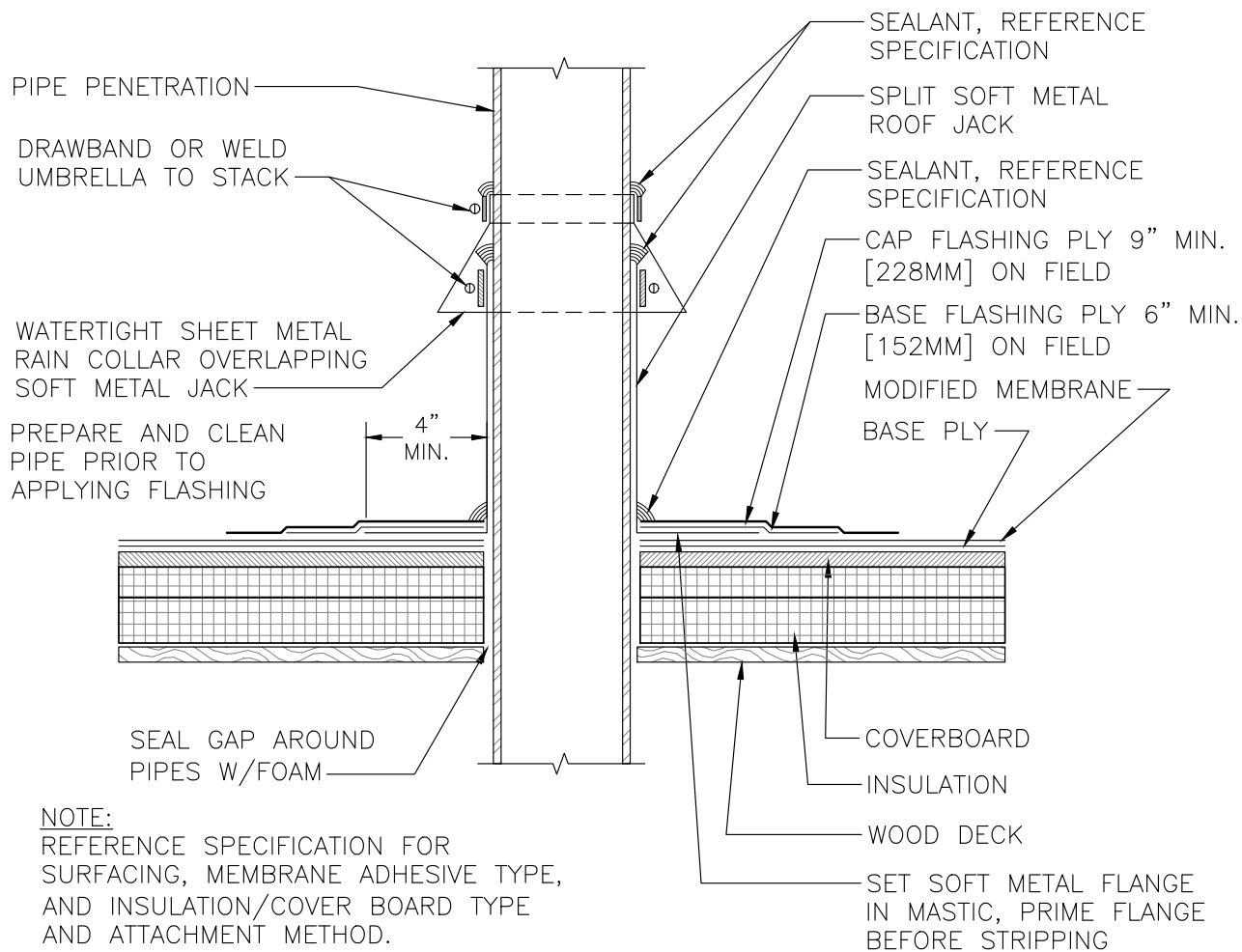
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PASSIVE AIR / VENT INTAKE



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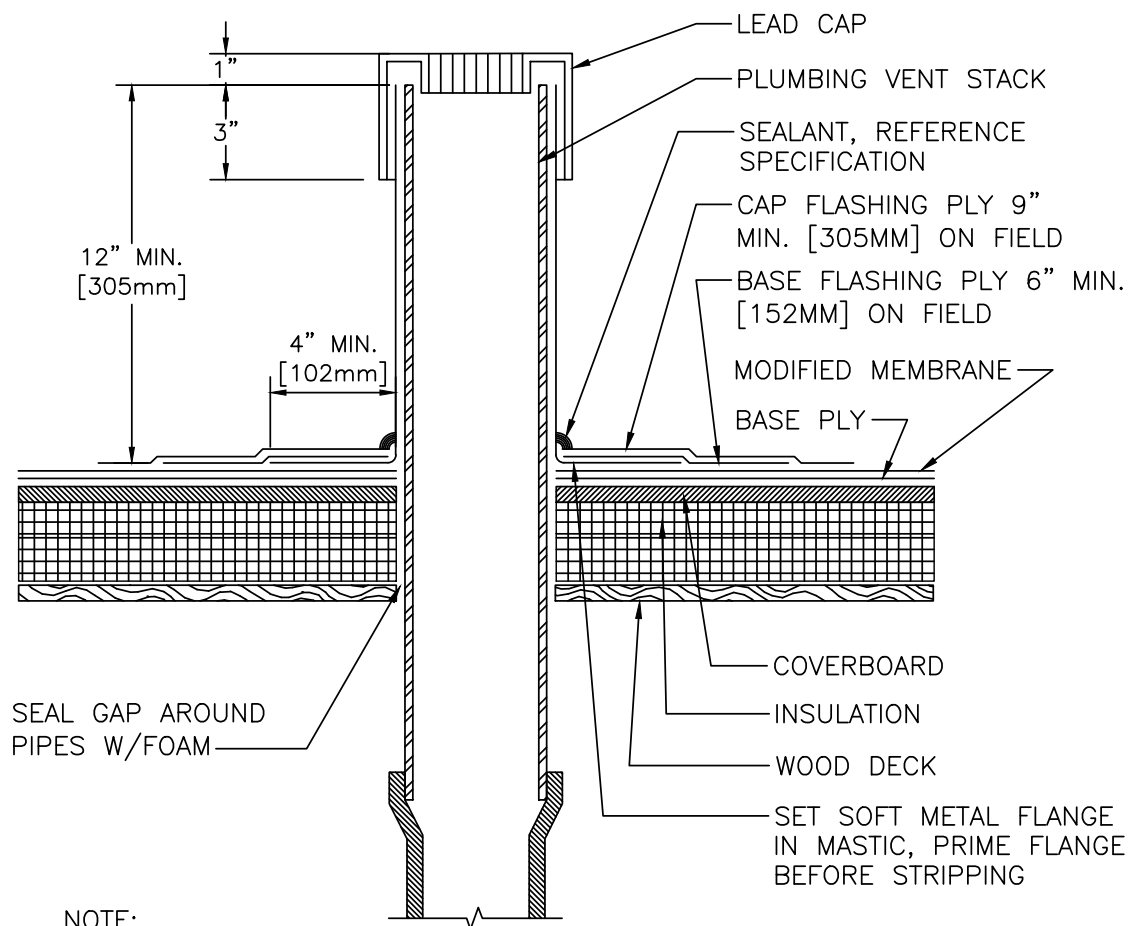
PIPE/TUBE PENETRATION - SPLIT JACK w/COLLAR



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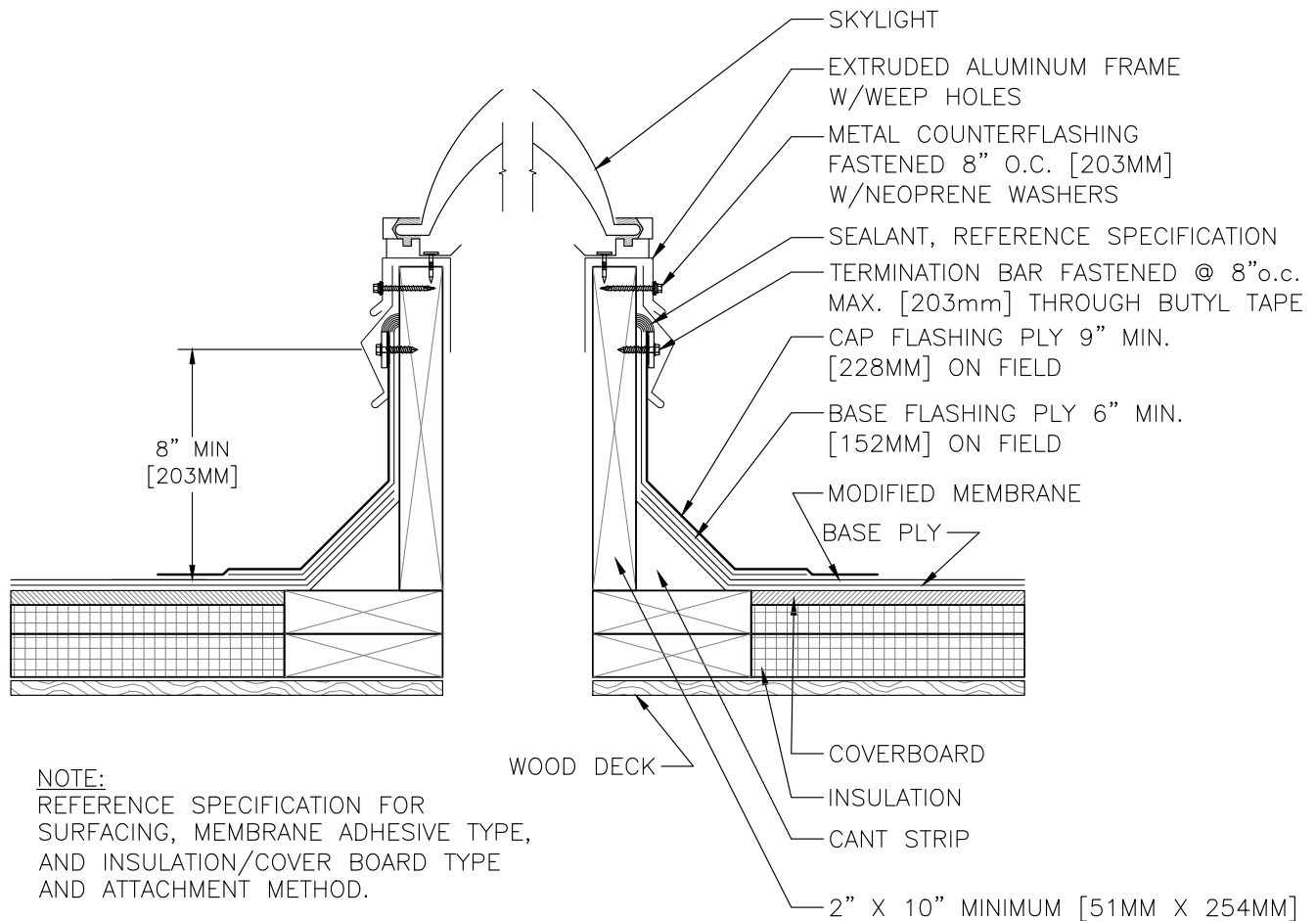
PLUMBING STACK



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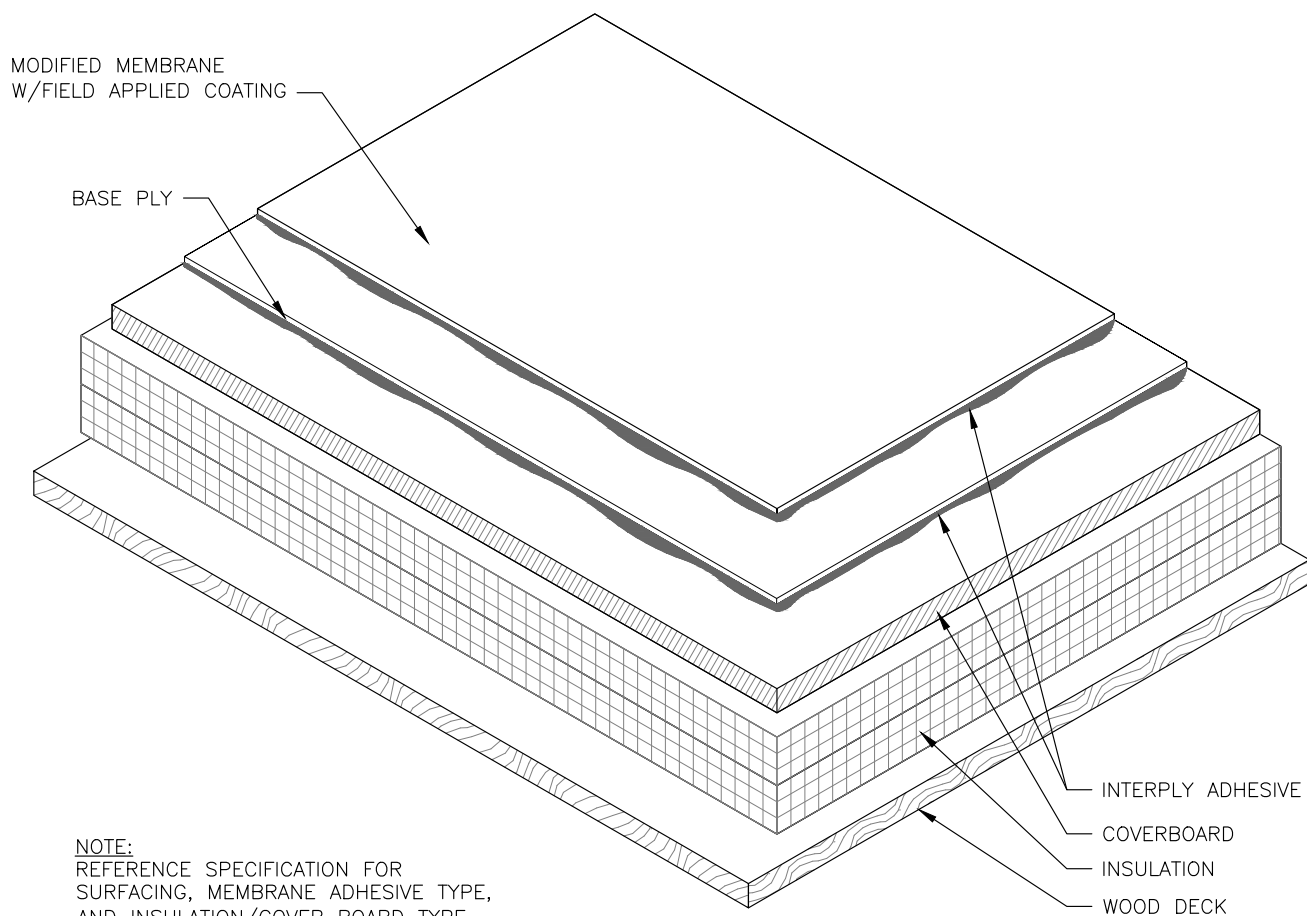
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AND ATTACHMENT METHOD.

DRAWINGS ON 8 $\frac{1}{2}$ "x11 TITLE BLOCKS ARE NOT TO SCALE.

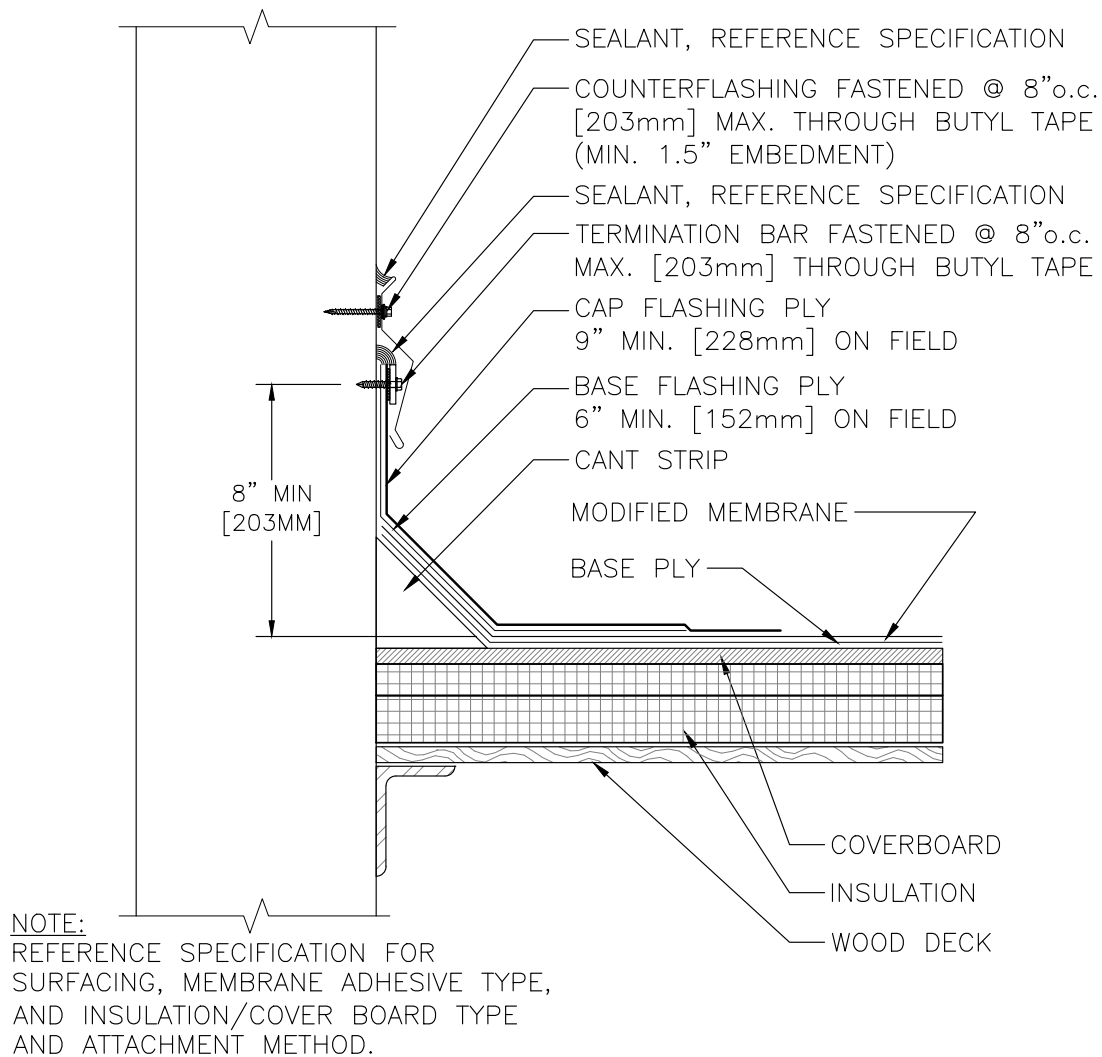
TYPICAL ROOF SYSTEM - COATED SURFACE



since 1895

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PROJECT:		
CUSTOMER:		
ARCHITECT:		
REPRESENTATIVE:		
DATE:	SHT:	OF



DRAWINGS ON 8 $\frac{1}{2}$ "x11 TITLE BLOCKS ARE NOT TO SCALE.

WALL FLASHING - SURFACE MOUNTED COUNTERFLASHING



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PROJECT:

CUSTOMER:

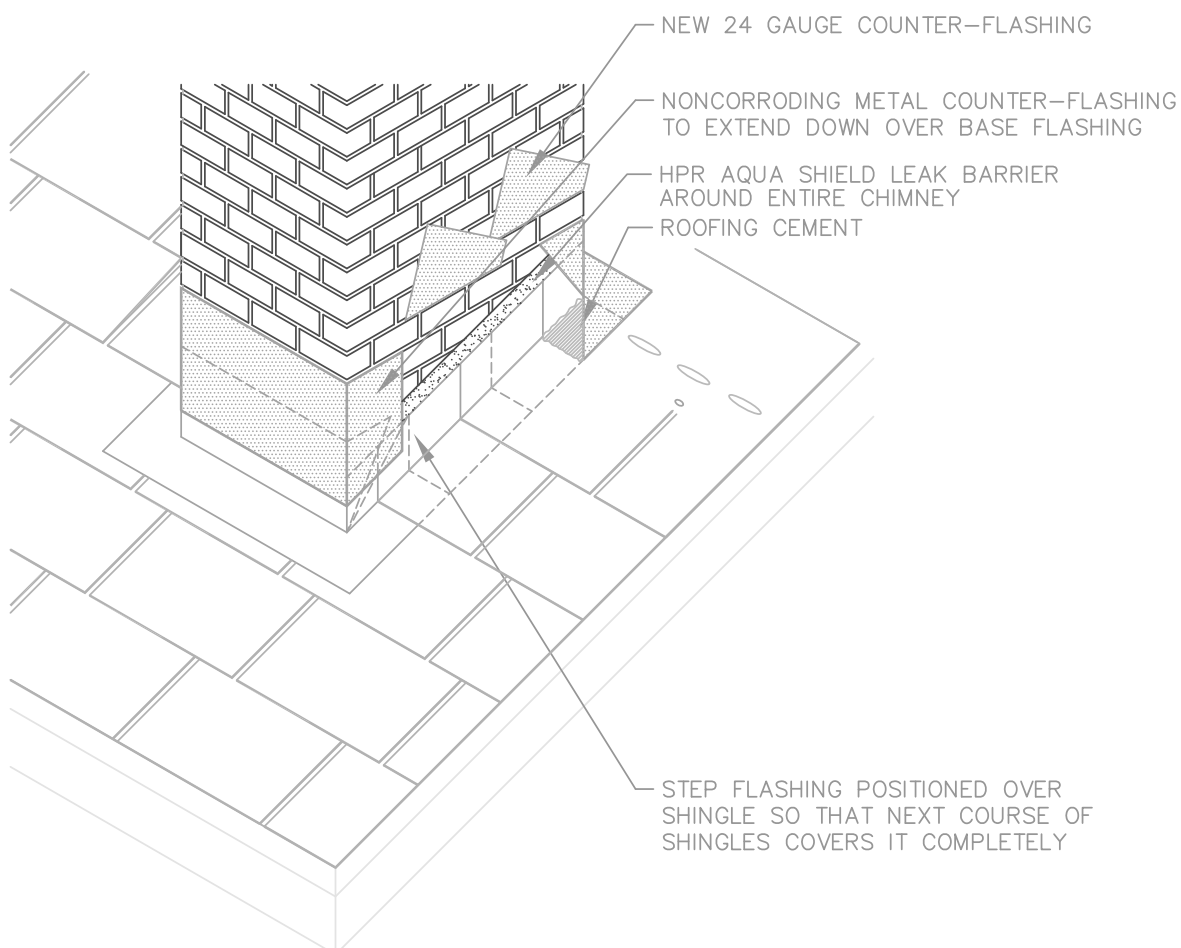
ARCHITECT:

REPRESENTATIVE:

DATE:

SHT:

OF



NOTES:

- 1.) INSTALL HPR AQUA SHIELD LEAK BARRIER AT LEAST 16" ON ALL SIDES.
- 2.) ALL METAL FLASHING TO BE A MINIMUM .024" (24 GAUGE) ALUMINUM, 16 OZ. COPPER OR 1.5 LB LEAD.
- 3.) EXTEND FLASHING A MINIMUM OF 4" BEYOND THE CHIMNEY ON THE FRONT AND SIDES AND A MINIMUM OF 16" BEHIND THE CHIMNEY.
- 4.) A CRICKET IS REQUIRED BEHIND ALL CHIMNEYS WIDER THAN 24 INCHES OR LOCATED ON ROOFS STEEPER THAN 6 INCHES PER FOOT.

CHIMNEY FLASHING



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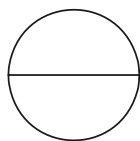
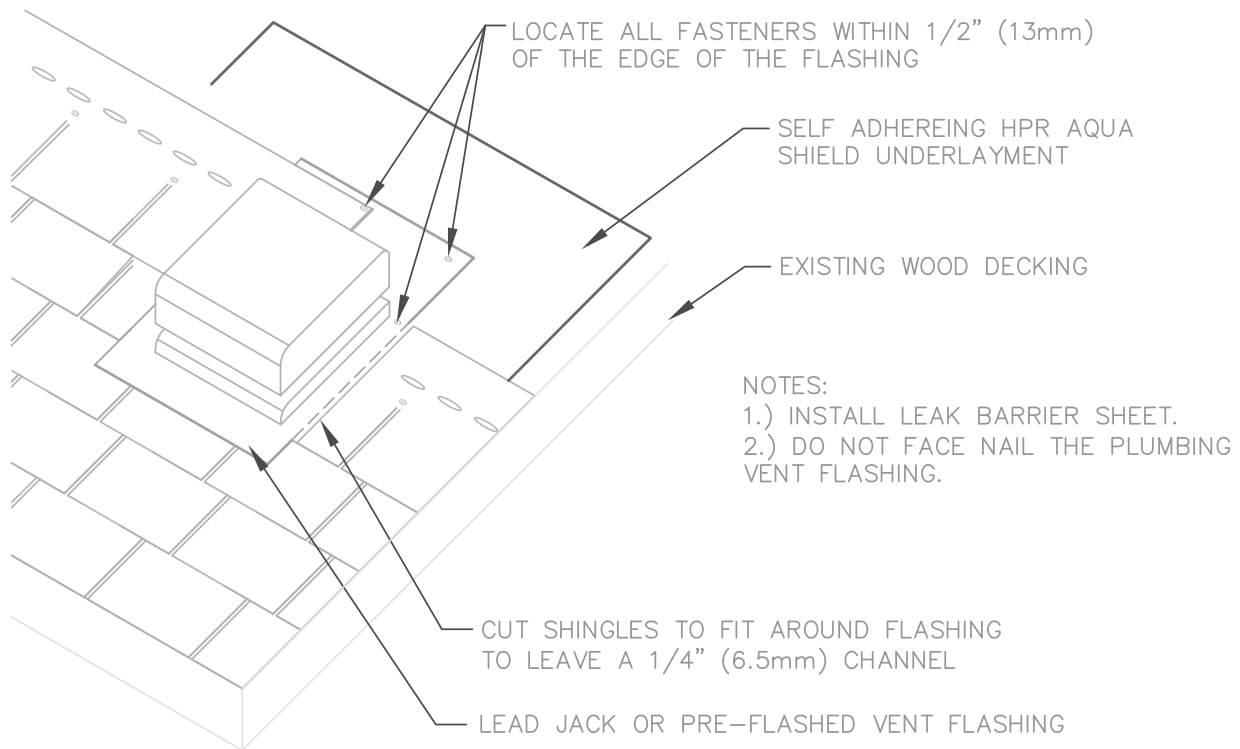
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DETAIL:

CHIMNEY FLASHING

FILENAME:

VENT FLASHING DETAIL



VENT FLASHING DETAIL

SCALE: N.T.S.



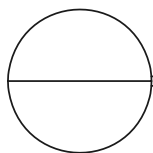
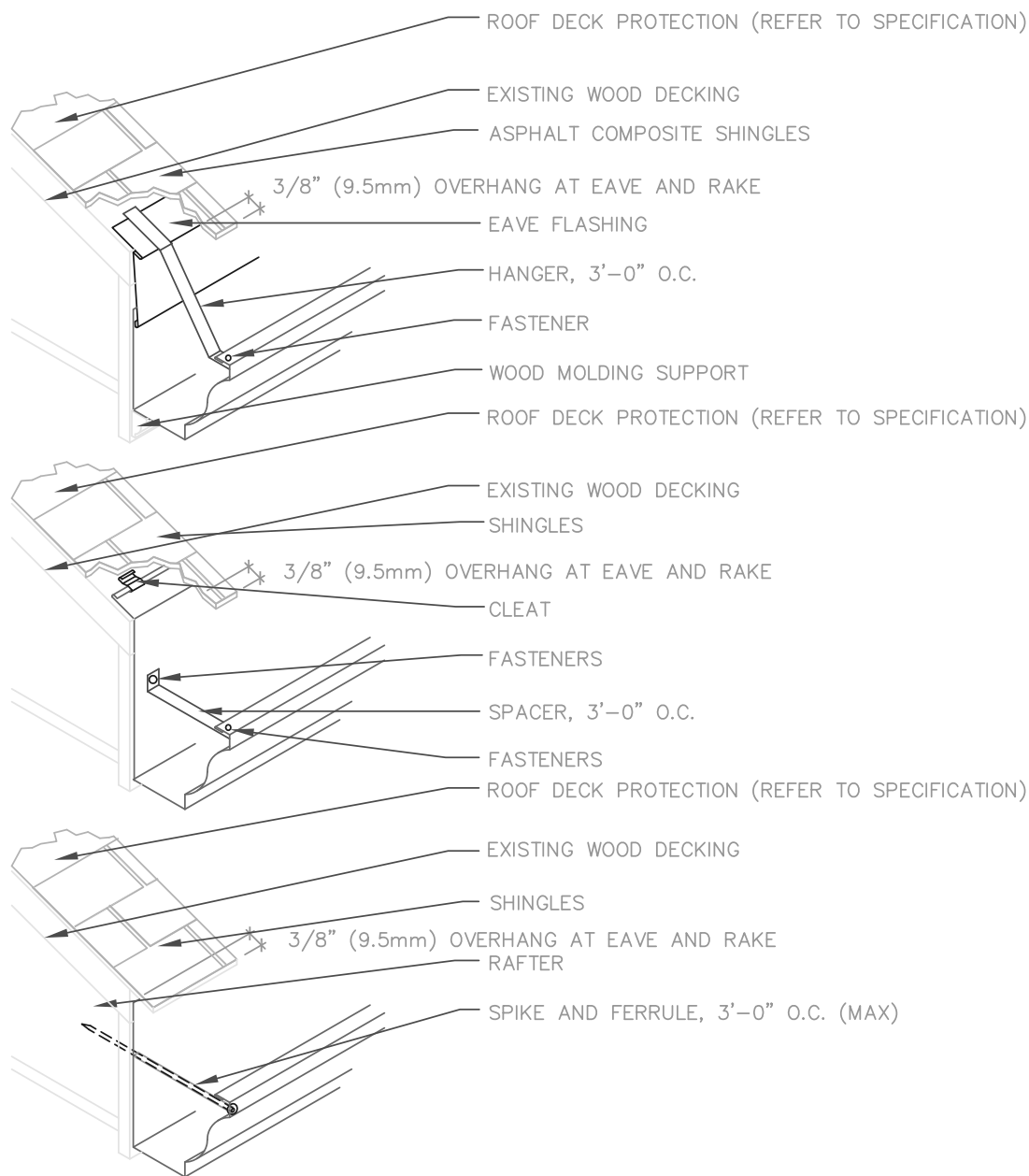
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DETAIL:

VENT FLASHING DETAIL



GUTTER INSTALLATION DETAIL OPTIONS

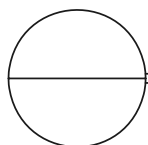
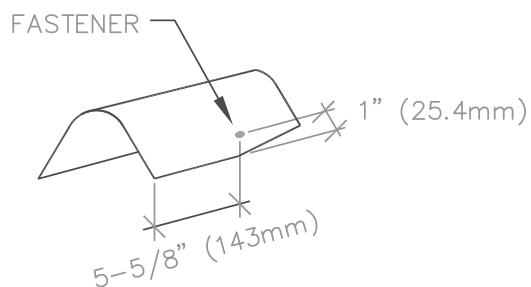
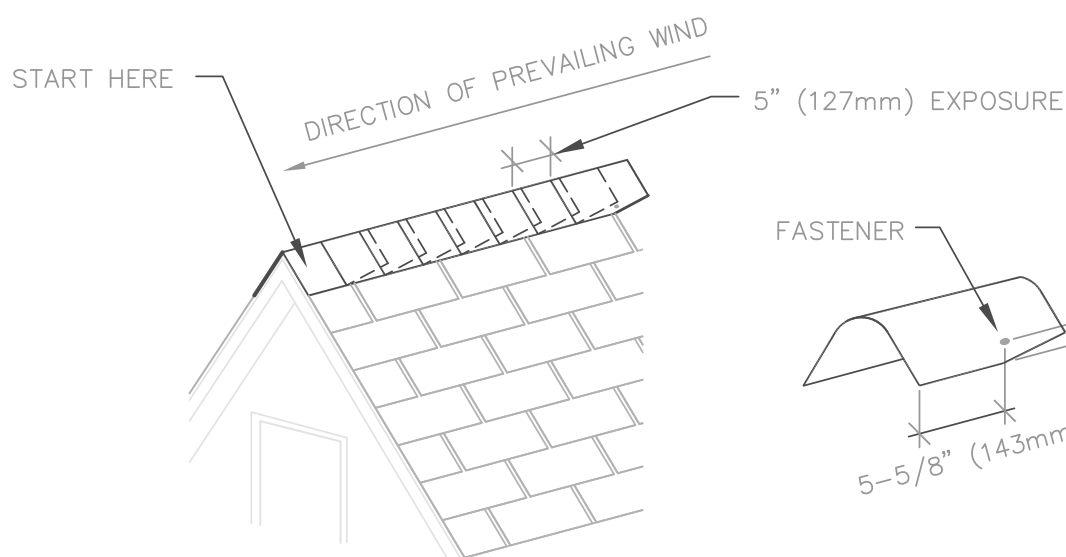
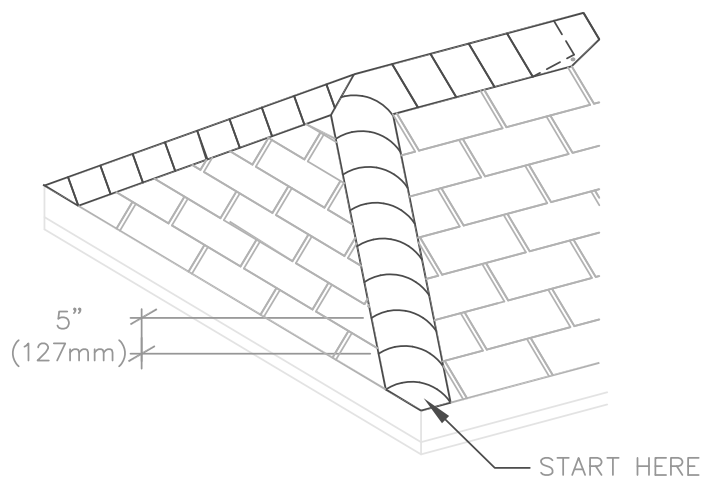
SCALE: N.T.S.



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DETAIL:

GUTTER INSTALLATION DETAIL OPTIONS



HIP AND RIDGE SHINGLES

SCALE: N.T.S.



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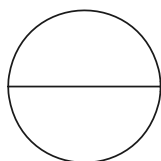
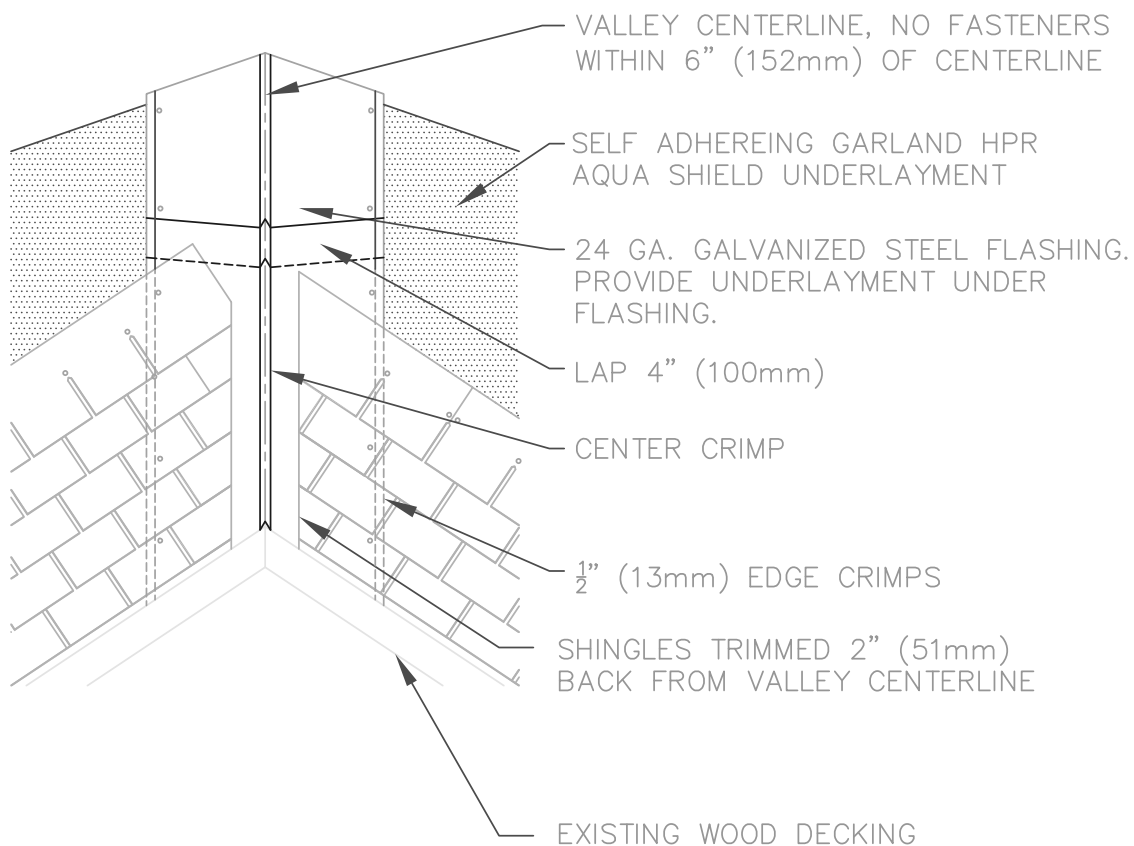
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DETAIL:

HIP AND RIDGE SHINGLES



OPEN VALLEY FLASHING DETAIL

SCALE: N.T.S.



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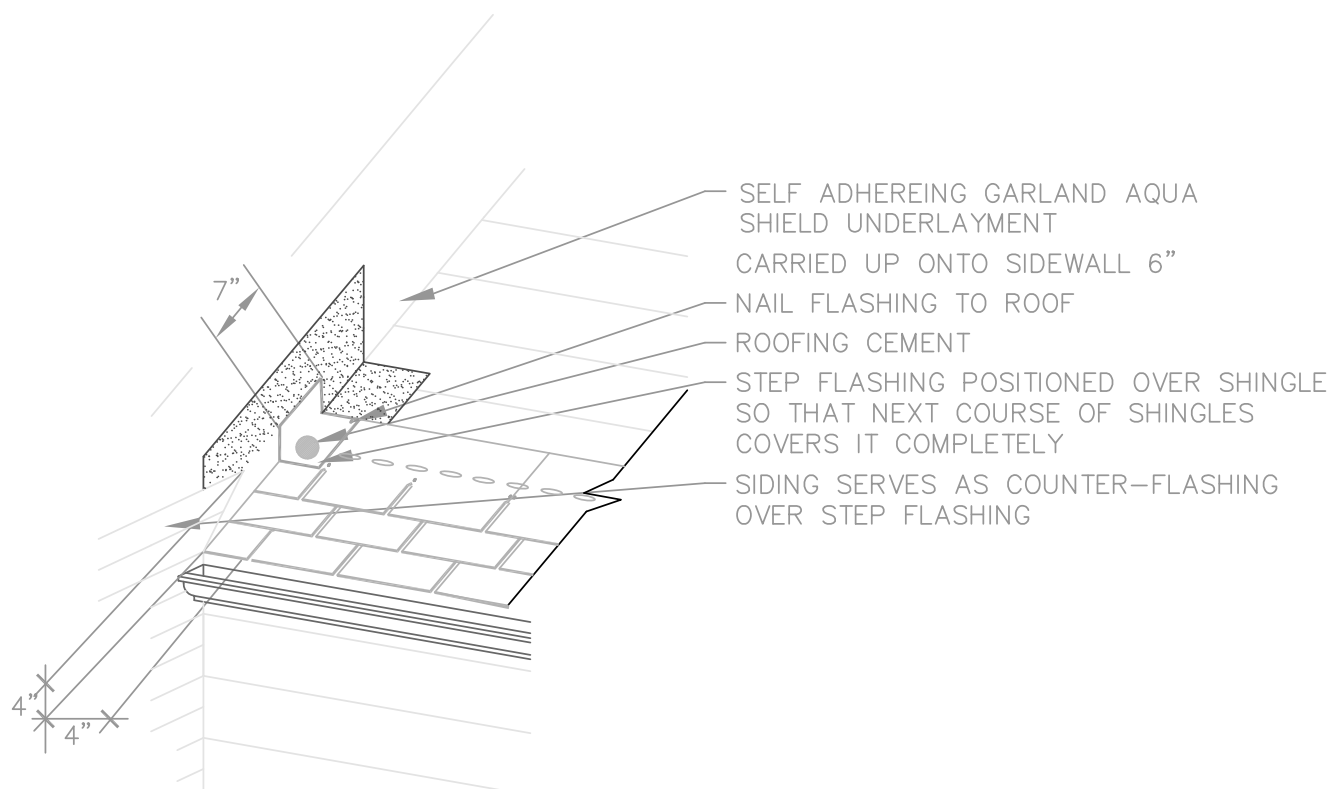
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DETAIL:

OPEN VALLEY FLASHING DETAIL



STEP FLASHING AGAINST VERTICAL SIDEWALL



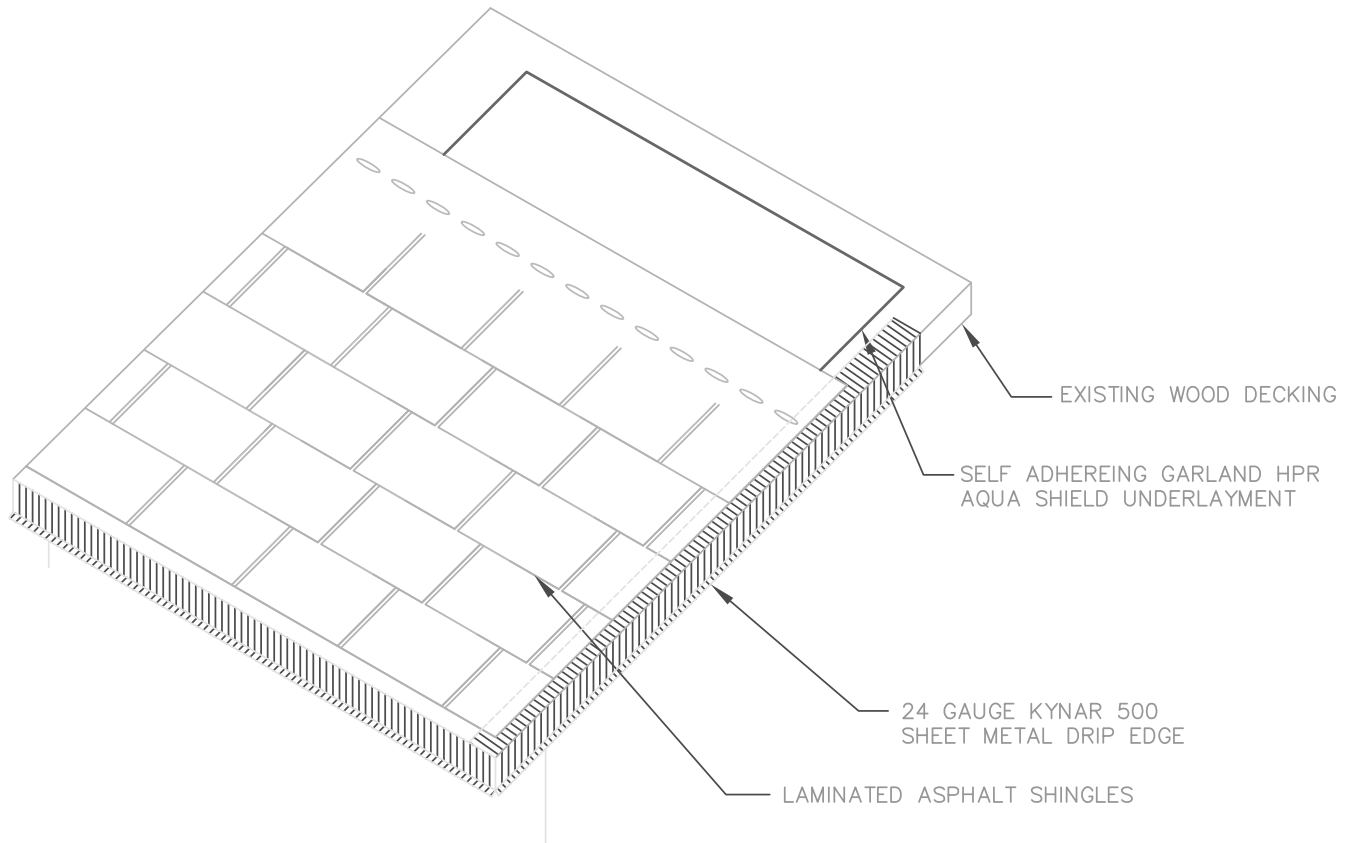
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DETAIL:

STEP FLASHING AGAINST VERTICAL SIDEWALL

FILENAME:

TYPICAL SHINGLE ROOF SECTION



TYPICAL ROOF SECTION

SCALE: N.T.S.



since 1895

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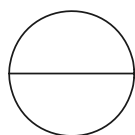
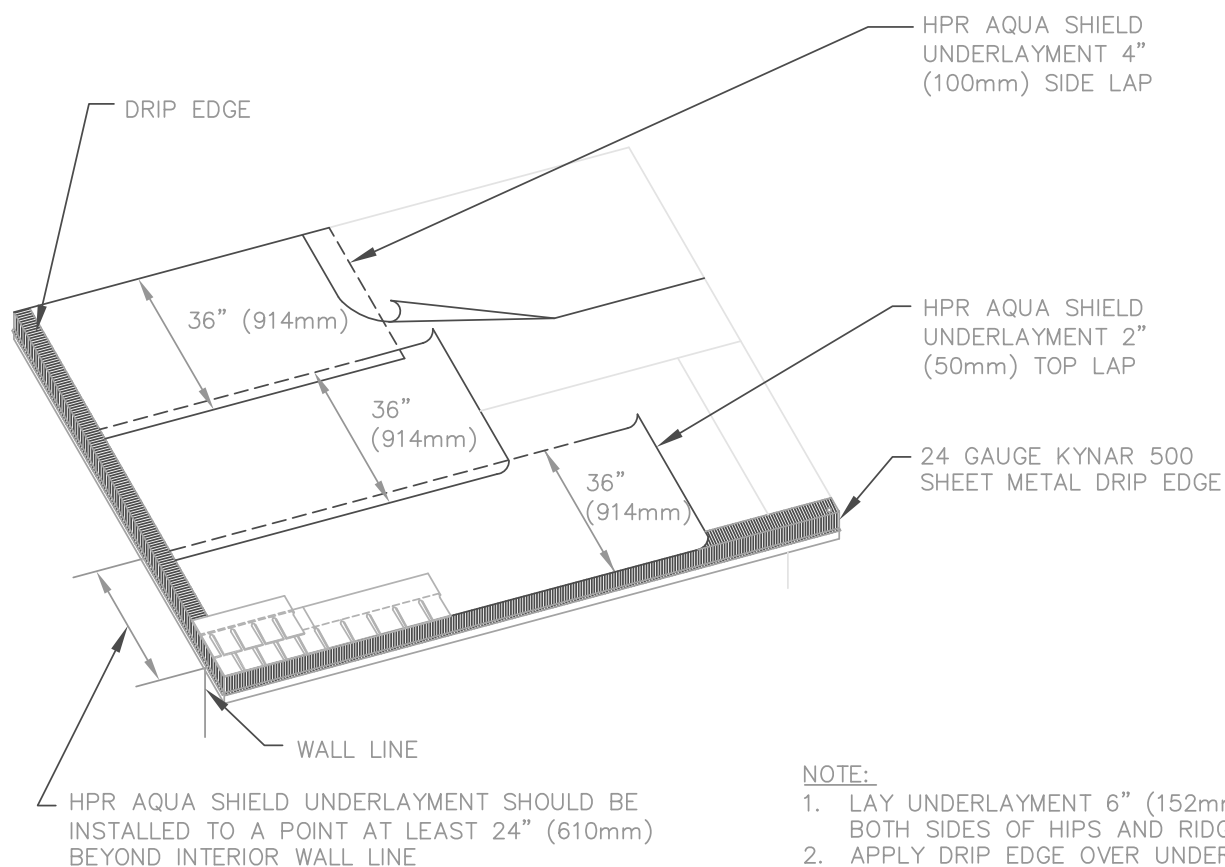
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DETAIL:

TYPICAL SHINGLE ROOF SECTION

FILENAME:

UNDERLAYMENT DETAIL



UNDERLAYMENT DETAIL

SCALE: N.T.S.



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GARLAND CANADA, INC.

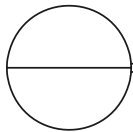
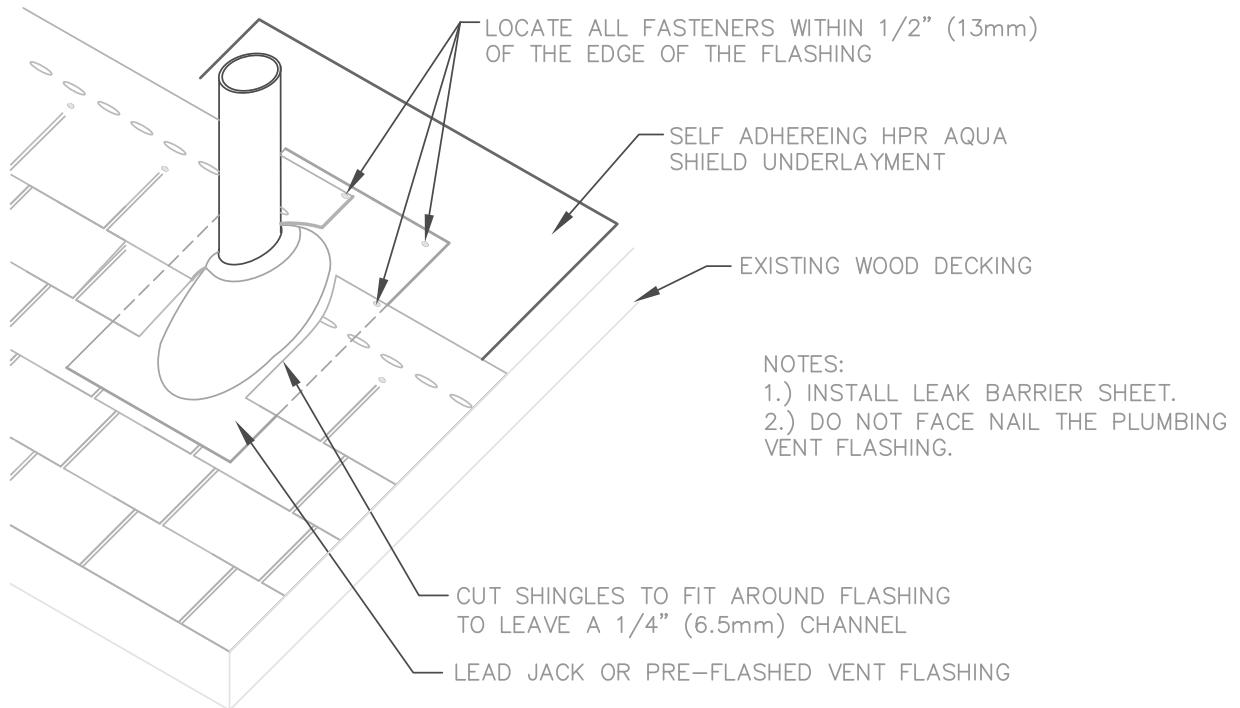
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DETAIL:

UNDERLAYMENT DETAIL

FILENAME:

VENT/PIPE PENETRATION FLASHING DETAIL



VENT/PIPE PENETRATION FLASHING DETAIL

SCALE: N.T.S.



since 1895

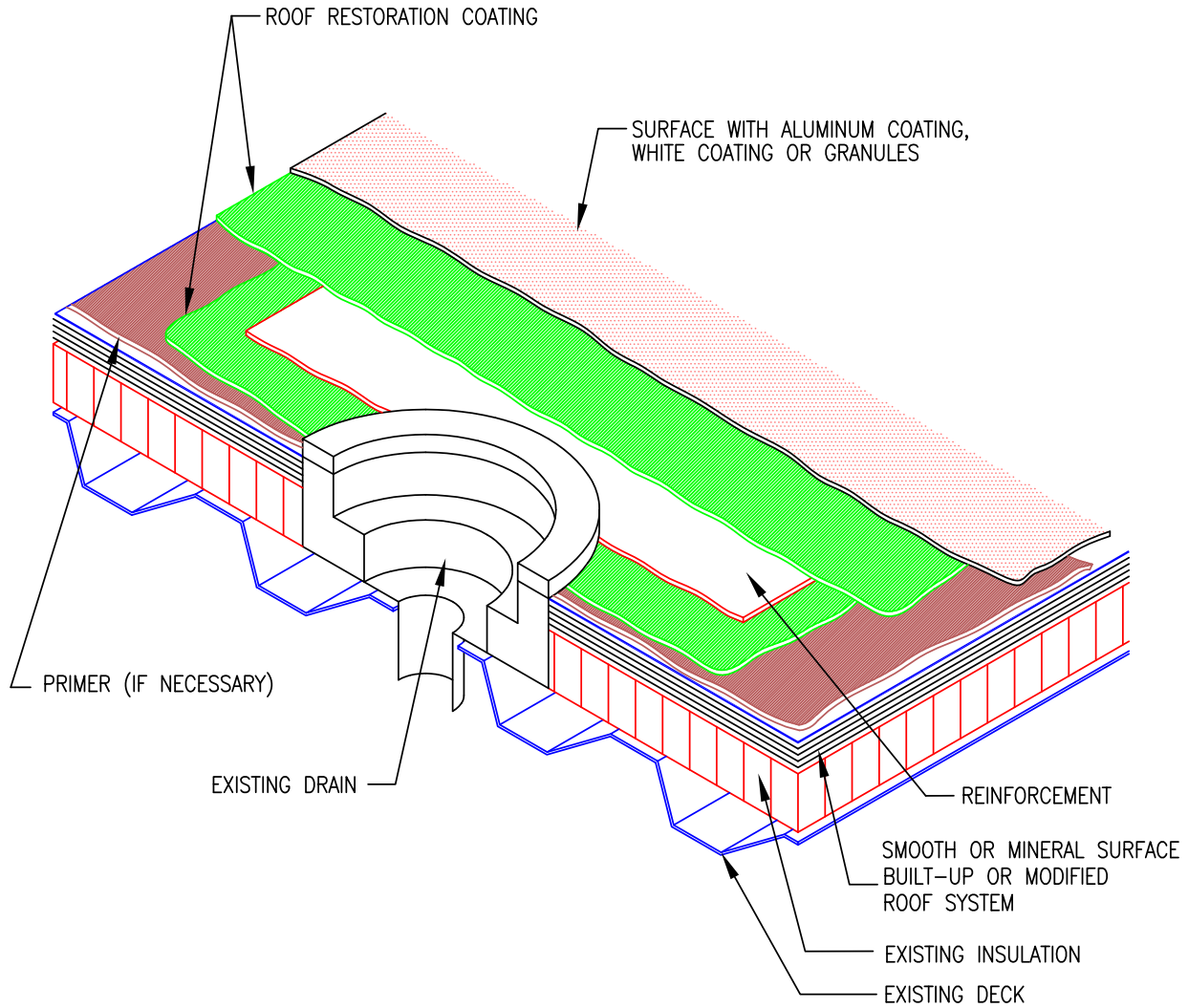
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DETAIL:

VENT/PIPE PENETRATION FLASHING DETAIL

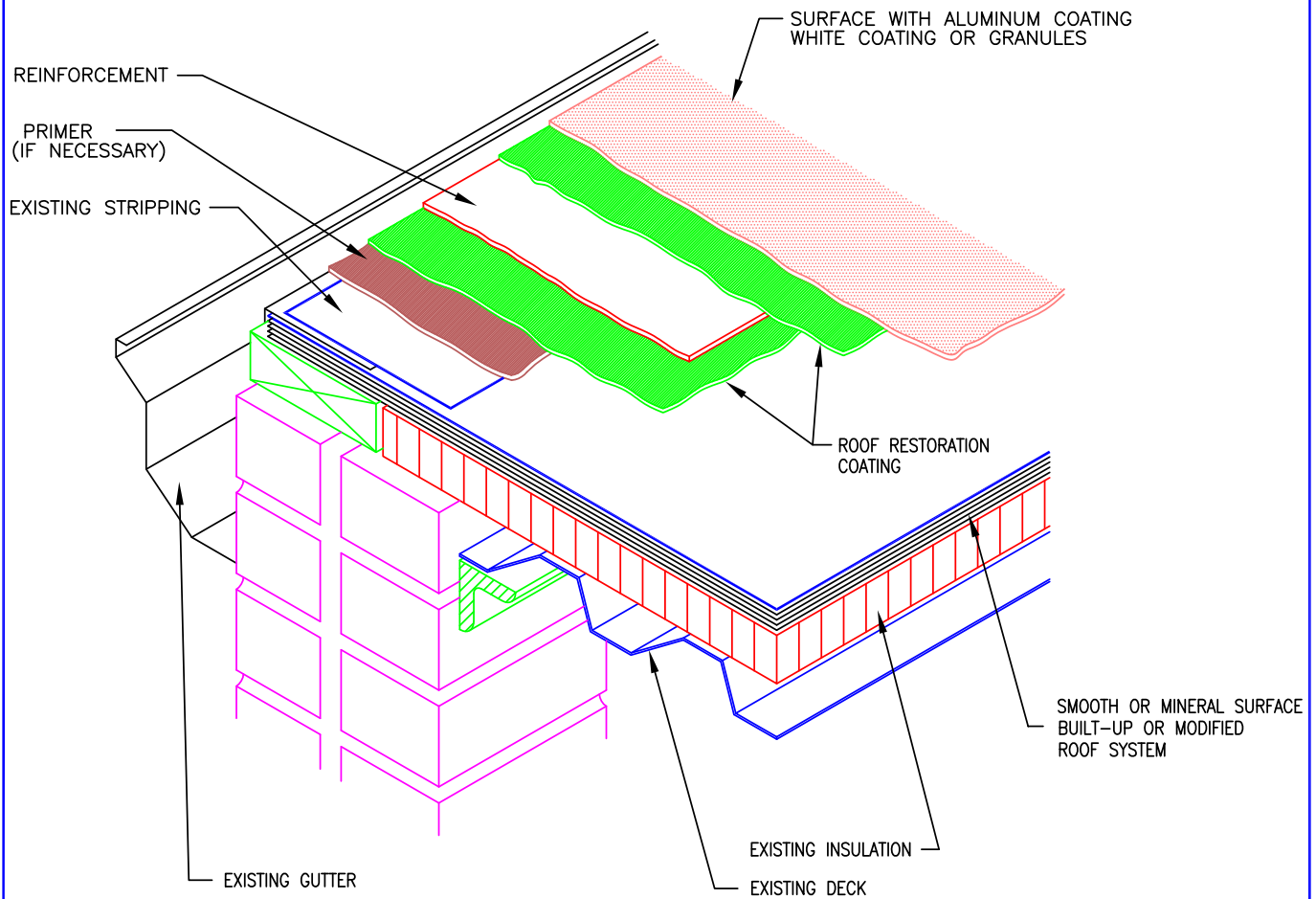


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DETAIL:

DRAIN DETAIL

SMOOTH/MINERAL MODIFIED RESTORATION

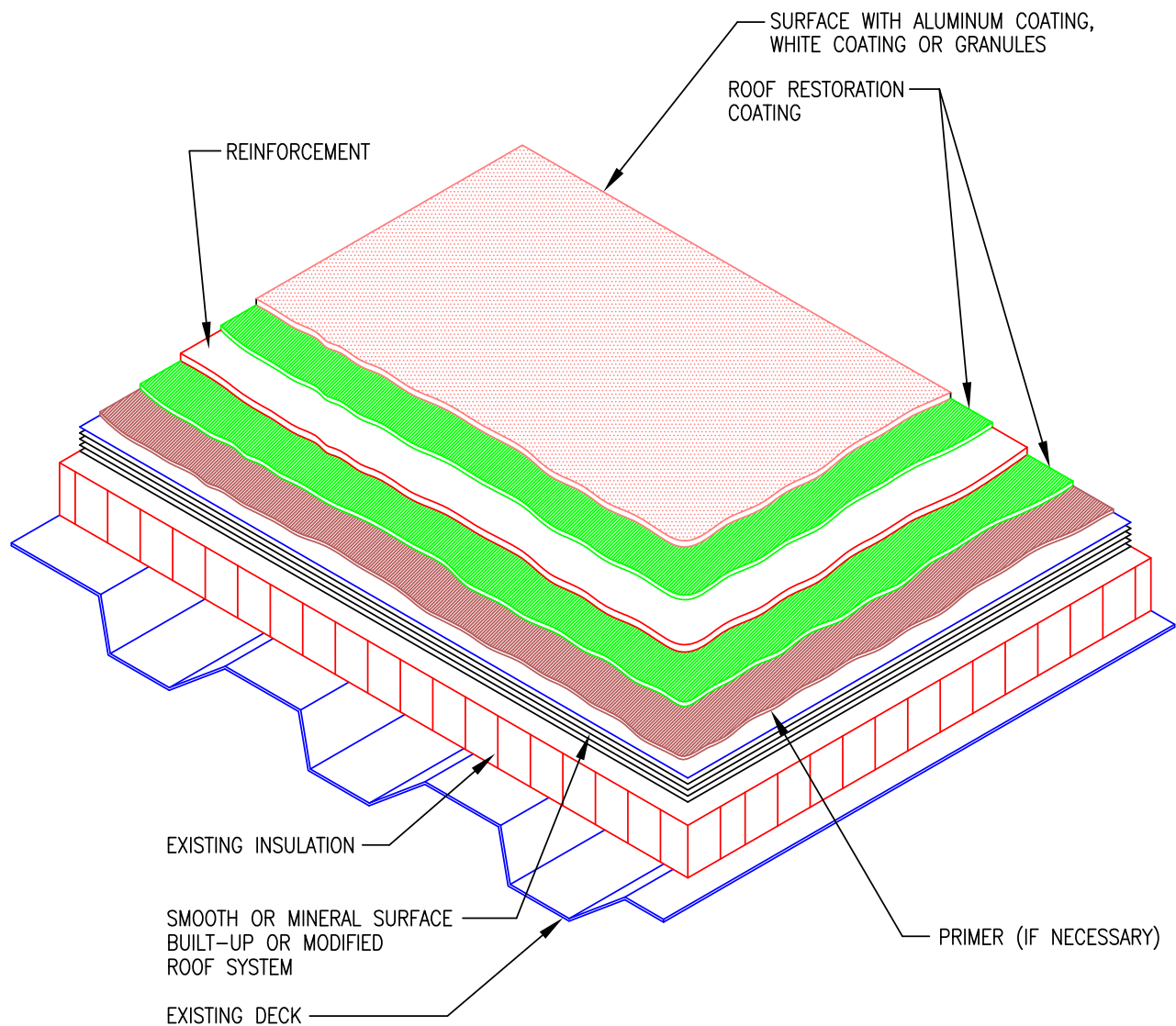


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DETAIL:

EDGE DETAIL

SMOOTH/MINERAL MODIFIED RESTORATION

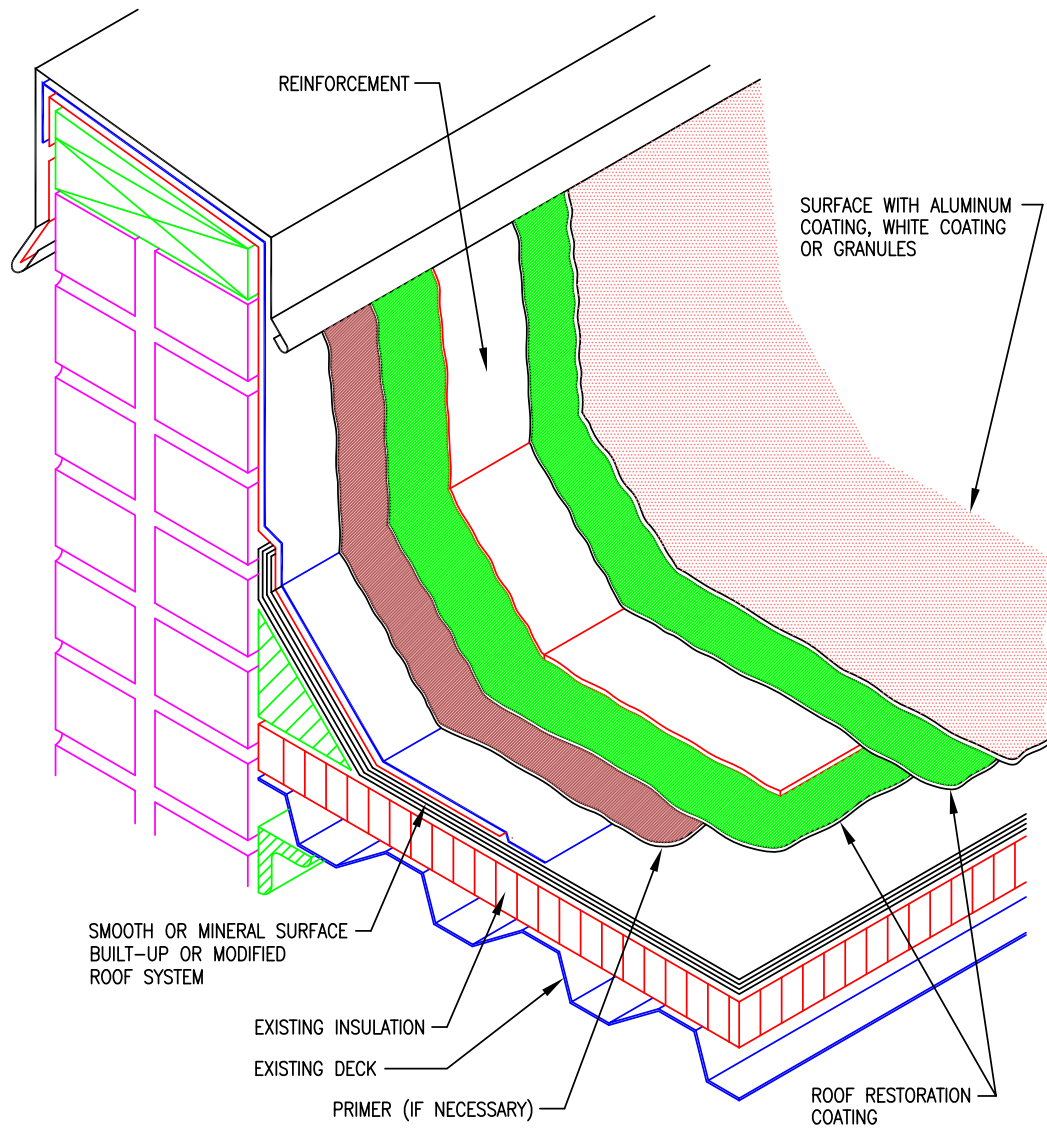


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DETAIL:

FIELD DETAIL

SMOOTH/MINERAL MODIFIED RESTORATION

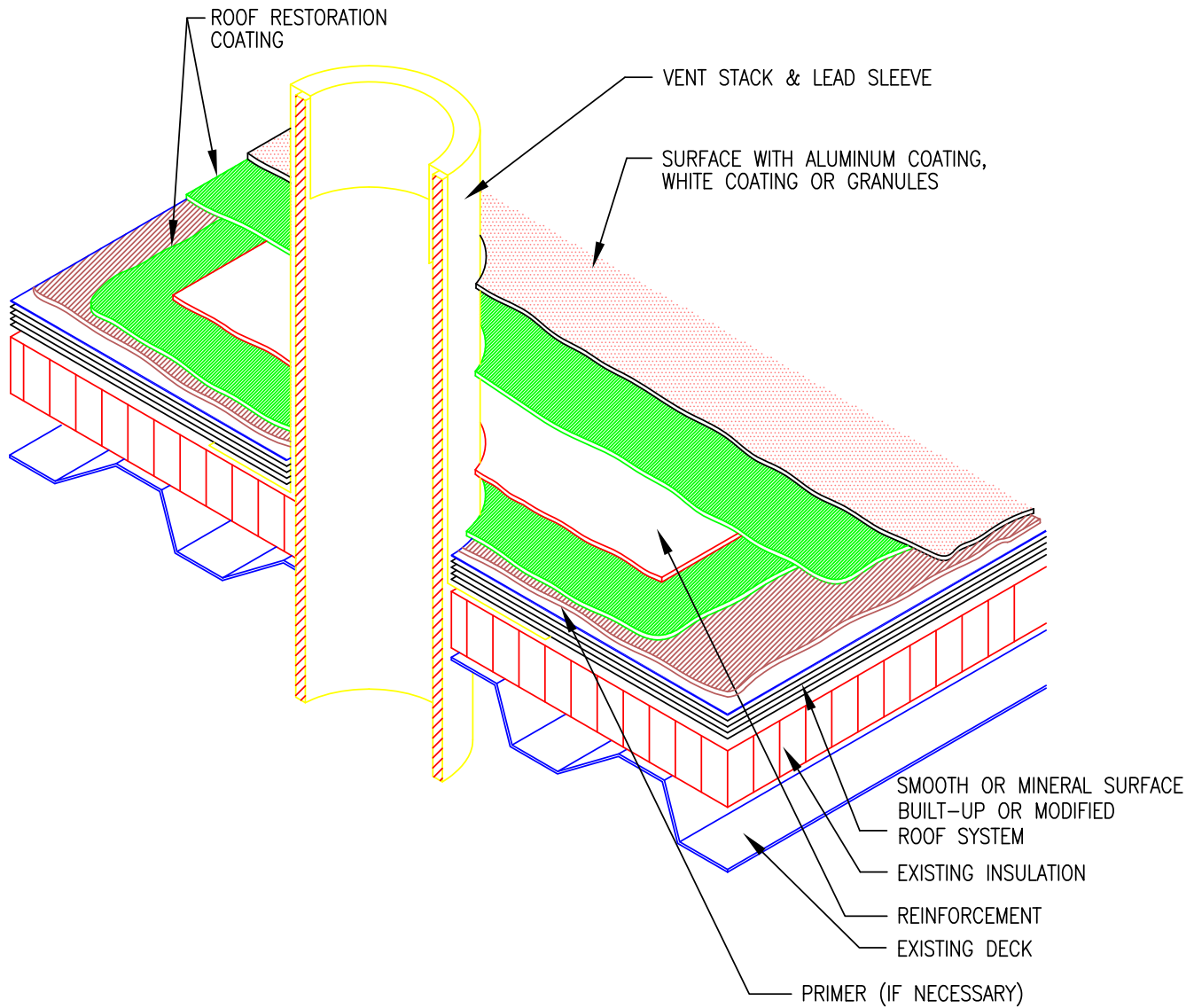


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DETAIL:

FLASHING DETAIL

SMOOTH/MINERAL MODIFIED RESTORATION



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DETAIL:

PIPE DETAIL

SMOOTH/MINERAL MODIFIED RESTORATION