

SECTION 07323

STONE COATED METAL ROOF PANEL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Stone coated metal modular roof panels and accessories.
- B. Associated metal flashings.

1.2 RELATED SECTIONS

- A. Section 06112 - Framing and Sheathing: Roof sheathing.
- B. Section 06200 - Finish Carpentry: Wood trim.
- C. Section 07620 - Sheet Metal Flashing and Trim.
- D. Section 07631 - Gutters and Downspouts.
- E. Section 08600 - Skylights.
- F. Division 15 - Mechanical: Mechanical work projecting through roof.
- G. Section 15575 - Breechings, Chimneys and Stacks.
- H. Division 16 - Electrical: Electrical work projecting through roof.

1.3 REFERENCES

- A. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. ASTM A 792/A 792M - Sheet Steel, Aluminum - Zinc alloy coated by the Hot-Dip Process, structural (physical) quality.
- C. ASTM B 117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
- D. ASTM C 920 - Specification for Electrometric Joint Sealant.
- E. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- F. ICC-ES Evaluation Report - ICC-ESR-1491-2017
- G. ICC-ES Evaluation Report - ICC-ESR-1188-2018

- H. ICC-ES Evaluation Report - ICC-ESR-3012-2016
- I. ICC-ES Evaluation Report - ICC-ESR-#3098-2017.
- J. Canadian Evaluation Report - CCMC-13258-R
- K. Canadian Evaluation Report - CCMC-13260-R
- L. Canadian Evaluation Report - CCMC-13313-R.
- M. Texas Department of Insurance Report RC-29 – Wind Resistance
- N. Miami-Dade County, Florida Acceptance NOA 15-0410.05
- O. Miami-Dade County, Florida Acceptance NOA 14-1008.06
- P. Miami-Dade County, Florida Acceptance NOA 13-0503.01
- Q. Miami-Dade County, Florida Acceptance NOA 17-0501.03
- R. Florida Approval No. 14533-R1
- S. Florida Approval No. 16448-R1

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation instructions.

C. Shop Drawings: Include roof plans and elevations; sections at hips, ridges, gables, valleys, and eaves; and details of components, accessories, and attachments to other work. Indicate metal panel and flashing profiles, joint locations, fastening locations, and installation details. Indicate panel layout with location of cut and special shapes identified.

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.

E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

F. Verification Samples: For each finish product specified, two samples, representing actual product, color, and patterns.

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

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Conform to applicable building code for roof assembly fire hazard requirements
2. Conform to building code for minimum wind uplift resistance

B. Manufacturer Qualifications: Minimum five years documented experience producing roofing panels of the type specified.

C. Installer Qualifications: Manufacturer certified installer specializing in performing the work of this section.

D. Pre-Installation Meeting:

1. Convene at job site seven calendar days prior to scheduled beginning of construction activities of this section to review requirements of this section.
2. Require attendance by representatives of the following:
 - a. Installer of this Section.
 - b. Other trades directly affecting, or affected by, construction activities of this Section.
3. Notify Architect four calendar days in advance of scheduled meeting date.

1.6 DELIVERY, STORAGE, AND HANDLING

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

B. Store products in accordance with the manufacturer's instructions.

1. Store products on pallets off the ground and sufficiently high to allow air circulation beneath each bottom stack and prevent rising water from entering pallet or stacks. Elevate one end of the pallets to ensure drainage.
2. Prevent rain from entering pallet stacks by covering with a tarpaulin, making provision for air circulation between draped edges of tarpaulin and ground.
3. Prolonged storage of panels in a stack or pallet outside is not recommended and could result in white rust or watermarks on the materials.

C. Secure stored materials and unfinished work against damage by wind.

1.7 SEQUENCING

A. Ensure that locating information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.

B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.8 PROJECT CONDITIONS

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

1.9 WARRANTY

A. Provide the manufacturer's 50 year fully transferable, limited warranty for defects and the following.

1. 120-mph Wind Warranty

2. Hail Impact Warranty
3. Fire: Boral Steel panels will not burn.
- B. Provide underlayment manufacturer's 20-year warranty

1.10 EXTRA MATERIALS

A. See Section 01600 - Product Requirements, for additional provisions.

B. Provide an additional 1 percent of installed roof tiles, but not less than one full square, for Owner's use in roof maintenance.

C. Furnish extra materials packaged with protective covering for storage and identified with labels clearly describing contents.

PART 2 PRODUCTS

2.1 SOURCE

A. Tile Basis of Design: Best Buy Metals LLC, 1652 S Lee Hwy. Cleveland, TN 37311 Tel: 800-728-4010. Fax: 423-728-3606. Web: bestbuymetals.com, Email: info@bestbuymetals.com

B. Underlayment Basis of Design: Garland Company, Inc. (The); 3800 E. 91st St., Cleveland, OH 44105. ASD. Toll Free: 800-321-9336. Phone: 216-641-7500. Fax: 216-641-0633. Web Site: www.garlandco.com.

C. Or Equal

D. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 MATERIALS - GENERAL

A. Coated Steel: ASTM A 792 Grade 33 with an AZ 50 class, hot-dipped aluminum-zinc alloy coating and a thickness of 0.017 inch (0.43 mm). Exposed surface is covered by pressed colored stone granules embedded in an acrylic resin base coating, followed with a clear acrylic glaze. Weight of coated steel is 1.3 psf (6.3kg m²).

2.3 STONE COATED PANELS AND ACCESSORIES

A. PACIFIC Tile: Panels resembling traditional roofing tile with sections 16 inches wide by 52 inches long (406 mm by 1320 mm) with an installed exposure of 14-1/2 inches by 50 inches (368 mm by 1270 mm). Leading edge of each panel is turned down 1 inch (25 mm), and the back edge is bent up and horizontally back 1-1/2 inches (38 mm) to create an overlapping weather edge. Side laps are 2 inches (51 mm). Color as selected from Manufacturer's line of available colors.

1. Panel Evaluations:
 - a. International Code Council (ICC), Brea California, Report Nos:
 - 1) ESR-3012
 - 2) ESR-3098
 - b. Canadian Construction Materials Center, Ottawa, Ontario, CCMC Nos:

- 1) 13313-R
- c. Texas Department of Insurance Report:
- 1) RC-29 – Wind Resistance
- d. Dade County, Florida
- 1) Acceptance No. 11-0628.01 – Wind Resistance
- e. State of Florida:
- 1) Approval No. 14533-R1

B. PINE-CREST Shake: Provides a wood grained shake appearance, 16-1/2 inches wide by 52 inches long (406 mm by 1320 mm) with an installed exposure of 14-1/2 inches by 50 inches (368 mm by 1270 mm). Leading edge of each panel is turned down 1 inch (25 mm), and the back edge is bent up and horizontally back 1-1/2 inches (38 mm) to create an overlapping weather edge. Side laps are 2 inches (51 mm). Color as selected from Manufacturer's line of available colors.

- 1. Panel Evaluations:
- a. International Code Council (ICC), Brea California, Report Nos:
- 1) ESR-3012
- 2) ESR-3098
- b. Canadian Construction Materials Center, Ottawa, Ontario, CCMC Nos:
- 1) 13313-R
- c. Texas Department of Insurance Report:
- 1) RC-29 – Wind Resistance
- d. Dade County, Florida
- 1) Acceptance No. NOA 17-0501.03 – Wind Resistance
- e. State of Florida
- 1) Approval No. FL 6710-R

C. BARREL VAULT Tile Panels: Resembling Spanish clay S-tile, 16 inches wide by 45 inches long (406 mm by 1143 mm) with an installed exposure of 14 inches by 42 inches (356 mm by 1067 mm). Leading edge of each panel is turned down 1 inch (25 mm), and the back edge is bent up and horizontally back 1-1/2 inches (38 mm) to create an overlapping weather edge. Side laps are 2 inches (51 mm). Color as selected from Manufacturer's line of available colors.

- 1. Panel Evaluations:
- a. International Code Council (ICC), Brea California, Report Nos:
- 1) ESR-1491
- b. Canadian Construction Materials Center, Ottawa, Ontario, CCMC Nos:
- 1) 13258-R
- c. Texas Department of Insurance Report
- 1) RC-29 – Wind Resistance
- d. Dade County, Florida Acceptance No.
- 1) 15-0410.05 (direct to deck)
- 2) 14-1008.06 (batten)
- e. State of Florida
- 1) Approval No. FL 16448

D. GRANITE-RIDGE Shingle Panels: Consists of a panel resembling a traditional asphalt shingle. Front and rear edges are formed to a 'C' configuration, so that the panels interlock when overlapped. Panel is 15-5/8 inches by 46-1/16 inches (397 mm by 1168 mm) with an installed exposure of 13-5/8 inches by 44 inches (346 mm by 1118 mm). Side laps are 2 inches (51 mm). Color as selected from Manufacturer's line of available colors.

- 1. Panel Evaluations:
- a. International Code Council (ICC), Brea California, Report Nos:
- 1) ESR-1188
- b. Canadian Construction Materials Center, Ottawa, Ontario, CCMC Nos:
- 1) 13260-R
- c. Texas Department of Insurance Report

- 1) RC-226 – Wind Resistance
- d. Dade County, Florida Acceptance No.
- 1) 13-0503.01 – Wind Resistance
- e. State of Florida Approval No.
- 1) 14448-R3

E. COTTAGE Shingle: Panels provide a heavy shingle appearance. Panel is 16 inches by 51 inches (407 mm by 1296 mm) with an installed exposure of 14 inches by 47-1/2 inches (356 mm by 1207 mm). Side laps are 3-1/2 inches (89 mm) top course section right side-lap and 2-1/2 inches (64 mm) bottom course section right side-lap. Color as selected from Manufacturer's line of available colors.

- 1. Panel Evaluations:
 - a. International Code Council (ICC), Brea California, Report Nos:
 - 1) ESR-3098
 - b. Canadian Construction Materials Center, Ottawa, Ontario, CCMC Nos:
 - 1) 13313-R
 - c. Texas Department of Insurance Report
 - 1) RC-29 – Wind Resistance
 - d. Dade County, Florida Acceptance No. 11-0628.01 – Wind Resistance
 - e. State of Florida Approval No.
 - 1) FL-6710-R6

F. Timber Battens:

- 1. Counter Batten, Nominal 1 by 4 inches (25 by 100 mm) #2 or better SPF, as needed, for re-roof applications.
- 2. Panel Batten, Nominal 2 by 2 inches (50 by 50 mm) #2 or better SPF, as needed.
- 3. Elevated Batten, Boral EBS (Elevated Batten System) Nominal 2 by 2 inches (50 by 50 mm).
- 4. Timber Batten Fasteners:
 - a. Screws: minimum #9 coarse thread of sufficient length to penetrate roofing structural member a minimum of 1 inch (25.4 mm).
 - b. Nails: Box: Minimum .131 inch, 16d ring shanked, 3-1/4 inch (83 mm) long of sufficient length to penetrate roofing structural member a minimum of 1 inch (25.4 mm).

G. Steel Battens: Minimum 20 Gauge, ASTM A 653 galvanized steel, formed into "hat channel", "C", "U", "J", or "Z" sections with minimum height of 1-1/2 inch (38 mm) with bends at 90 degrees.

- 1. Steel Batten Fasteners: Screws: No. 8, minimum 2 inch (51 mm) long, corrosion resistant wood screw or 3/4 inch (19 mm) minimum, Tek type screws or equivalent, to fasten to steel rafter/truss member.

H. Direct-to-Deck – (batten-less) installation flashing: Trim to be of same material, profile and color as roof panels.

- 1. Drip edge
- 2. Gutter-Riser or Ventilated Riser
- 3. Rake Channels or Trim Caps on rakes

I. Hips, Ridges and Rakes: Boral Steel, Aluminum-Zinc Alloy Coated Steel sheet, nominal .0170 inches. Pressure formed to match roofing material, color, and finish to match panels.

- 1. Cap Shake (PINE-CREST Shake, COTTAGE Shingle)
- 2. Cap Mission (BARREL-VAULT Tile, PACIFIC Tile)

3. Cap Cottage (COTTAGE Shingle)
4. Cap Shingle (GRANITE-RIDGE Shingle)

J. Sheet Metal Materials: Aluminum-Zinc Alloy Coated Steel sheet, ASTM A 792/A 792M, color and surface finish matching roof panels.

K. End Cap: Boral Steel End Disk Aluminum-Zinc Alloy Coated Steel sheet, nominal .0170 inch. Circular cap to match roofing material, color, and finish to match panels. To be applied at open end of hip and ridge at eave.

L. Flashing: Trim to be of same material, profile and color as roof panels.

M. Nails: Corrosion resistant full, flat head, .131 inch ring shanked, nails of sufficient length to penetrate substrate 1 inch minimum, finish color black.

N. Screws: Manufacturer's minimum #9 by 2-1/2 inch (63.5 mm) long corrosion resistant steel, 1/4 inch (6.36 mm) hex head screws. Screws colored coat to match panel color. Capable of resisting a minimum 1,000 hours salt spray in accordance with ASTM B 117.

O. Panel Fasteners:

1. Battenless Screws: Minimum #10 by 2-1/2 inch (64 mm) long corrosion resistant steel, 1/4 inch (6.36 mm) hex head screws.
 - a. Screws colored coat to match panel color.
 - b. Use color matched stainless-steel screws for Coastal Regions/Salt Spray installations.
2. Batten Screws: Minimum #10 by 2 inch (50 mm) long minimum, 1/4 inch (6.36 mm) hex head screws.
 - a. Screws colored coat to match panel color.
 - b. Use color matched stainless-steel screws for Coastal Regions/Salt Spray installations.
3. Granite-Ridge Screws: Minimum #10 by 1-1/2 (64 mm) long minimum, 1/4 inch (6.36 mm) hex head screws.
 - a. Screws colored coat to match panel color.
 - b. Use color matched stainless-steel screws for Coastal Regions/Salt Spray installations.
4. Nails: Full, flat head, .131 inch ring shanked, 8d box nails, of sufficient length to penetrate substrate 1 inch (25 mm) minimum, finish color black.

P. Valley and other Flashings: Aluminum zinc alloy coated sheet ASTM-A792/A792M or G-90 Galvanized. Do not use copper and lead flashings due to metal incompatibility.

Q. Underlayment:

1. Terra-Seal Underlayment

R. Sealant: One-part elastomeric polyurethane, sealant conforming to ASTM C 920. Where sealant will be exposed, provide in color to match panels

S. Elastomeric Pipe Sleeve Covers: EPDM elastomeric pipe and penetration flashing, Master flash or equal..

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify roof structure for correct framing prior to placing battens and Metro roof panels.
- C. Verify roof penetrations and plumbing vent stacks are in place and flash to roof surface.
- D. Verify that work requiring roof access by other trades is completed prior to starting roofing panel installation. Limit roof access by other trades after completion of roofing.
- E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Coordinate with installation of gutters, vents, skylights and other adjoining work to ensure proper sequencing. Do not install roofing materials until all vent stacks and other penetrations through roof sheathing have been installed and securely fastened.
- C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions and the applicable local code requirements.
- B. Underlayment
 - 1. Re-roof: Install 30# asphalt saturated felt or better over existing surface.
 - 2. New Construction: Install:
 - a. Install Self-adhering roofing underlayment membrane installed per manufacture's specifications at perimeter, valleys and non-heated areas or as required by local building codes.
 - b. Install asphalt saturated felt or better. Installed as per manufacture's specification over roof field.
- C. Counter Batten:
 - 1. Nominal 1 by 4 inches (25 by 100 mm) #2 or better SPF.
 - 2. Fastener Number: Refer to fastener requirement of the local building code.
 - 3. Fastener Size: Refer to fastener requirement of the local building code.
 - 4. Install counter battens at all rakes, hips, valleys, ridges, headwalls, and sidewalls and around all roof penetrations and at all roof truss/rafter members at a maximum of 24 inches (610 mm) O.C.
 - 5. Fasteners to be sufficient length to penetrate truss/rafter members by minimum 1 inch (25 mm)
- D. Batten:
 - 1. Nominal 2 inch by 2 inch (51 mm by 51 mm) SPF Batten.
 - 2. Steel Battens.

3. Fastener Number: Refer to fastener requirement of the local building code.
4. Fastener Size: Refer to fastener requirement of the local building code.
5. Install battens as required in Boral Steel' installation manual with appropriate spacing as determined by panel profile spacers specified.
 - a. Fasten battens at all intersections of counter battens, insuring that batten joints are located at counter batten support
 - b. Install battens at rakes, hips, and ridges
 - c. Install battens at valleys with full run frame for complete support of valley flange.
 - d. Fasteners for wood battens to be sufficient length to penetrate truss/rafter members by minimum 1 inch (25 mm)
 - e. Fasteners for steel battens to be 3/4 inch (19 mm) minimum, Tek type screws.

E. Direct to Deck:

1. Install perimeter drip edge metal.
2. Install Valley Metal
 - a. Two-piece valley
 - b. 5 "V" Valley
 - c. Strip in valley center joint
 - d. Valley Center Cover
3. Install eave riser
 - a. Gutter Riser.
 - b. 1 by 4 inches (25 by 100 mm) batten specified.

F. Install valley flashing prior to panel installation:

1. Overhang valley beyond fascia by 1/2 inch (12.5 mm) minimum.
2. Lap valley flashing 6 inches (152 mm) and seal (two beads) at all laps.
3. Cut, notch, bend and seal water tight at all valley heads.
4. Fasten both sides of valley flashing at valley flange at 24 inches (610 mm) O.C. with corrosion resistant fasteners.

G. Eave Metal

1. BARREL-VAULT Stone Coated Fascia:
 - a. 3.5 inch (90 mm) Bird-stop Eave Fascia
2. PINE-CREST Shake; PACIFIC Tile or COTTAGE Shingle:
 - a. 3.5 inch (90 mm) Eave Boral Universal Fascia
 - b. 5 inch (127 mm) Eave Boral Universal Fascia
 - c. Painted drip edge
3. GRANITE-RIDGE Shingle: Starter Strip.

H. Panels:

1. Work from numerous bundles of panels to help ensure overall color batch/production run blending throughout installation
2. Cut and bend panels at gables, hips, valleys, walls and ridge to complete panel installation as per Boral Steel installation instructions.
3. Install ridge trim, hip caps and counter flashing as per Boral Steel's installation instructions.
4. Fasten with fasteners in accordance with local code requirements and use the same fasteners for Hips, Ridges and Rakes
5. Stitch screws to be 3/4 inch (19 mm) hex head self-tapping thread. As provided by Boral Steel
6. Tools: Use standard Boral Steel cutter, bender and batten spacers as applicable.

I. Rake Trim: Install as required.

1. Rake Channel
2. Rake Trim and trim Cap

J. Roof Penetrations: Install as required.

1. Double panel method
 - a. Cut hole in primary panel
 - b. Install pipe flashing and apply sealant on top and sides of flashing
 - c. Cut and install top panel
 - d. Seal and chip cut
2. EPDM elastomeric pipe and penetration flashing.

3.4 CLEANING

A. Clean up building and grounds of all debris left from installation procedures and dispose of all debris in legal manner

B. Foot Traffic: Only permitted directly over horizontal joints or 2 by 2 inches (50 by 50 mm) battens to prevent denting of panels. Avoid stepping on side laps.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Stage work progress to avoid foot traffic over completed sections of roofing.

C. Where practical provide protection of installed materials from potential damage through work from other trades.

D. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 52 00
MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Cold Applied 2-Ply Thermoplastic Hybrid Roof System (KEE-Stone)

1.2 RELATED SECTIONS

- A. Deck Preparation

1.3 REFERENCES

- A. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.
- B. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
- C. ASTM D 312 - Standard Specification for Asphalt used in Roofing.
- D. ASTM D 412 - Tensile Test on Rubber and Elastomers.
- E. ASTM D 2178 Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.
- F. ASTM D 2824 Standard Specification for Aluminum-Pigmented Asphalt Roof Coating.
- G. ASTM D 3019 - Standard Specification for Lap Cement Used with Asphalt Roll Roofing, Non-Fibered, and Fibered.
- H. ASTM D 4586 Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- 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 D 6754 - Standard Specification for Ketone Ethylene Ester (KEE) Sheet Roofing.
- O. ASTM D 6757 - Standard Specification for Underlayment Felt Containing Inorganic Fibers Used in Steep-Slope Roofing.
- P. ASTM E 108 - Standard Test Methods for Fire Test of Roof Coverings

- Q. Factory Mutual Research (FM): Roof Assembly Classifications.
- R. National Roofing Contractors Association (NRCA): Roofing and Waterproofing Manual.
- S. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal Manual.
- T. Underwriters Laboratories, Inc. (UL): Fire Hazard Classifications.
- U. Intertek/Warnock Hersey (WH): Fire Hazard Classifications.
- V. ANSI-SPRI ES-1 Wind Design Standard for Edge Systems used with Low Slope Roofing Systems.
- W. ASCE 7, Minimum Design Loads for Buildings and Other Structures
- X. UL - Fire Resistance Directory.
- Y. FM Approvals - Roof Coverings and/or RoofNav assembly database.
- Z. Miami-Dade Building Code Compliance - N.O.A. (Notice of Acceptance).
- AA. California Title 24 Energy Efficient Standards.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

- A. Perform work in accordance with all federal, state and local codes.
- B. Design Requirements:
 - 1. Uniform Wind Uplift Load Capacity
 - a. Installed roof system shall withstand negative (uplift) design wind loading pressures complying with the following criteria.
 - 1) Design Code: ASCE 7, Method 2 for Components and Cladding.
 - 2) Importance Category:
 - a) IV
 - 3) Importance Factor of:
 - a) 1.0
 - 4) Wind Speed: 103 mph
 - 5) Exposure Category:
 - a) C.
 - 6) Design Roof Height: 20 feet.
 - 7) Minimum Building Width: 200 feet.
 - 8) Roof Pitch: .5:12.
 - 9) Roof Area Design Uplift Pressure:
 - a) Zone 1' Interior Field of Roof 18.1 psf -
 - b) Zone 1 - Field of roof 28.1psf
 - c) Zone 2 - Eaves, ridges, hips and rakes 35.6 psf
 - d) Zone 3 - Corners 46.8 psf
- C. Roof system shall have been tested in compliance with the following codes and test requirements:
 - 1. FM Approvals:
 - a. RoofNav Website

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.

- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation instructions.
- C. Shop Drawings: Submit shop drawings including installation details of roofing, flashing, fastening, insulation and vapor retarder, including notation of roof slopes and fastening patterns of insulation and base modified bitumen membrane, prior to job start.
- D. Design Pressure Calculations: Submit design pressure calculations for the roof area in accordance with ASCE 7 and local Building Code requirements. Include a roof system attachment analysis report, certifying the system's compliance with applicable wind load requirements before the start of work. Calculations must be signed and sealed by a professional engineer licensed in the State of California.
- E. 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.
- F. 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.
- G. Provide a notarized letter stating that a full-time representative of the roofing manufacturer will perform the site inspections of at least 5 days per working week listed in section 3.7
- H. 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. Manufacturer's Field Supervision: A representative of the roof system manufacturer must be present 5 days per week during the roof system installation.
- F. 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.
- G. Source Limitations: Obtain all components of roof system from a single manufacturer. Secondary products that are required shall be recommended and approved in writing by the

roofing system Manufacturer. Upon request of the Architect or Owner, submit Manufacturer's written approval of secondary components in list form, signed by an authorized agent of the Manufacturer.

1.7 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 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 Edge-To-Edge NDL System 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 installer, 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 including Garland Metal Components.

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:
 - 5 years from date of acceptance.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Garland Company, Inc. (The); 3800 E. 91st St., Cleveland, OH 44105. ASD. Toll Free: 800-321-9336. Phone: 216-641-7500. Fax: 216-641-0633. Web Site: www.garlandco.com.
- B. Or Equal
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.
- D. The Products specified are intended and the Standard of Quality for the products required for this project. If other products are proposed the bidder must disclose in the bid the manufacturer and the products that they intend to use on the Project. If no manufacturer and products are listed, the bid may be accepted only with the use of products specified.
 1. Bidder will not be allowed to change materials after the bid opening date.
 2. If alternate products are included in the bid, the products must be equal to or exceed the products specified. Supporting technical data shall be submitted to the Architect/ Owner for approval prior to acceptance.
 3. In making a request for substitution, the Bidder/Roofing Contractor represents that it has:
 - a. Personally investigated the proposed product or method, and determined that it is equal or superior in all respects to that specified.
 - b. Will provide the same guarantee for substitution as for the product and method specified.
 - c. Will coordinate installation of accepted substitution in work, making such changes as may be required for work to be completed in all respects.
 - d. Will waive all claims for additional cost related to substitution, which consequently become apparent.
 - e. Cost data is complete and includes all related cost under his/her contract or other contracts, which may be affected by the substitution.
 - f. Will reimburse the Owner for all redesign cost by the Architect for accommodation of the substitution.
 4. Architect/ Owner reserves the right to act as the final authority on the acceptance or rejection of any or all bids, proposed alternate roofing systems or materials that have met ALL specified requirement criteria.
 5. Failure to submit substitution package, or any portion thereof requested, will result in immediate disqualification and consideration for that particular contractor's request for manufacturer substitution.

2.2 COLD APPLIED 2-PLY THERMOPLASTIC HYBRID ROOF SYSTEM - KEE-Stone

- A. Mechanically attached polyiso insulation fastened to the deck per wind uplift calculations

1. R- 23.6 minimum
- B. Tapered polyiso insulation:
 1. Tapered per approved drainage calculations to the internal drains with min 1:12 slope
- C. Coverboard: GP Densdeck Prime
 1. ½" Densdeck Prime coverboard
- D. Interply Adhesive: (1)
 1. Green-Lock Plus Membrane Adhesive
- E. Base (Ply) Sheet: One ply bonded to the prepared substrate with Interply Adhesive:
 1. Stressbase 80:
- F. Interply Adhesive: (2)
 1. KEE-Lock Foam Spatter applied:
- G. Thermoplastic Cap (Ply) Sheet: One ply bonded to the prepared substrate with Interply Adhesive (2):
 1. KEE-Stone FB 60:
- H. Flashing Adhesive: (1)
 1. Green-Lock Plus Membrane Adhesive
- I. Flashing Base Ply: One ply bonded to the prepared substrate with Flashing Ply Adhesive:
 1. Stressbase 80
- J. Flashing Adhesive: (2)
 1. KEE-Lock spatter spray foam adhesive
- K. Flashing Cap (Ply) Sheet: One ply bonded to the prepared substrate with Flashing Ply Adhesive:
 1. KEE-Stone FB 60 Flashing.
- L. Sealant
 1. Tuff-Stuff TruWhite
- M. Sheet Metal Flashings, coping, and trim
 1. R-Mer .040 aluminum flat sheet
- N. Accessories:
 1. Pre-molded reinforced KEE-Stone accessories for detail applications.
 2. Utility Roll Membrane Reinforced KEE-Stone butt ends.
 3. KEE-Lock Water Cut-Off Sealant for exposed cut edges on KEE-Stone membrane.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Inspect and approve the deck condition, slopes and fastener backing if applicable, parapet walls, expansion joints, roof drains, stack vents, vent outlets, nailers and surfaces and elements.
- C. Verify that work penetrating the roof deck, or which may otherwise affect the roofing, has been properly completed.

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

3.2 PREPARATION

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

3.3 INSTALLATION - GENERAL

- A. Install modified bitumen membranes and flashings in accordance with manufacturer's instructions and with the recommendations provided by the National Roofing Contractors Association's Roofing & Waterproofing Manual, the Asphalt Roofing Manufacturers Association, and applicable codes.
- B. General: Avoid installation of modified bitumen membranes at temperatures lower than 40-45 degrees F. When work at such temperatures unavoidable use the following precautions:
 - 1. Take extra care during cold weather installation and when ambient temperatures are affected by wind or humidity, to ensure adequate bonding is achieved between the surfaces to be joined. Use extra care at material seam welds and where adhesion of the applied product to the appropriately prepared substrate as the substrate can be affected by such temperature constraints as well.
 - 2. Unrolling of cold materials, under low ambient conditions must be avoided to prevent the likelihood of unnecessary stress cracking. Rolls must be at least 40 degrees F at the time of application. If the membrane roll becomes stiff or difficult to install, it must be replaced with roll from a heated storage area.
- C. Commence installation of the roofing system at the lowest point of the roof (or roof area), working up the slope toward the highest point. Lap sheets shingle fashion so as to constantly shed water
- D. All slopes greater than 2:12 require back-nailing to prevent slippage of the ply sheets. Use ring or spiral-shank 1 inch cap nails, or screws and plates at a rate of 1 fastener per ply (including the membrane) at each insulation stop. Place insulation stops at 16 ft o.c. for slopes less than 3:12 and 4 feet o.c. for slopes greater than 3:12. On non-insulated systems, nail each ply directly into the deck at the rate specified above. When slope exceeds 2:12, install all plies parallel to the slope (strapping) to facilitate backnailing. Install 4 additional fasteners at the upper edge of the membrane when strapping the plies.

3.4 INSTALLATION COLD APPLIED ROOF SYSTEM

- A. Base Ply: Cut base ply sheets into 18-foot lengths and allow plies to relax before installing.. Shingle base sheets uniformly to achieve one ply throughout over the prepared substrate.

Shingle in proper direction to shed water on each large area of roofing.

1. Lap ply sheet ends 8 inches. Stagger end laps 12 inches minimum.
2. Solidly bond to the substrate and adjacent ply
3. Extend plies 2 inches beyond top edges of cants at wall and projection bases.
4. Install base flashing ply to all perimeter and projection details.
5. The modified membrane must be installed the same day as the base plies.

B. Thermoplastic Cap Ply: 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. All field seams exceeding 10 feet in length shall be welded with an approved automatic welder.
2. All field seams must be clean and dry prior to initiating any field welding. Remove foreign materials from the seams (dirt, oils, etc.) with acetone or authorized alternative. Use CLEAN WHITE COTTON cloths and allow approximately five minutes for solvents to dissipate before initiating the automatic welder. Do not use denim or synthetic rags for cleaning.
3. Contaminated areas within a membrane seam will inhibit proper welding and will require a membrane patch or strip.
4. All welding shall be performed only by qualified personnel to ensure the quality and continuity of the weld. The lap or seam area of the membrane may be intermittently tack welded to hold the membrane in place.
5. The back interior edge of the membrane shall be welded first, with a thin, continuous weld to concentrate heat along the exterior edge of the lap during the final welding pass.
6. Follow local code requirements for electric supply, grounding and surge protection. The use of a dedicated, portable generator is highly recommended to ensure a consistent electrical supply, without fluctuations that can interfere with weld consistency.
7. Properly welded seams shall utilize a 1.5-inch-wide nozzle, to create a homogeneous weld, a minimum of 1.5 inches in width.

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 06 11 00.

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 07 62 00 or Section 07 71 23. Install in accordance with the SMACNA "Architectural Sheet Metal Manual" or the NRCA Roofing Waterproofing manual.

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

required.

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

1. Seal curb, wall, and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.
2. Prepare all walls, penetrations, expansion joints and where shown on the Drawings to be flashed with required primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.
3. Adhere to the underlying base ply with specified flashing ply adhesive unless otherwise specified. Nail off at a minimum of 8 inches (203 mm) o.c. from the finished roof at all vertical surfaces.
4. Solidly adhere the entire flashing ply to the substrate. 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 o.c. 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 o.c. and covered with an acceptable counter flashing.

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

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. Inspection: Provide manufacturer's field observations at start-up and at daily intervals until 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 Sales 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 Sales Representative indicating procedures followed, weather conditions and any discrepancies found during inspection.
 - 4. Provide a final report from the Sales Representative, certifying that the roofing system has been satisfactorily installed according to the project specifications, approved details and good general roofing practice.

3.8 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) 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, Passes -40 deg. F (-40 deg. C)
- B. Thermoplastic Cap (Ply) Sheet:
 - 1. KEE-Stone HP: 60 mil thermoplastic, ketone ethylene ester (KEE) roofing membrane with polyester scrim. ASTM D 6754
 - a. Breaking Strength, ASTM D 751, Proc. B, Strip
 - 1) 375 lbf. (1,668 N)
 - b. Tear Strength, ASTM D 751
 - 1) 150 lbf. Min (667 N)
 - c. Elongation at Break (%), ASTM D 751, Proc. B, Strip
 - 1) 40.0%

- 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 11.4 lbs./gal. (1.36 g/m³)
 - c. Viscosity Brookfield 20,000-50,000 cPs.
 - d. Flash Point ASTM D 93 400 deg. F min. (232 deg. C)
 - e. Slope: up to 3:12
 2. KEE-Lock Foam: Dual component, single bead (ribbon applied) urethane insulation/membrane adhesive.
 - a. Tensile Strength (ASTM D 412) 250 psi
 - b. Density (ASTM D 1875) 8.5 lbs./gal.
 - c. Viscosity (ASTM D 2556) 22,000 - 60,000 cP
 - d. Peel Strength (ASTM D 903) 17 lb./in.
 - e. Flexibility (ASTM D 816) Pass @ -70 deg. F (-56.7 deg. C)
- 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, Passes -40 deg. F (-40 deg. C)
- E. Flashing Ply Adhesive:
1. KEE-Lock Foam: Dual component, single bead (ribbon applied) urethane insulation/membrane adhesive.
 - a. Tensile Strength (ASTM D 412) 250 psi
 - b. Density (ASTM D 1875) 8.5 lbs./gal.
 - c. Viscosity (ASTM D 2556) 22,000 - 60,000 cP
 - d. Peel Strength (ASTM D 903) 17 lb./in.
 - e. Flexibility (ASTM D 816) Pass @ -70 deg. F (-56.7 deg. C)
 2. 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/m³)
 - c. Viscosity Brookfield 400,000 cPs.
 - d. Flash Point ASTM D 93 400 deg. F min. (232 deg. C)
- F. Surfacing:
1. Flashing Cap (Ply) Sheet:
 2. KEE-Stone HP: 60 mil thermoplastic, ketone ethylene ester (KEE) roofing membrane with polyester scrim. ASTM D 6754
 - a. Breaking Strength, ASTM D 751, Proc. B, Strip
 - 1) 375 lbf. (1,668 N)
 - b. Tear Strength, ASTM D 751
 - 1) 150 lbf. Min (667 N)
 - c. Elongation at Break (%), ASTM D 751, Proc. B, Strip
 - 1) 40.0%

END OF SECTION



LISTING INFORMATION OF
Garland Combustible Deck (AC-49)
SPEC ID: 42967

Garland Company, Inc. (The)
3800 East 91st Street
Cleveland, OH 44105
United States

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LISTING INFORMATION

Garland Combustible Deck (AC-49)

Slope: 2:12

1.) Optional vapor retarder: Garland VaporSmart SA Garland SA Roofing primer coverage of 1/3 to 1/2 gall/100ft² or Pro-Stop FR primer @ 1/2gal/100ft².

2.) Optional insulation: ½"Wood fiber, ½"glass fiber, polyisocyanurate, ½"perlite.

3.) ½" Dens-Deck. **Note:** when EPS insulation is applied over a metal or combustible deck, a thermal barrier complying with section 2603.4.1.5 of the IBC is required.

Note: When insulation is not used, 1-ply ASTM D4601 Type II Base Sheet or 1-ply VersiPly 40, mechanically fastened, is required. Insul Lock HR insulation adhesive can be used for insulation and cover board.

4.) Minimum 1 ply of Stress Base 80, Flex Base Plus 80, Flex base E 80, Stress Base 120, Flex Base Plus 120, Stress Base E 120, Flex Base 80, Flex Base 120, VersiPly 80, StressPly IV Smooth 120. Adhered with Weatherking, Green-Lock, Green-Lock Plus, Green-Lock Plus White or ASTM-D312 Type IV roofing asphalt OR Minimum 1 ply HPR Torchbase.

5.) Minimum 1 ply of KEE Stone Fleece Back HP Membrane adhered with KEE Lock Foam Adhesive or Kee-Lock Spatter Spray Adhesive.

Note: The component materials of each system must be applied in the order in which they are listed above.

Evaluated to the following:

The roof covering systems in this section have been evaluated for external fire resistance Classifications A, B, C as outlined by the following test methods:

- ASTM-E108 - American Society for Testing & Materials 'Standard Methods of Fire Test of Roof Covering'
- FM-4470, Section 5.1.A - Factory Mutual 'Standard Method of Test for Fire Resistance of Roof Covering Materials'
- ULC-S107 - Underwriters' Laboratories of Canada 'Standard Method of Tests for Fire Resistance of Roof Covering Materials'
- UL-790 - Underwriters' Laboratories Inc. 'Tests for Fire Resistance of Roof Covering Materials'

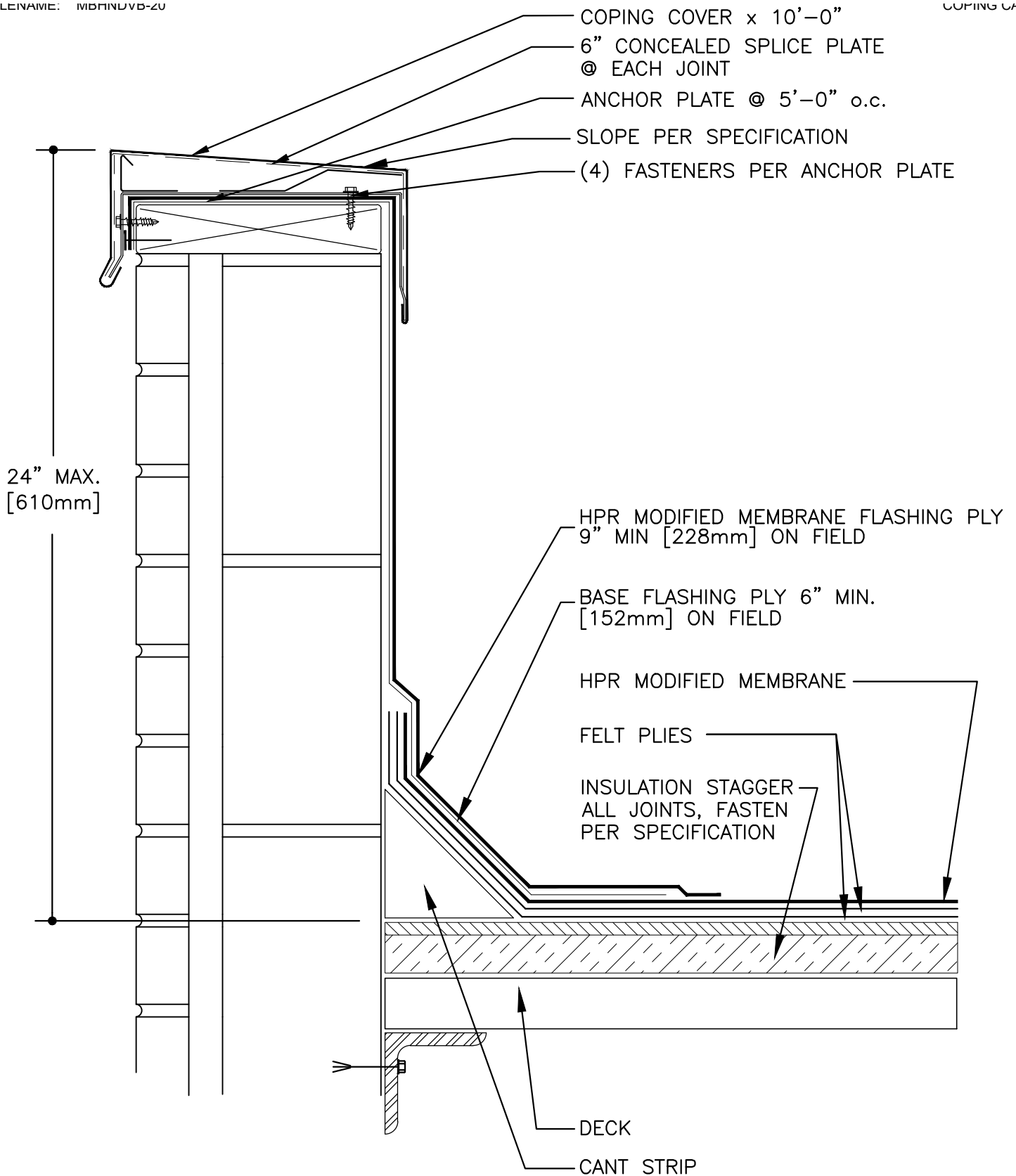
Each system listing identifies the deck substrate as either non-combustible or combustible. Systems evaluated for combustible decks will provide the same ratings when applied over non-combustible decks. Unless otherwise noted in individual listings, combustible decks shall be sheathed with a minimum 15/32" veneer plywood or minimum 7/16" non-veneer APA rated sheathing panel (oriented strand board panels, structural particleboard panels, composite panels or wafer-board panels) or 3/4" thick solid wood sheathing boards. The component materials of each system must be applied in the order in which they are listed. All components of the system must be listed for external fire exposure by an agency acceptable to the AHJ.

Some Roof Covering Systems have been evaluated for other performance characteristics, in addition to external fire exposure. Where applicable, such additional performance characteristics are noted within the specific listing.

In all cases, manufacturer's instructions should be consulted for installation procedures and details not covered by these listings.

Listed Materials are identified by a label or marking bearing the wording, "Listed Roofing Component", a reference number or code and the WHI Certification Mark.

Attribute	Value
Criteria	FM 4470 (1986) Section 5.1.1
Criteria	ASTM E108 (2017)
Criteria	UL 790 (2014)
Criteria	ASTM E108 (2020)
CSI Code	07 50 00 Membrane Roofing
Listing Section	ROOF COVERING SYSTEMS
Roofing: Deck Type	Combustible
Roofing: Fire Rating	Class A
Roofing: Maximum Slope	2:12
Spec ID	42967



ALL PLIES SET IN BITUMEN SEE
SPECIFICATIONS FOR SURFACING



THE GARLAND COMPANY, INC.

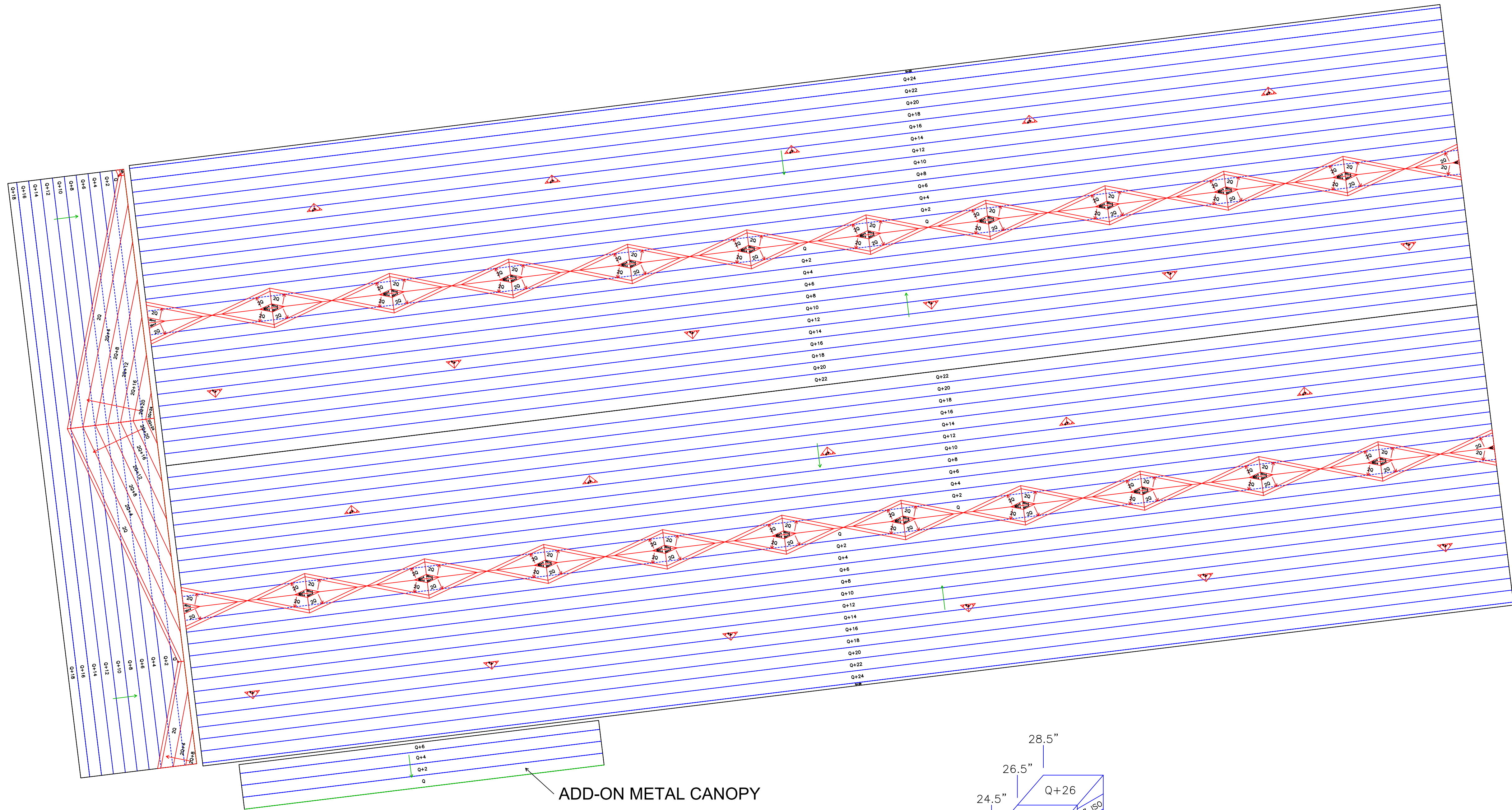
GARLAND CANADA, INC.

THE GARLAND COMPANY UK, LTD

DETAIL:

COPING CAP

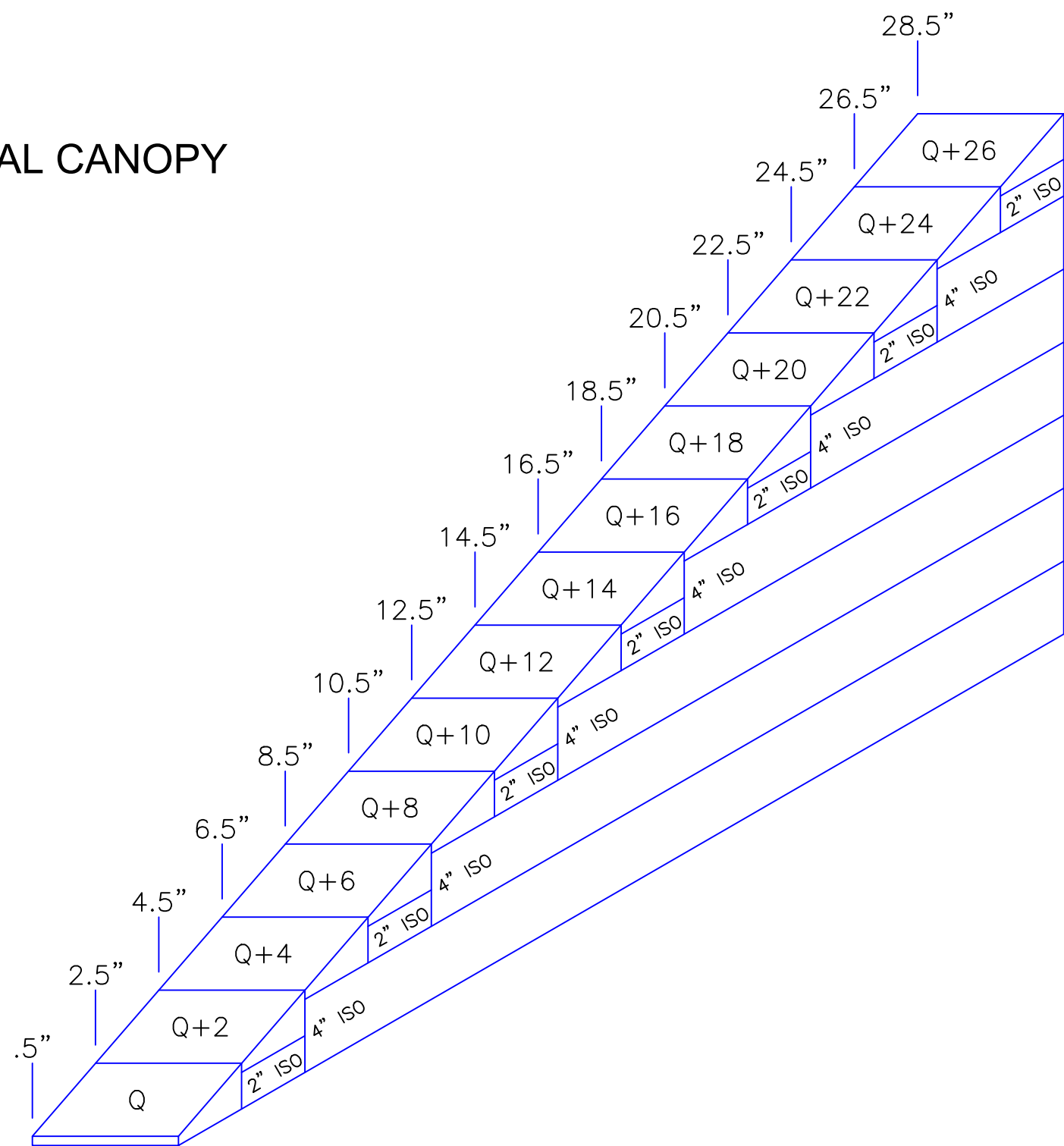
GENERIC DECK



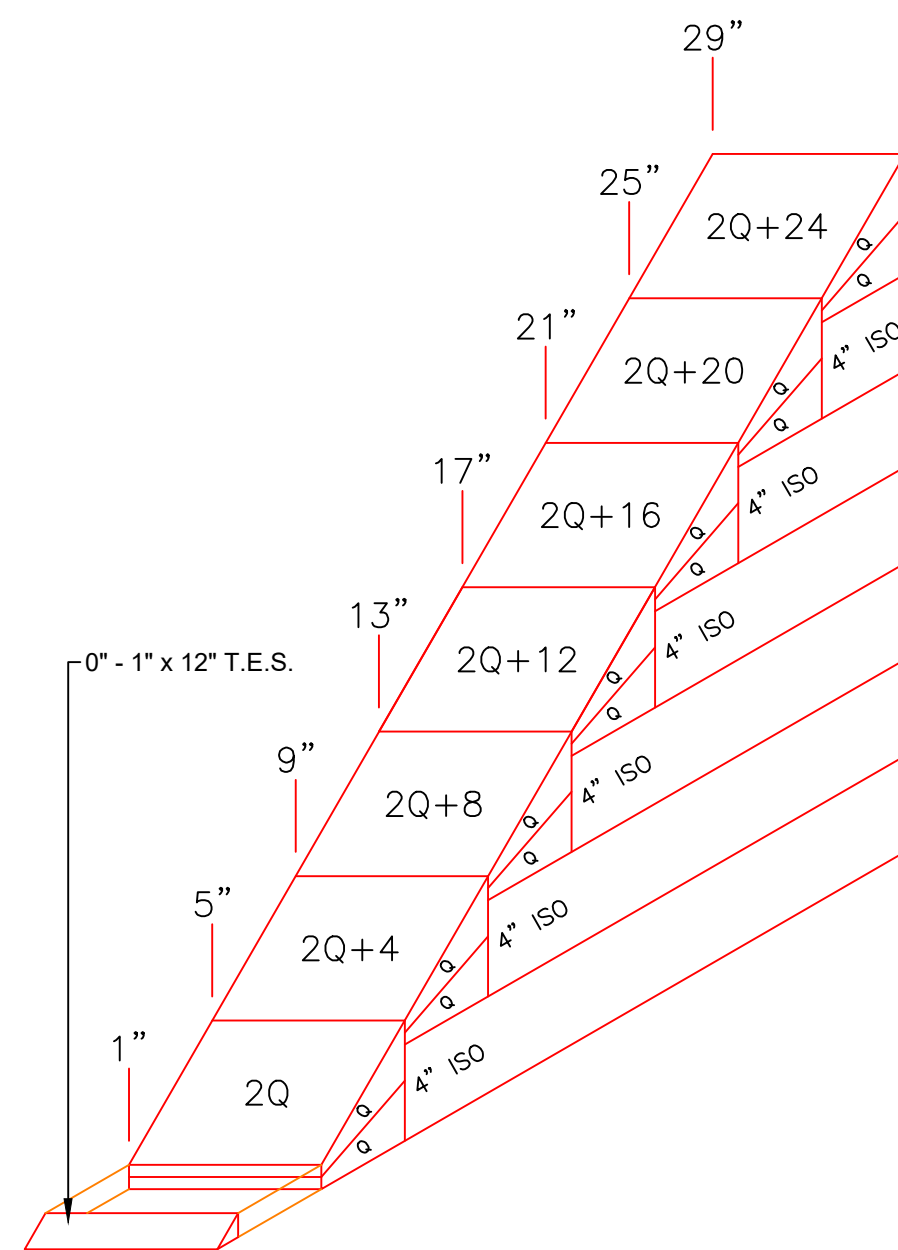
 **TAPERED ROOF PLAN**
SCALE- 1"=20'

TAPERED PANELS		
PANEL	DIMENSION	SLOPE
Q	1/2" - 2 1/2"	1/2"
2Q	1" - 5"	1"
Double stack Q panels for 1" slope		

 **TAPER PANELS**



 **TAPERED SECTIONS**



 **TAPERED CRICKET**

DISCLAIMER:
BEACON ENGINEERING DID NOT PERFORM AND OR CONDUCT ANY DESIGN OR ENGINEERING ANALYSIS IN CONJUNCTION WITH THE PREPARATION OF THESE DRAWINGS. THESE DRAWINGS REPRESENT A RECITATION AND GRAPHIC DEPICTION OF THE MANUFACTURERS SPECIFICATIONS AND THE DESIGN DETAILS ONLY. THESE DRAWINGS SHOULD NOT AND ARE NOT TO BE CONSTRUED AS CONSTITUTING DESIGN ERECTION DRAWINGS, SPECIFICATIONS OR DESIGN DETAILS PREPARED OR APPROVED BY BEACON ENGINEERING. THE ARCHITECT'S/ENGINEER'S APPROVED DESIGN OF THE ROOF IS THE CONTROLLING DOCUMENT. CONTRACTOR REMAINS RESPONSIBLE FOR THE INSTALLATION IN COMPLIANCE WITH THAT APPROVED DESIGN.

NOTES:
INSTALLER MUST VERIFY ALL FIELD DIMENSIONS, DRAIN AND SCUPPER LOCATIONS AND PRODUCT SPECIFICATIONS FOR ACCURACY. MATERIAL WILL BE SHIPPED TO MATCH THE SPECIFICATIONS AND QUANTITIES NOTED HEREON. CONTRACTOR IS RESPONSIBLE FOR VERIFICATION OF ALL FIELD CONDITIONS AND COMPLIANCE WITH BUILDING CODE ISSUES.
THE TAPERED LAYOUT ILLUSTRATED ON THIS DRAWING REQUIRES THE INSTALLER TO REUSE PARTIAL PIECES OF INSULATION. THEREFORE, DISCARDING MORE THAN HALF OF A USEABLE PIECE OF TAPERED INSULATION AND/OR ONE QUARTER OF A PIECE OF FLAT INSULATION WILL RESULT IN A SHORTAGE OF MATERIAL FOR YOUR TAPERED SYSTEM.

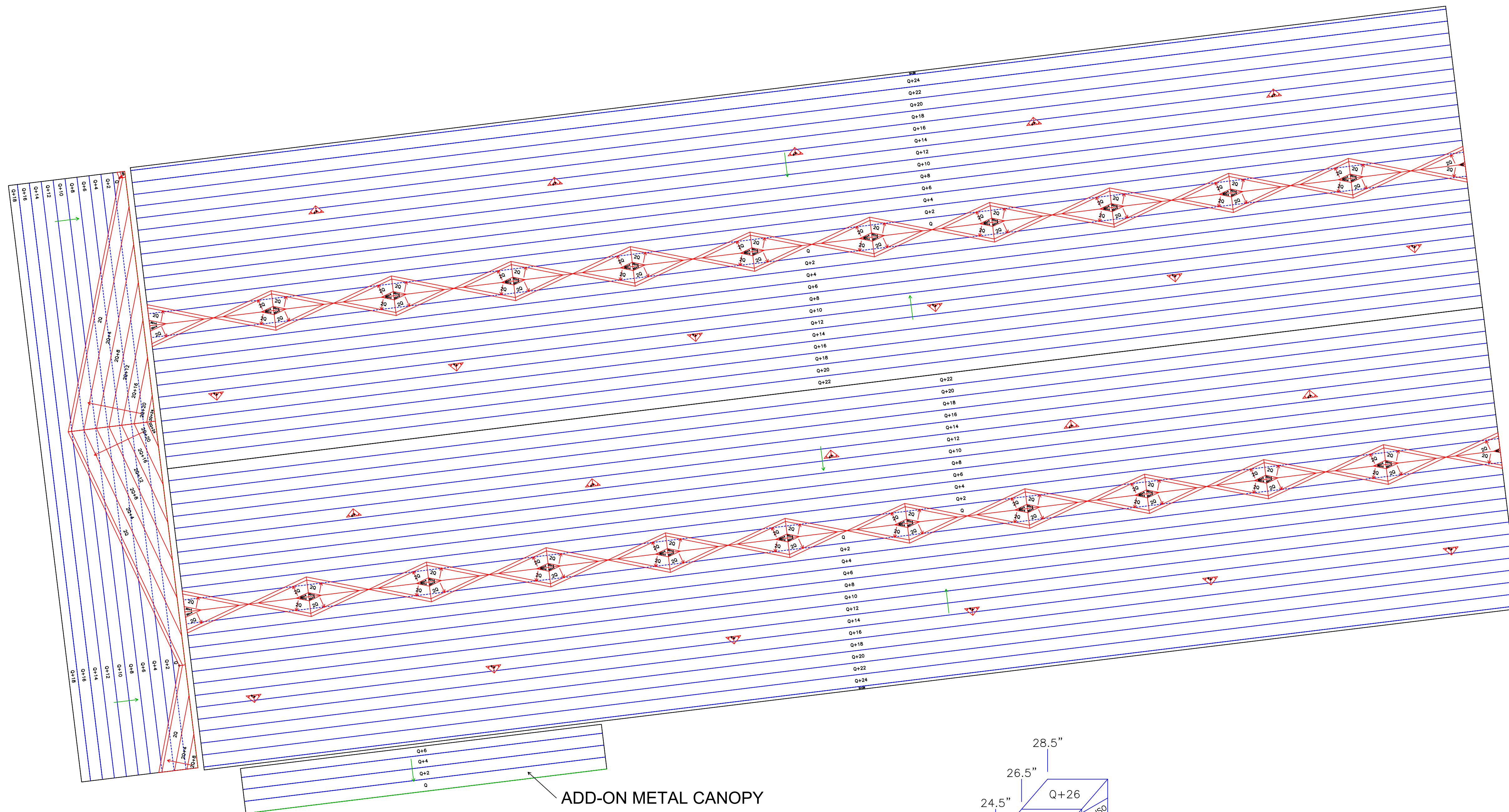


Engineering Services
571 Boston Mills Rd. Suite 400
Hudson, OH 44236
(330)425-0199

632 NAPA AVE.
SAN LUIS OBISPO, CALIFORNIA
THE GARLAND COMPANY

PROJECT:
PROJECT NOTES:

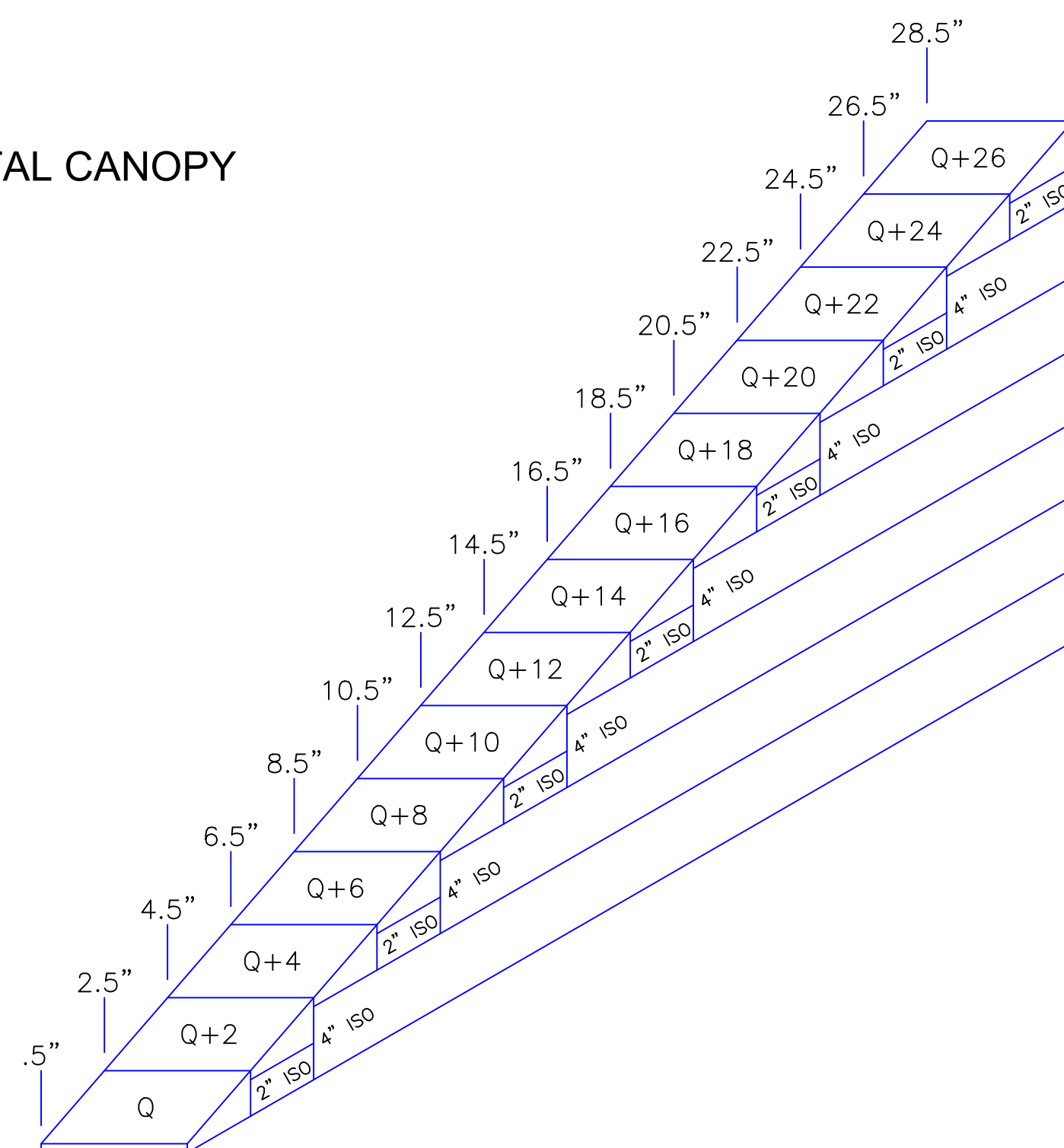
TAPER SPECS
TAPERED MATERIAL: Polyiso 20psi
TAPERED SLOPE: 1/2"
MINIMUM THICKNESS: 0.50"
MAXIMUM THICKNESS: 27"
R-VALUE (AVG/MIN): AVG R-77.11
CRICKET SPECS
CRICKET MATERIAL: Polyiso 20psi
CRICKET SLOPE: 1"
MINIMUM THICKNESS: 0.00" w/TES
MAXIMUM THICKNESS: 27.75"
DATE: 12/9/2025
PROJECT NUMBER: F25-04616-R3_drawing
QUOTE NUMBER: Q250217-264
DRAWN BY: B. Billingsley
DRAWING PAGES: 1 OF 1



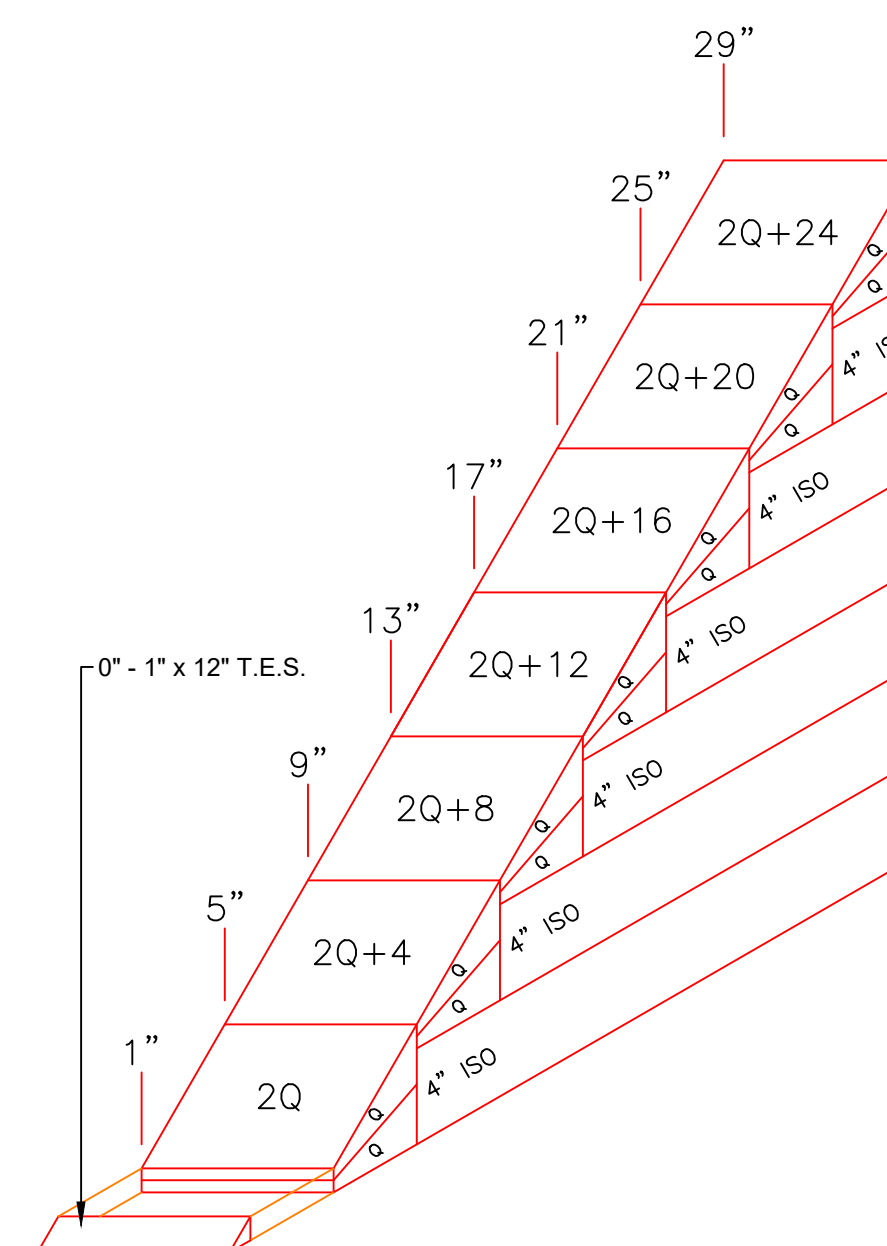
 **TAPERED ROOF PLAN**
SCALE- 1"=20'

TAPERED PANELS		
PANEL	DIMENSION	SLOPE
Q	1/2" - 2 1/2"	1/2"
2Q	1" - 5"	1"
Double stack Q panels for 1" slope		

 **TAPER PANELS**



 **TAPERED SECTIONS**



 **TAPERED CRICKET**

DISCLAIMER:
BEACON ENGINEERING DID NOT PERFORM AND OR CONDUCT ANY DESIGN OR ENGINEERING ANALYSIS IN CONJUNCTION WITH THE PREPARATION OF THESE DRAWINGS. THESE DRAWINGS REPRESENT A RECITATION AND GRAPHIC DEPICTION OF THE MANUFACTURERS SPECIFICATIONS AND THE DESIGN DETAILS ONLY. THESE DRAWINGS SHOULD NOT AND ARE NOT TO BE CONSTRUED AS CONSTITUTING DESIGN ERECTION DRAWINGS, SPECIFICATIONS OR DESIGN DETAILS PREPARED OR APPROVED BY BEACON ENGINEERING. THE ARCHITECT'S/ENGINEER'S APPROVED DESIGN OF THE ROOF IS THE CONTROLLING DOCUMENT. CONTRACTOR REMAINS RESPONSIBLE FOR THE INSTALLATION IN COMPLIANCE WITH THAT APPROVED DESIGN.

NOTES:
INSTALLER MUST VERIFY ALL FIELD DIMENSIONS, DRAIN AND SCUPPER LOCATIONS AND PRODUCT SPECIFICATIONS FOR ACCURACY. MATERIAL WILL BE SHIPPED TO MATCH THE SPECIFICATIONS AND QUANTITIES NOTED HEREON. CONTRACTOR IS RESPONSIBLE FOR VERIFICATION OF ALL FIELD CONDITIONS AND COMPLIANCE WITH BUILDING CODE ISSUES.
THE TAPERED LAYOUT ILLUSTRATED ON THIS DRAWING REQUIRES THE INSTALLER TO REUSE PARTIAL PIECES OF INSULATION. THEREFORE, DISCARDING MORE THAN HALF OF A USEABLE PIECE OF TAPERED INSULATION AND/OR ONE QUARTER OF A PIECE OF FLAT INSULATION WILL RESULT IN A SHORTAGE OF MATERIAL FOR YOUR TAPERED SYSTEM.

**BEACON**
Engineering Services

571 Boston Mills Rd, Suite 400
Hudson, OH 44236
(330)425-0199

632 NAPA AVE.
SAN LUIS OBISPO, CALIFORNIA

THE GARLAND COMPANY

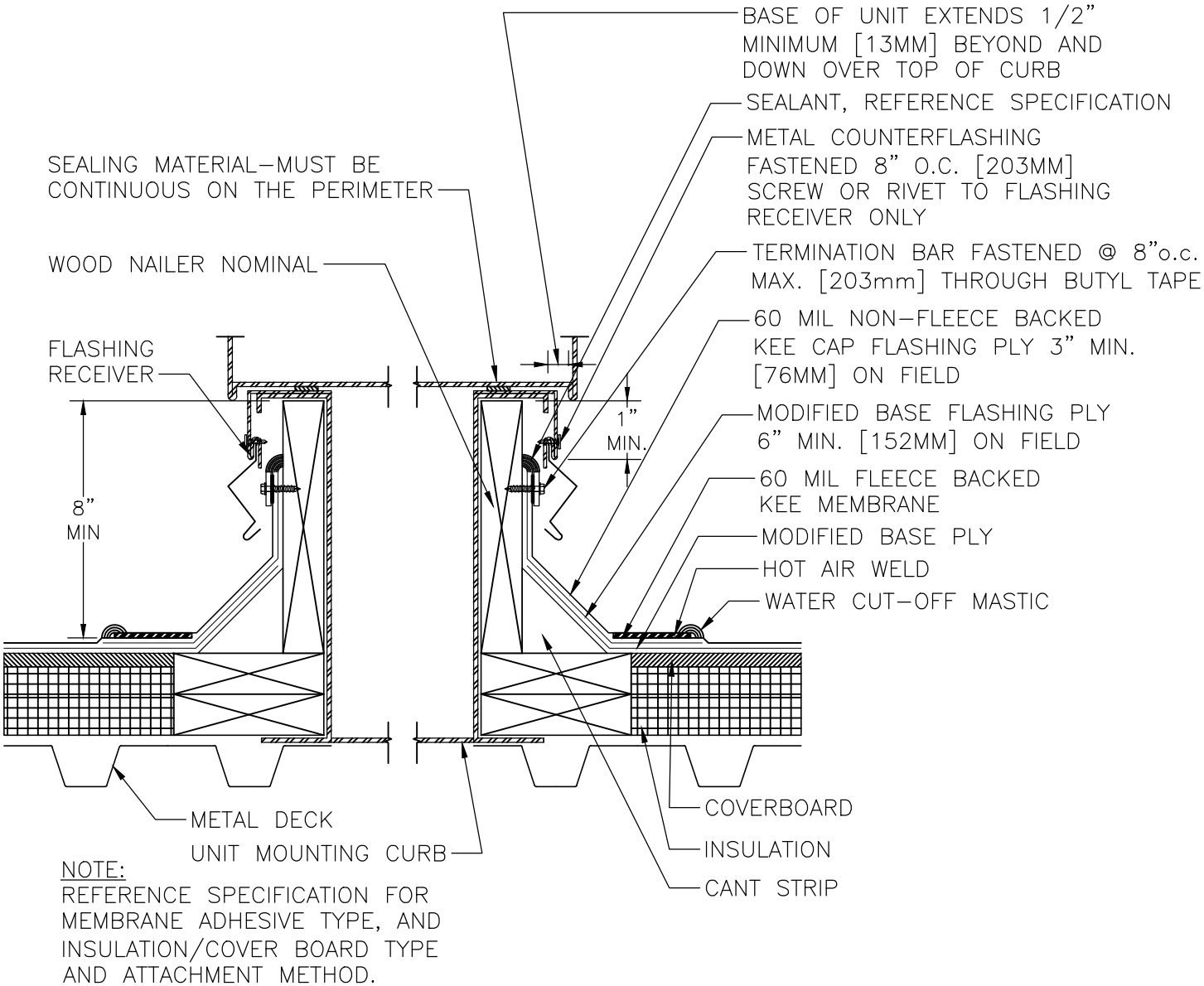
PROJECT:
ROOFING CONTRACTOR:

PROJECT NOTES:

TAPER SPECS
TAPERED MATERIAL: Polyiso 20psi
TAPERED SLOPE: 1/2"
MINIMUM THICKNESS: 0.50"
MAXIMUM THICKNESS: 27"
R-VALUE (AVG/MIN): AVG R-77.11

CRICKET SPECS
CRICKET MATERIAL: Polyiso 20psi
CRICKET SLOPE: 1"
MINIMUM THICKNESS: 0.00" w/TES
MAXIMUM THICKNESS: 27.75"

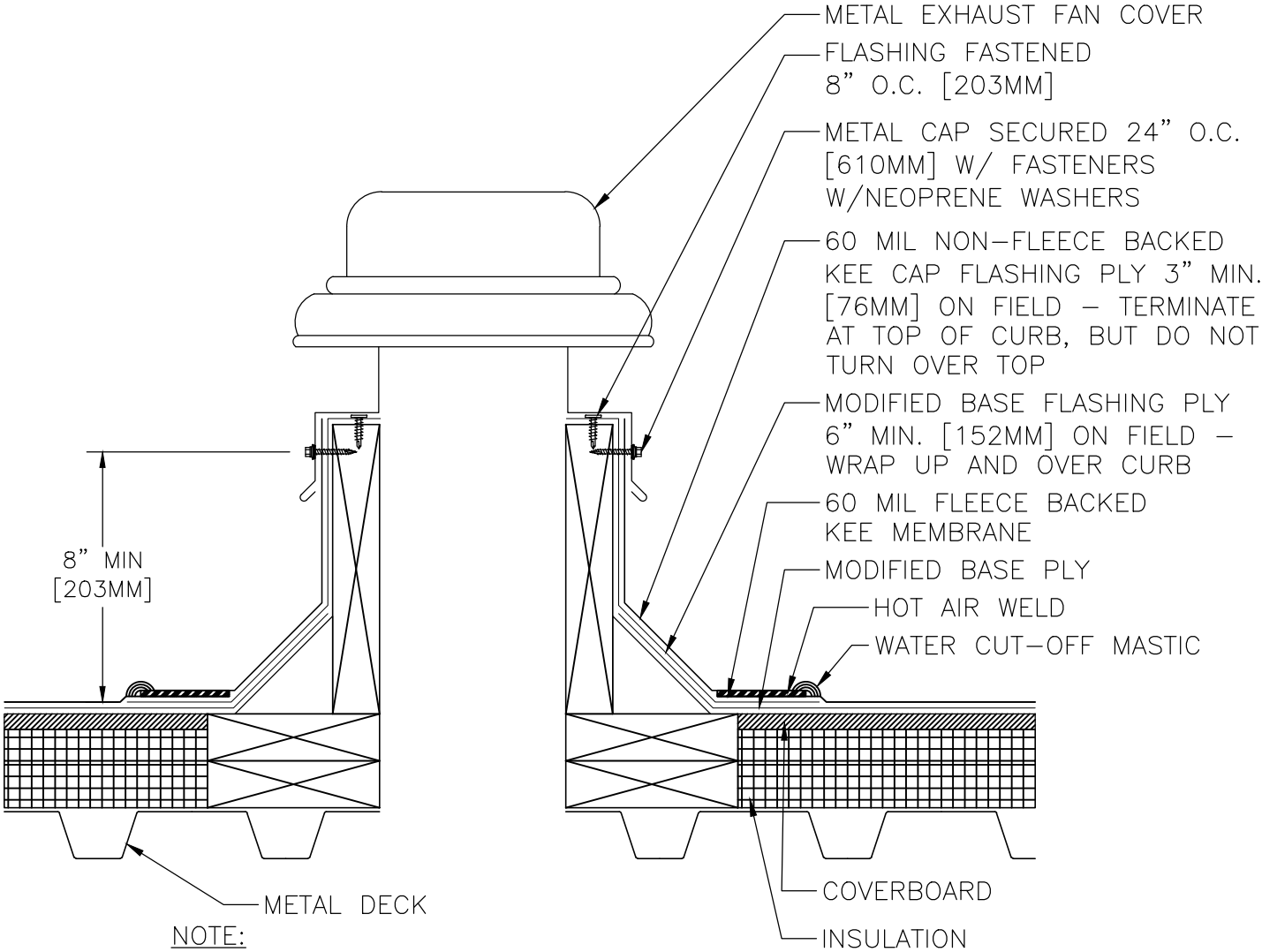
DATE: 2/17/2025
PROJECT NUMBER: F25-04616-R3_drawing
QUOTE NUMBER: Q250217-264
DRAWN BY: B. Billingsley
DRAWING PAGES: 1 OF 1



DRAWINGS ON 8½"x11 TITLE BLOCKS ARE NOT TO SCALE.

CURB DETAIL / AIR HANDLING STATION

	THE GARLAND COMPANY, INC.		PROJECT:	
	GARLAND CANADA, INC.		CUSTOMER:	
	THE GARLAND COMPANY UK, LTD		ARCHITECT:	
			REPRESENTATIVE:	
			DATE:	SHT: OF



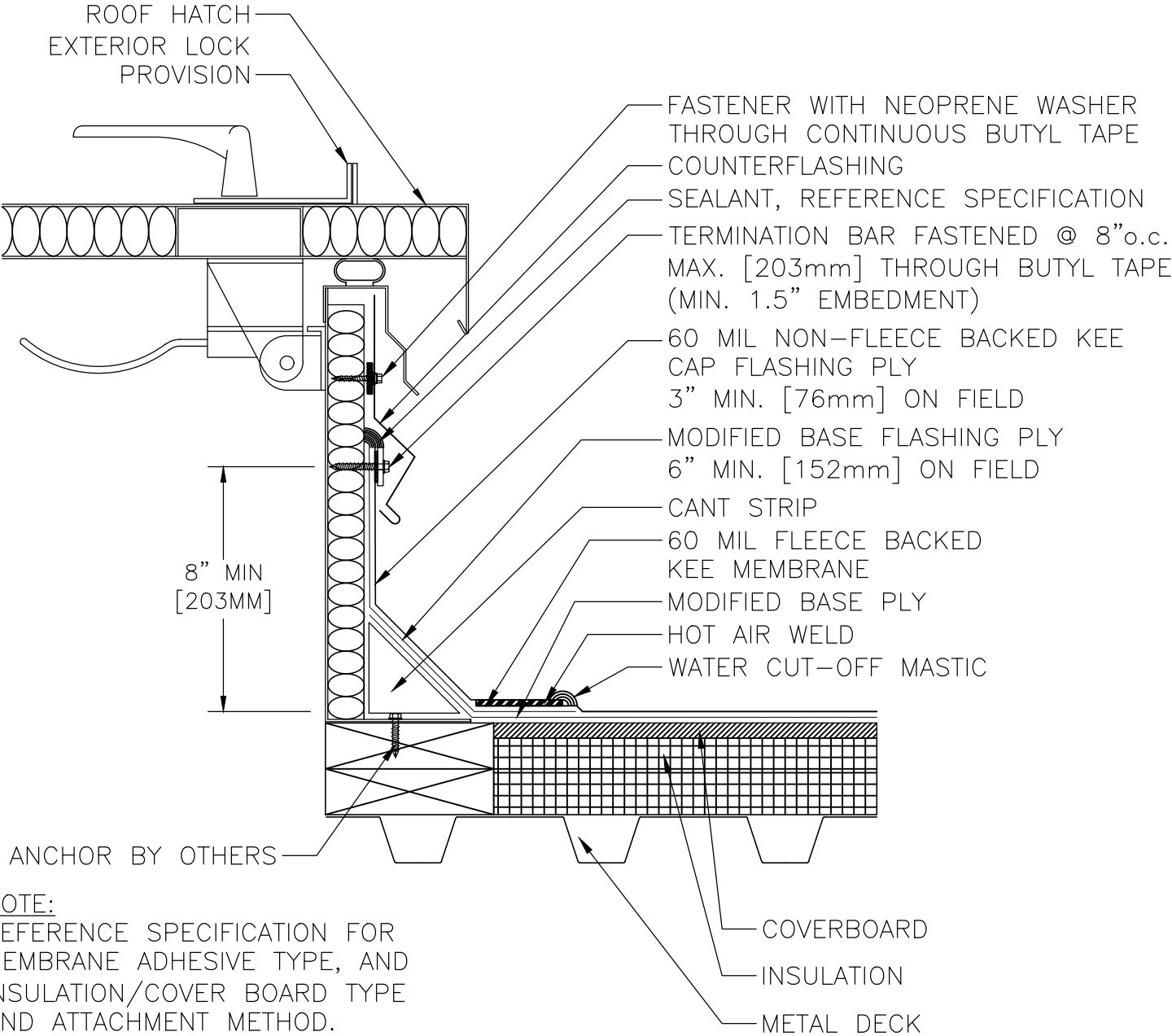
NOTE:
REFERENCE SPECIFICATION FOR
MEMBRANE ADHESIVE TYPE, AND
INSULATION/COVER BOARD TYPE
AND ATTACHMENT METHOD.

DRAWINGS ON 8½"x11 TITLE BLOCKS ARE NOT TO SCALE.

EXHAUST FAN

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

THE GARLAND COMPANY, INC.
GARLAND CANADA, INC.
THE GARLAND COMPANY UK, LTD



NOTE:
REFERENCE SPECIFICATION FOR
MEMBRANE ADHESIVE TYPE, AND
INSULATION/COVER BOARD TYPE
AND ATTACHMENT METHOD.

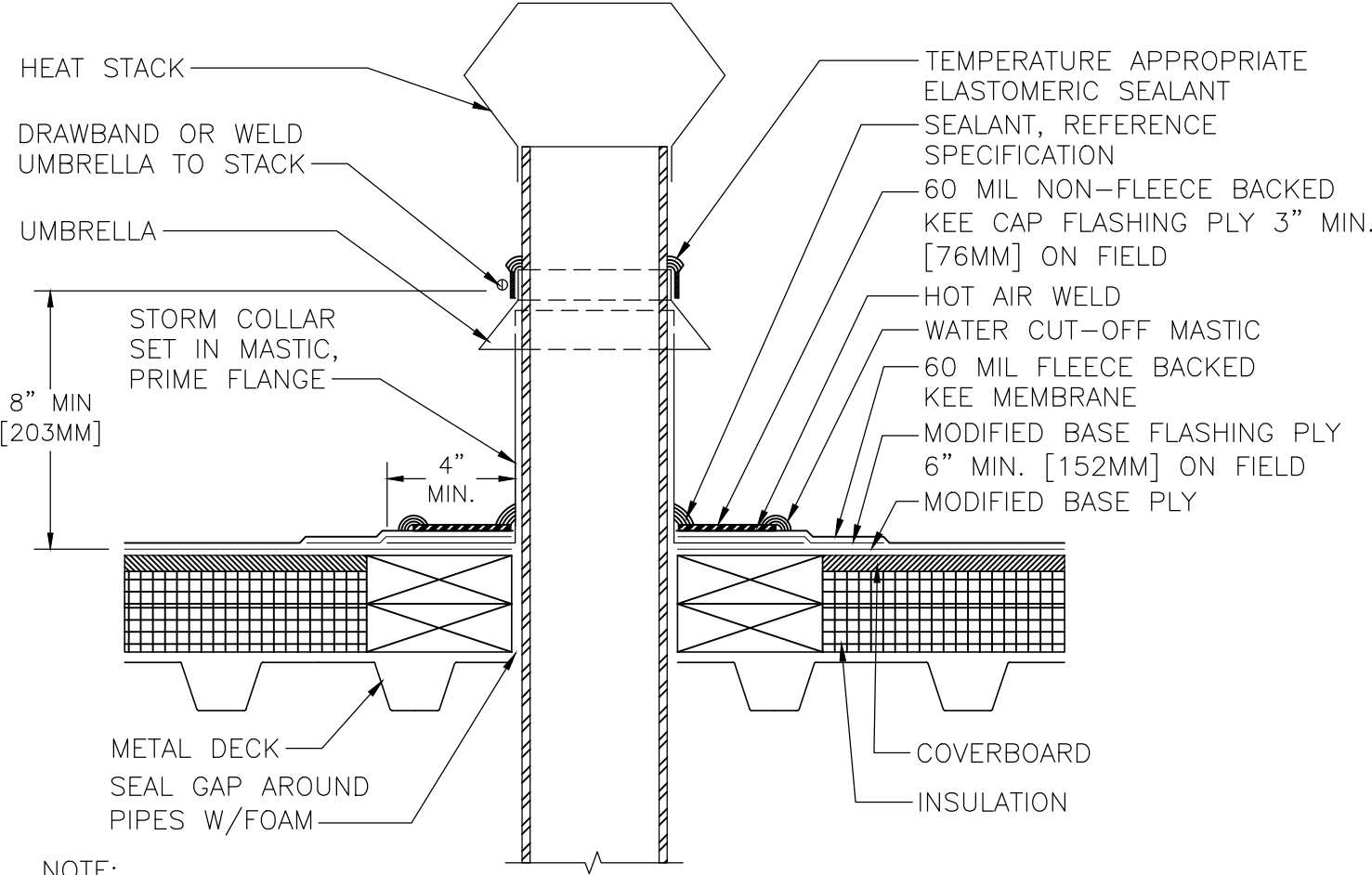
DRAWINGS ON 8½"x11 TITLE BLOCKS ARE NOT TO SCALE.

HATCH DETAIL



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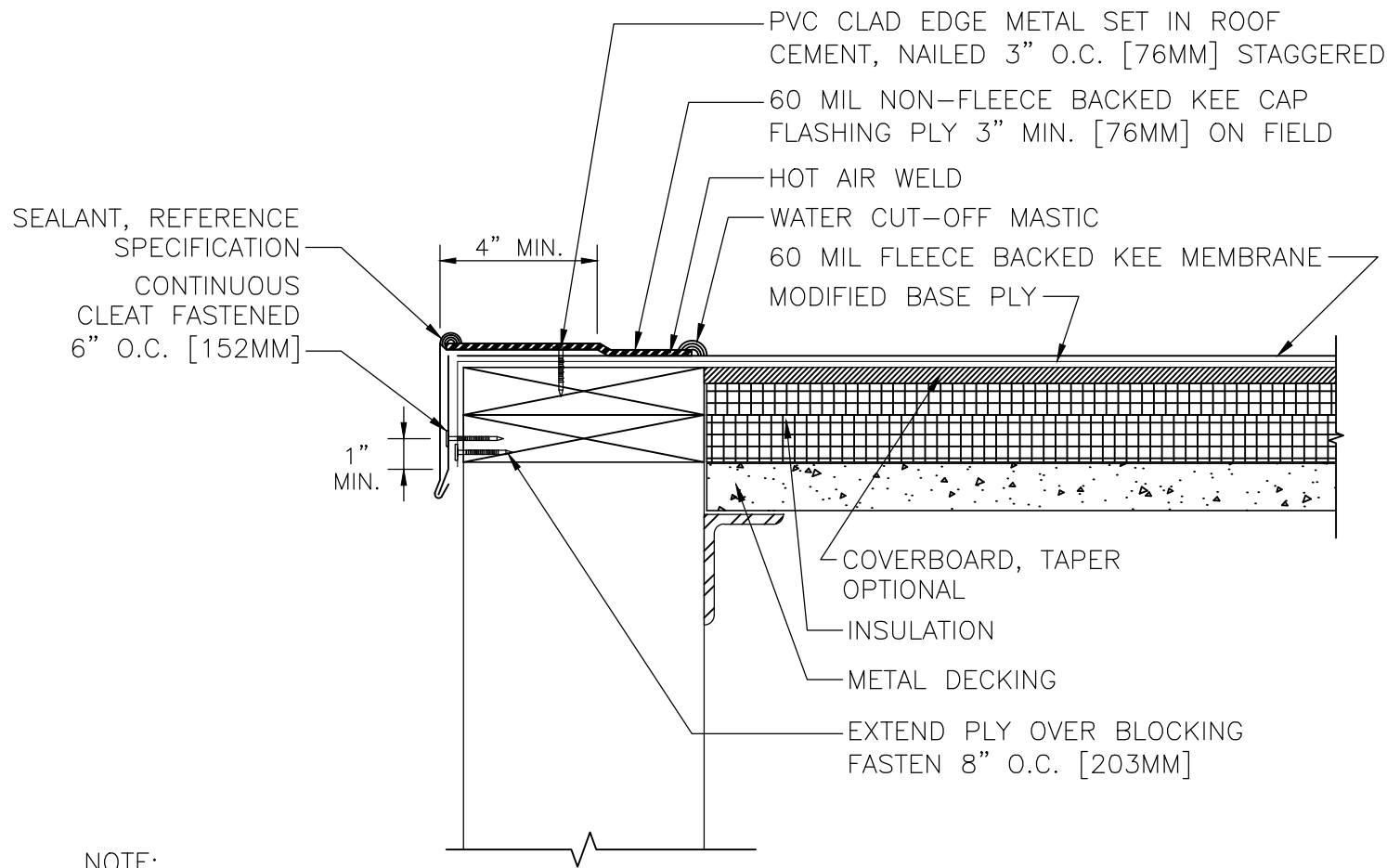
PROJECT:	
CUSTOMER:	
ARCHITECT:	
REPRESENTATIVE:	
DATE:	SHT: OF



NOTE:
REFERENCE SPECIFICATION FOR
MEMBRANE ADHESIVE TYPE, AND
INSULATION/COVER BOARD TYPE
AND ATTACHMENT METHOD.

DRAWINGS ON 8½"x11 TITLE BLOCKS ARE NOT TO SCALE.

HEAT STACK			
	THE GARLAND COMPANY, INC.		
	GARLAND CANADA, INC.		
	THE GARLAND COMPANY UK, LTD		
	PROJECT:		
	CUSTOMER:		
ARCHITECT:			
REPRESENTATIVE:			
DATE:		SHT:	OF

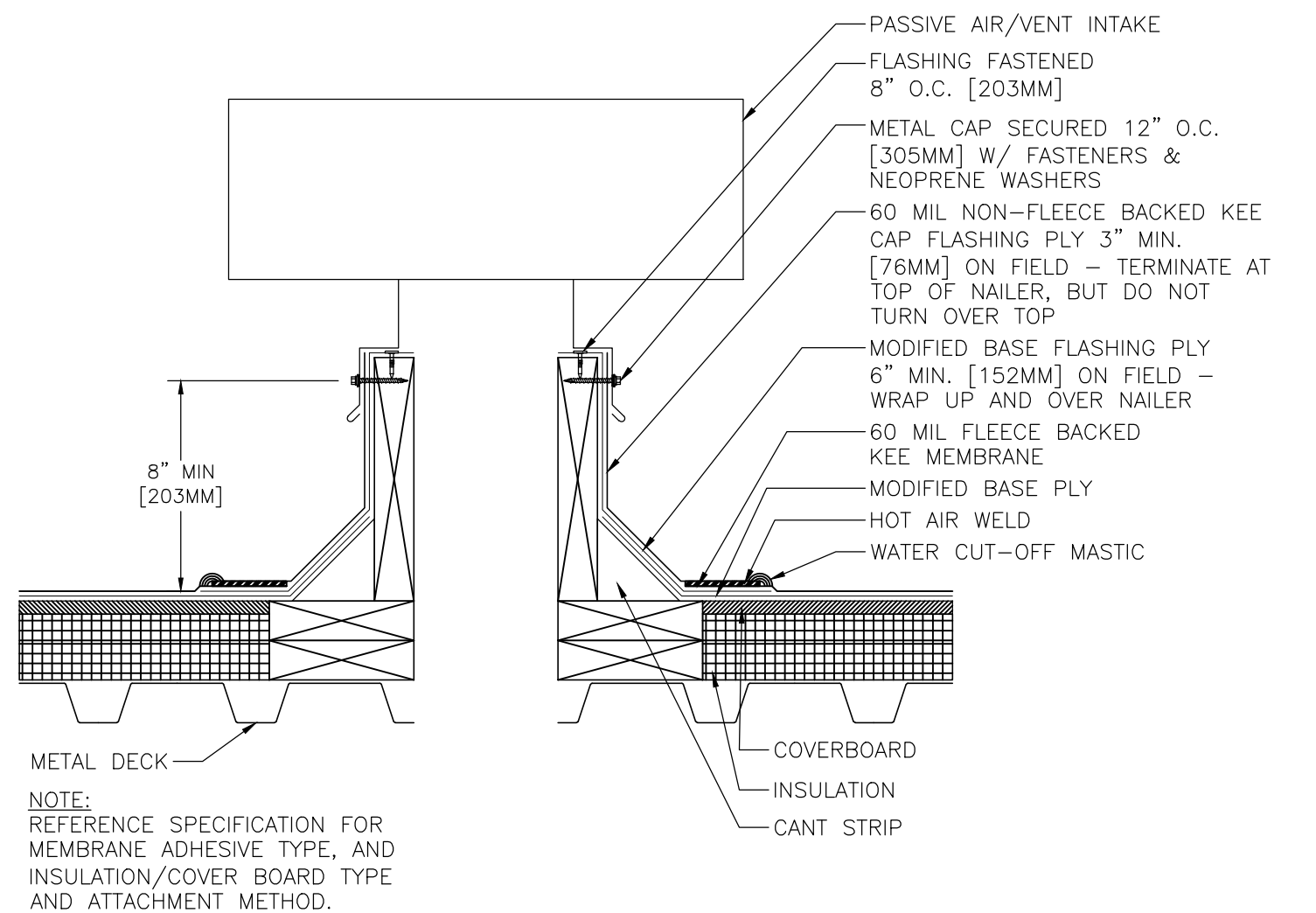


NOTE:
REFERENCE SPECIFICATION FOR
MEMBRANE ADHESIVE TYPE, AND
INSULATION/COVER BOARD TYPE
AND ATTACHMENT METHOD.

DRAWINGS ON 8½"x11 TITLE BLOCKS ARE NOT TO SCALE.

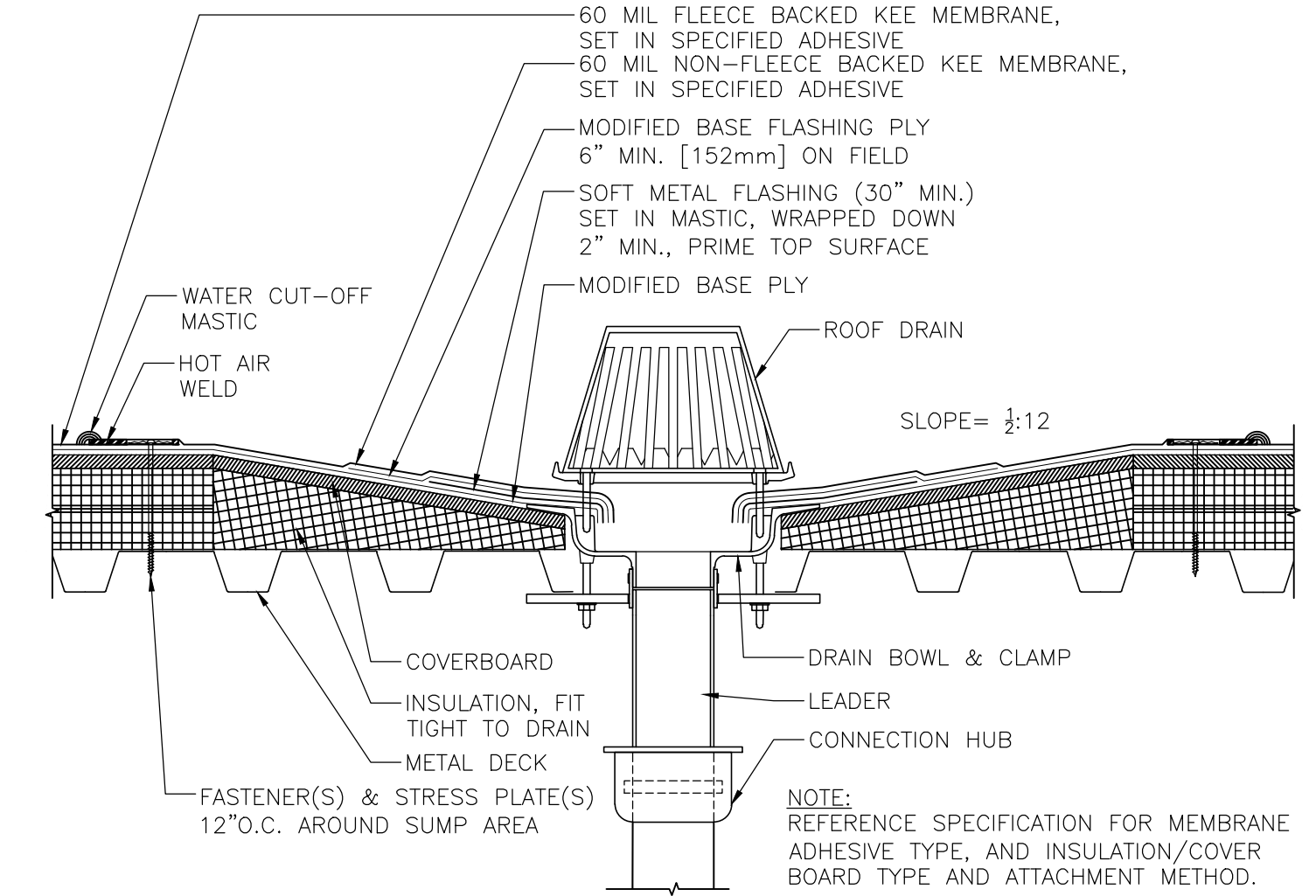
METAL EDGE - DRIP EDGE (ALTERNATE) w/PVC CLAD EDGE METAL

	THE GARLAND COMPANY, INC.		PROJECT:	
	GARLAND CANADA, INC.		CUSTOMER:	
	THE GARLAND COMPANY UK, LTD		ARCHITECT:	
			REPRESENTATIVE:	
			DATE:	SHT: OF



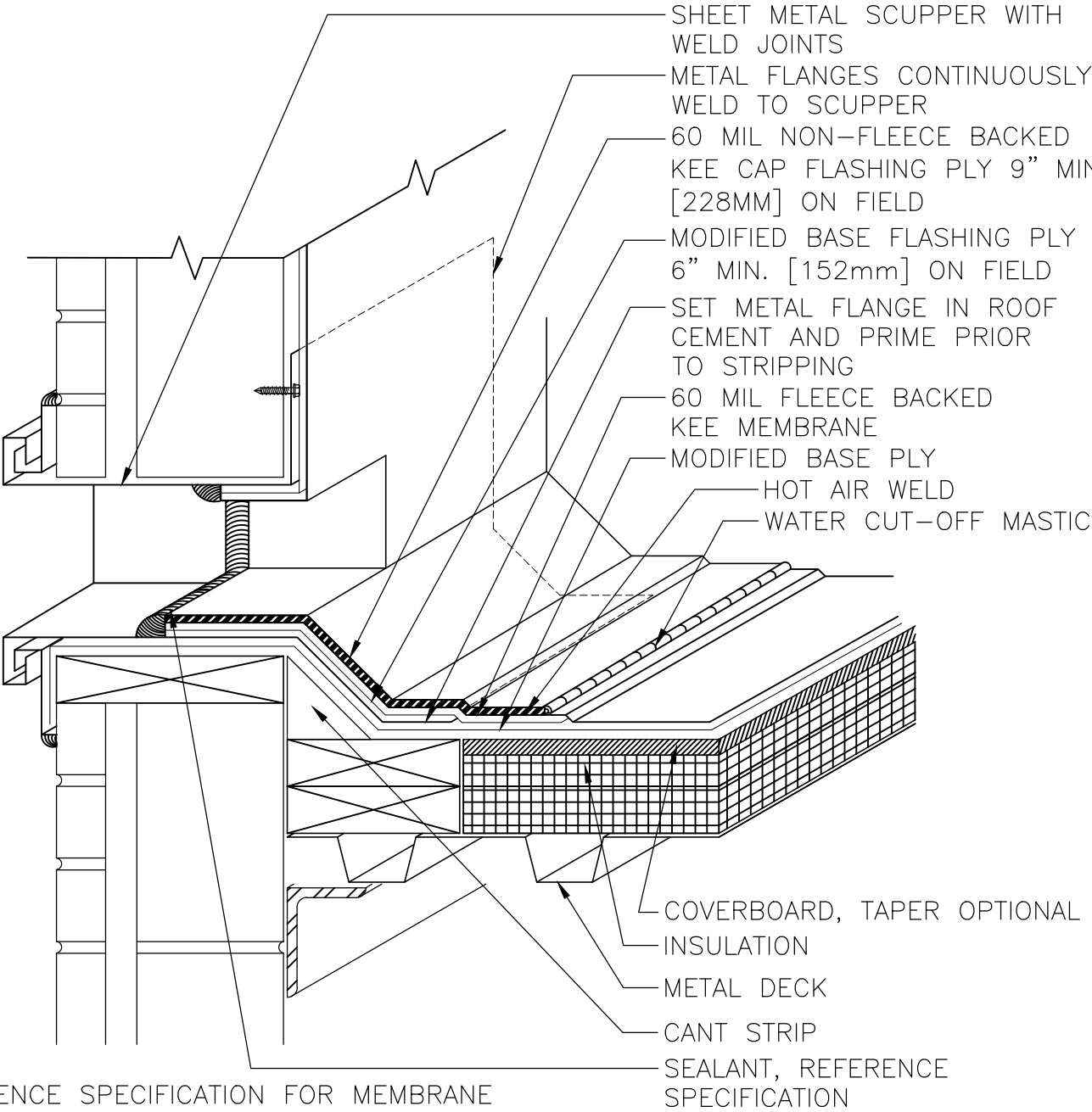
DRAWINGS ON 8½"x11 TITLE BLOCKS ARE NOT TO SCALE.

PASSIVE AIR / VENT INTAKE			
	PROJECT:		
	CUSTOMER:		
	ARCHITECT:		
	REPRESENTATIVE:		
	DATE:	SHT:	OF



DRAWINGS ON 8 1/2"x11 TITLE BLOCKS ARE NOT TO SCALE.

ROOF DRAIN		
	PROJECT:	
	CUSTOMER:	
	ARCHITECT:	
	REPRESENTATIVE:	
	DATE:	SHT:



NOTE:
REFERENCE SPECIFICATION FOR MEMBRANE
ADHESIVE TYPE, AND INSULATION/COVER BOARD
TYPE AND ATTACHMENT METHOD.

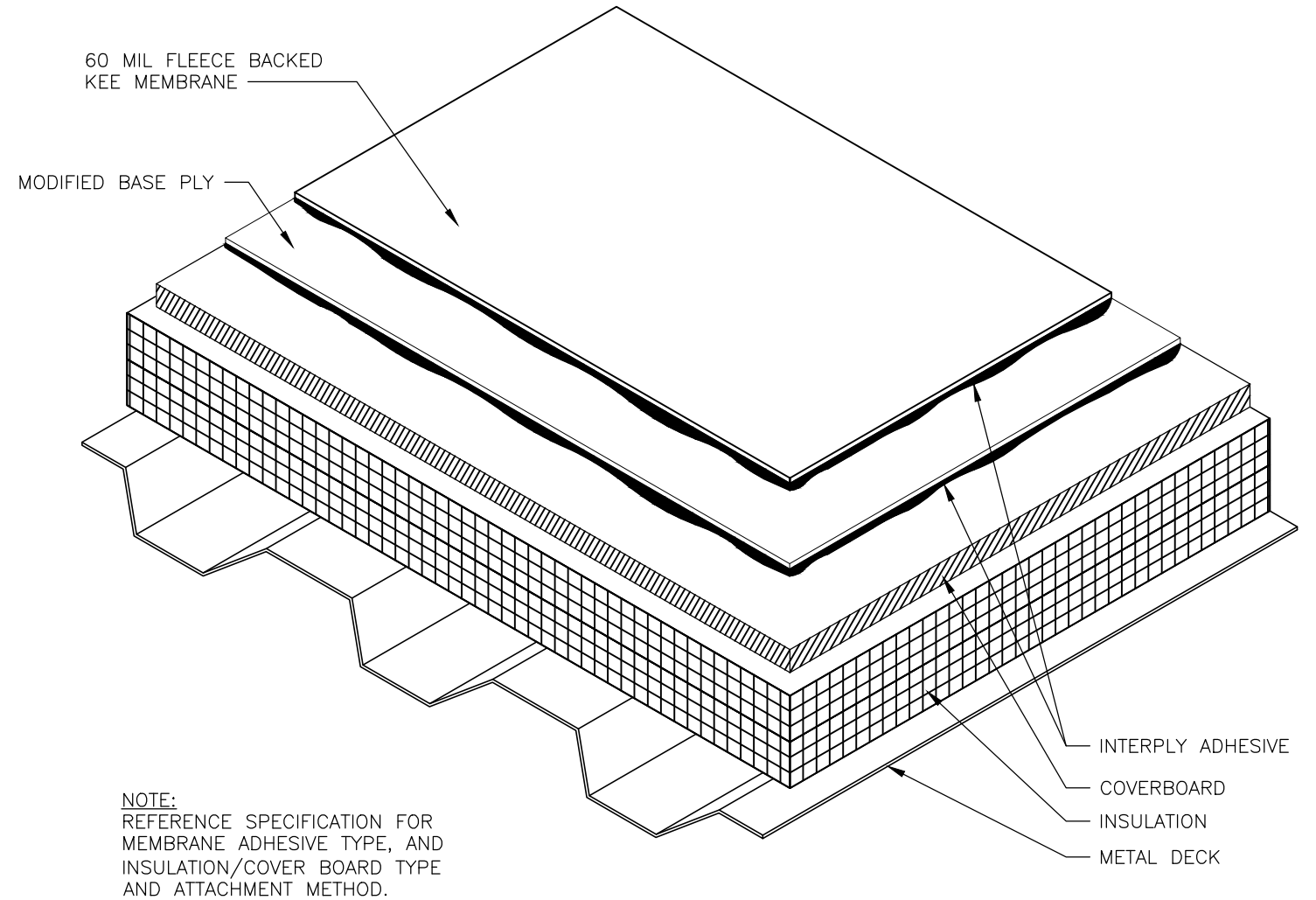
DRAWINGS ON 8½"x11 TITLE BLOCKS ARE NOT TO SCALE.

SCUPPER THROUGHWALL - OVERFLOW



THE GARLAND COMPANY, INC.
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PROJECT:	
CUSTOMER:	
ARCHITECT:	
REPRESENTATIVE:	
DATE:	SHT: OF



DRAWINGS ON 8½"x11 TITLE BLOCKS ARE NOT TO SCALE.

TYPICAL ROOF SYSTEM SURFACE

	THE GARLAND COMPANY, INC.		PROJECT:	
	GARLAND CANADA, INC.		CUSTOMER:	
	THE GARLAND COMPANY UK, LTD		ARCHITECT:	
			REPRESENTATIVE:	
			DATE:	SHT: OF



THE GARLAND COMPANY, INC.

HIGH-PERFORMANCE BUILDING ENVELOPE SOLUTIONS

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P. (216) 641-7500 · F. (216) 641-0633 · 800-321-9336 · www.garlandco.com

Preliminary Pressure Calculations

Date 2/6/2025 EBLANCO 7.3
Sales Rep Jason Moronnolte
City San Luis Obispo
State CA

Project Name Camp SLO Warehouse
Roof Sections Entire Warehouse Roof

Design Code ASCE 7-16 ASD
Exposure Category C
Risk Cat. , Importance Factor IV , 1
Wind Speed 103 mph
Design Roof Height: 20 ft
Minimum Building Width: 200 ft
Roof Pitch (X, Y) 0.5 : 12
Roof Angle 2.39 deg
Parapet ≥ 36" Entire Roof No

Base Velocity Pressure 12.5 psf Gcpi = 0.55
Roof Type Gable

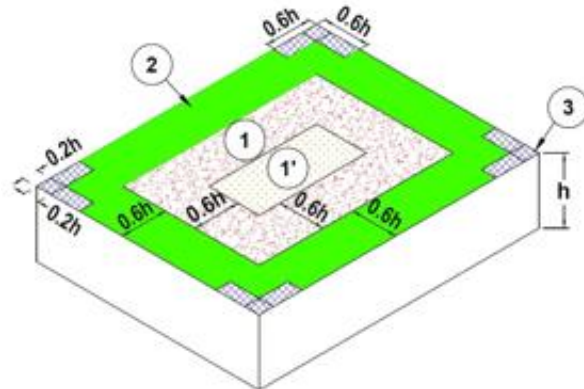
Edge Zones
Zone 1 width = 12'-0"
Zone 2 width = 12'-0"
Zone 3 width = 4'-0"
Zone 3 length = 12'-0"
=
=

Deck Type Steel

Notes:



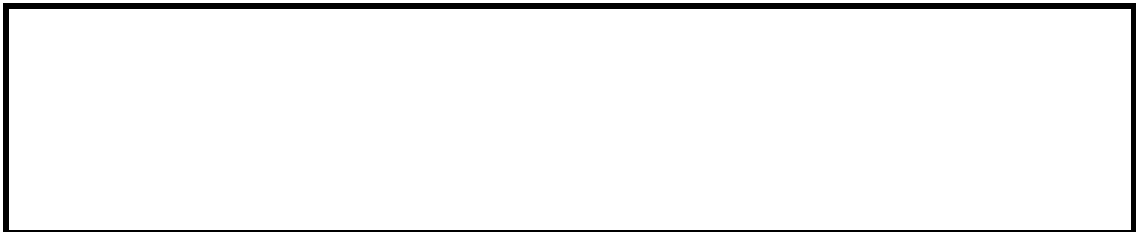
Zone Image



Zone Pressures (psf)

Zone 1'	Zone 1	Zone 2	Zone 3			Wall Perimeter	Wall Corner
18.1	28.1	35.6	46.8			20.6	24.4

Notes:





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Coping

Date	2/6/2025
Sales Rep	Jason Moronnolte
City	San Luis Obispo
State	CA

Project Name	Camp SLO Warehouse
Roof Sections	Entire Warehouse Roof

ANSI/SPRI ES-1 COPING PRELIMINARY DESIGN

Project Data

Design Wind Speed:	103.00	mph
Roof Eave Height:	20.00	feet
	+	
Tallest Parapet:	3.00	feet
Metal Edge Eave Height:	23.00	feet
Exposure Category:	C	
Importance Classification:	IV	

Design Wind Pressure ASCE 7-16 ASD

Basic Velocity Pressure:	12.87	psf
Horizontal Design Pressure:	25.09	psf
Vert. Design Pressure:	48.24	psf

ES-1 Tested Coping System

Product Designation: ES-C040-16-60-16

System Description: R-Mer Edge Snap on Coping 16" x 0.040" Alum w/ 16 GA Anchor Chairs at 60" o.c.

Maximum Tested Front Load:	50.9	psf
Max. Vertical Front Dim.:	6	inches
Maximum Tested Top Load:	130	psf
Max. Vertical Width:	16.00	inches
Maximum Tested Rear Load:	111.5	psf
Max. Vertical Rear Dim.:	4.00	inches



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Fascia

Date	2/6/2025
Sales Rep	Jason Moronnolte
City	San Luis Obispo
State	CA

Project Name	Camp SLO Warehouse
Roof Sections	Entire Warehouse Roof

ANSI/SPRI ES-1 FASCIA PRELIMINARY DESIGN

Project Data

Design Wind Speed:	103	mph
Roof Eave Height:	20.00	feet
	+	
Tallest Parapet:	3.00	feet
Metal Edge Eave Height:	23.00	feet
Exposure Category:	C	
Importance Classification:	IV	

Design Wind Pressure ASCE 7-16 ASD

Basic Velocity Pressure:	12.87	psf
Horizontal Design Pressure:	25.09	psf

ES-1 Fascia Load

Vertical Face Dimension:	7.25	inches
Fascia Design Load:	41.90	psf

ES-1 Tested Fascia System

Product Designation: MEA-RMF-Fascia725-A40

System Description: R-Mer Force Fascia 7.25" x 0.040" Aluminum w/ RMEBF-700 Base Frame

Maximum Tested Load:	470	psf
Max. Vertical Face Dim.:	7.25	inches