

SECTION 07540

THERMOPLASTIC SINGLE-PLY ROOFING

*Note: GAF does not practice architecture or engineering. This document is provided as a guide specification and is based on criteria provided to GAF. GAF has not observed the jobsite conditions, contract specifications, or other documents and shall not be construed in any manner to be the designer of record.*

1. **GENERAL**
   1. SUMMARY
      1. Section Includes
         1. Thermoplastic Polyolefin Single-Ply Roofing Membrane
         2. Thermoplastic Polyolefin Flashings
         3. Thermoplastic Polyolefin Accessories
         4. Insulation
      2. Related Sections
         1. Section 06100: Rough Carpentry
         2. Section 07620: Sheet Metal Flashing and Trim
         3. Section 15430: Plumbing Specialties
   2. REFERENCES
      1. American Society for Testing and Materials (ASTM) - Annual Book of ASTM Standards
         1. ASTM D-751 – Standard Test Methods for Coated Fabrics
         2. ASTM D-2137 - Standard Test Methods for Rubber Property—Brittleness Point of Flexible Polymers and Coated Fabrics
         3. ASTM E-96 - Standard Test Methods for Water Vapor Transmission of Materials
         4. ASTM D1204 - Standard Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature
         5. ASTM D-471 - Standard Test Method for Rubber Property—Effect of Liquids
         6. ASTM D-1149 - Standard Test Methods for Rubber Deterioration—Cracking in an Ozone Controlled Environment
         7. ASTM C-1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer
         8. ASTM C-1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers
         9. ASTM E 903 – Standard Test Method for Solar Absorptance, Reflectance, and Transmission of Materials Using Integrating Spheres
         10. ASTM G155 - Standard Practice For Operating Xenon Arc Light Apparatus For Exposure Of Non-Metallic Materials
         11. ASTM D573 - Standard Test Method For Rubber - Deterioration In An Air Oven
      2. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - *Architectural Sheet*

*Metal Manual*

* + 1. National Roofing Contractors Association (NRCA)
    2. U.S. Green Building Council (USGBC)
       1. Leadership in Energy and Environmental Design (LEED)
    3. California Title 24 Energy Efficient Standards
    4. ENERGY STAR
    5. Cool Roofing Rating Council (CRRC)
  1. DEFINITIONS
     1. Roofing Terminology: Refer to ASTM D1079 and the glossary of the National Roofing Contractors Association (NRCA) *Roofing and Waterproofing Manual* for definitions of roofing terms related to this section.
  2. SUBMITTALS
     1. Product Data: Provide product data sheets for each type of product indicated in this section.
     2. Shop Drawings: Provide manufacturers standard details and approved shop drawings for the roof system specified.
     3. Samples: Provide samples of insulations, fasteners, membrane materials and accessories for verification of quality.
     4. Certificates: Installer shall provide written documentation from the manufacturer of their authorization to install the roof system, and eligibility to obtain the warranty specified in this section.
     5. To ensure compliance with GAF’s minimum warranty requirements, the following project details should be forwarded to GAF for review prior to installation, preferably prior to bid.
  3. QUALITY ASSURANCE
     1. Manufacturer’s Qualifications: GAF shall provide a roofing system that meets or exceeds all criteria listed in this section.
     2. Installer’s Qualifications:
        1. Installer shall be classified as a ***Master or Master Select™*** contractor as defined and certified by GAF.
     3. Source Limitations: All components listed in this section shall be provided by a single manufacturer or approved by the primary roofing manufacturer.
     4. Final Inspection

Manufacturer’s representative shall provide a comprehensive final inspection after completion of the roof system. All application errors must be addressed and final punch list completed.

* 1. PRE-INSTALLATION CONFERENCE
     1. Prior to scheduled commencement of the roofing installation and associated work, conduct a meeting at the project site with the installer, architect, owner, GAF representative and any other persons directly involved with the performance of the work. The installer shall record conference discussions to include decisions and agreements reached (or disagreements), and furnish copies of recorded discussions to each attending party. The main purpose of this meeting is to review foreseeable methods and procedures related to roofing work.
  2. PERFORMANCE REQUIREMENTS
     1. GAF shall provide all primary roofing materials that are physically and chemically compatible when installed in accordance with manufacturers current application requirements.
  3. REGULATORY REQUIREMENTS
     1. All work shall be performed in a safe, professional manner, conforming to all federal, state and local codes.
  4. DELIVERY, STORAGE AND HANDLING
     1. Deliver all roofing materials to the site in original containers, with factory seals intact. All products are to carry a GAF label.
     2. Store all pail goods in their original undamaged containers in a clean, dry location within their specified temperature range.
     3. Do not expose materials to moisture in any form before, during, or after delivery to the site. Reject delivery of materials that show evidence of contact with moisture.
     4. Remove manufacturer supplied plastic covers from materials provided with such. Use “breathable” type covers such as canvas tarpaulins to allow venting and protection from weather and moisture. Cover and protect materials at the end of each work day. Do not remove any protective tarpaulins until immediately before the material will be installed.
     5. Materials shall be stored above 55°F (12.6°C) a minimum of 24 hours prior to application.
  5. PROJECT CONDITIONS
     1. Weather
        1. Proceed with roofing only when existing and forecasted weather conditions permit.
        2. Ambient temperatures must be above 45°F (7.2°C) when applying hot asphalt or water based adhesives.
  6. WARRANTY
     1. Provide Manufacturers standard EverGuard® Diamond Pledge™ Guarantee with single source edge-to-edge coverage and no monetary limitation where the manufacturer agrees to repair or replace components in the roofing system, which cause a leak due to a failure in materials or workmanship.
        1. Duration: Twenty (20) years from the date of completion.
           1. Covered components include GAF roofing membrane, liquid-applied membrane or coating, base flashing, high wall waterproofing flashing, insulation, expansion joint covers, preflashed accessories, and metal flashings used by the contractor of record that meet SMACNA standards (the “GAF Roofing Materials”).
           2. Materials and workmanship of listed products within this section are included when installed in accordance with current GAF application and specification requirements. Contact GAF Design Services for the full terms and conditions of the guarantee.
           3. Leaks caused by any non-GAF materials, such as the roof deck, existing materials, or non-GAF insulation are not covered.

1. **PRODUCTS**
   1. ACCEPTABLE MANUFACTURER
      1. Acceptable Manufacturer: GAF, Commercial Roofing Products Division, which is located at: 1 Campus Drive; Parsippany, NJ 07054; Toll Free Tel: 877-423-7663 (option 4, then option 3); Email: designservices@gaf.com; Web: [www.gaf.com](http://www.gaf.com)

## VAPOR RETARDER

### SBS Modified self-adhering vapor retarder for use in approved GAF roof assemblies. Each full roll contains 6 squares (56.1 m2) of roofing material, 105’ x 69”. **GAF SA Vapor Retarder XL** by GAF.

* 1. INSULATION
     1. Rigid polyisocyanurate board, with a glass-reinforced cellulosic felt facer. Conforms to or exceeds the requirements of ASTM C 1289 Type II, Class 1, Grade 2. **EnergyGuard™ Polyiso Insulation**, with the following characteristics:
        1. Board Thickness:
        2. Thermal Resistance (LTTR value) of:
        3. Board Size: 4’ x 4’or 4’ x 8’
        4. Compressive Strength:

### Rigid, non-halogenated polyisocyanurate board, with a glass-reinforced cellulosic felt facer. Holds a Health Product Declaration (HPD), is GreenCircle third-party recycled content certified, and is a Red List Free product with a Declare label designation. Conforms to or exceeds the requirements of ASTM C 1289 Type II, Class 1, Grade 2. **EnergyGuard™ NH Polyiso Insulation**, with the following characteristics:

#### Board Thickness:

#### Thermal Resistance (LTTR value) of:

#### Board Size: 4’ x 4’ or 4’ x 8’

#### Compressive Strength:

### Coated glass fiber and a special coated glass-fiber facer laminated to a closed-cell polyisocyanurate foam core. Conforms to or exceeds the requirements of ASTM C 1289 Type II, Class 2, Grade 2. **EnergyGuard™ Barrier Polyiso Insulation**, with the following characteristics:

#### Board Thickness:

#### Thermal Resistance (LTTR value) of:

#### Board Size: 4’ x 4’ or 4’ x 8’

#### Compressive Strength:

**\*This product is subject to regional availability.**

### Coated glass fiber and a special coated glass-fiber facer laminated to a closed-cell non-halogenated polyisocyanurate foam core. Conforms to or exceeds the requirements of ASTM C 1289 Type II, Class 2, Grade 2. **EnergyGuard™ NH Barrier Polyiso Insulation**, with the following characteristics:

#### Board Thickness:

#### Thermal Resistance (LTTR value) of:

#### Board Size: 4’ x 4’ or 4’ x 8’

#### Compressive Strength: 20 psi

**\*This product is subject to regional availability.**

### Rigid polyisocyanurate board, with a coated glass-fiber mat facer. Conforms to or exceeds the requirements of ASTM C 1289 Type II, Class 2, Grade 2. **EnergyGuard™ Ultra Polyiso Insulation**, with the following characteristics:

#### Board Thickness:

#### Thermal Resistance (LTTR value) of:

#### Board Size: 4’ x 4’ or 4’ x 8’

#### Compressive Strength: 20 psi

### Rigid, non-halogenated polyisocyanurate board, with a coated glass-fiber mat facer. Holds a Health Product Declaration (HPD), is GreenCircle third-party recycled content certified, and is a Red List Free product with a Declare label designation. Conforms to or exceeds the requirements of ASTM C 1289 Type II, Class 2, Grade 2. **EnergyGuard™ NH Ultra Polyiso Insulation**, with the following characteristics:

#### Board Thickness:

#### Thermal Resistance (LTTR value) of:

#### Board Size: 4’ x 4’or 4’ x 8’

#### Compressive Strength: 20 psi

### Non-structural composite roofing panel comprised of a top layer of EnergyGuard™ HD cover board (80psi) adhered with a high-tack adhesive to a second layer of EnergyGuard™ Ultra polyiso insulation (20psi). All panels of the composite are faced with a coated glass for increased durability and mold resistance. Conforms to or exceeds the requirements of ASTM C 1289, Type II, Class 4, Grade 1. **EnergyGuard™** **Ultra HD Composite Insulation**, with the following characteristics:

1. Board Thickness:

2. Thermal Resistance (LTTR value) of:

3. Board Size: 4’ x 4’ or 4’ x 8’

4. Compressive Strength: 20 psi

* 1. TAPERED INSULATION

### Rigid, tapered polyisocyanurate board, with a glass-reinforced cellulosic felt facer. Conforms to or exceeds the requirements of ASTM C 1289 Type II, Class 1, Grade 2. **EnergyGuard™ Tapered Polyiso Insulation**, with the following characteristics:

* + - 1. Board Thickness:
      2. Thermal Resistance (LTTR value) of: varies
      3. Board Size: 4’ x 4’
      4. Compressive Strength:

### Rigid, tapered polyisocyanurate board, with a coated glass-fiber mat facer. Conforms to or exceeds the requirements of ASTM C 1289 Type II, Class 2, Grade 2. **EnergyGuard™ Ultra Tapered Polyiso Insulation**, with the following characteristics:

#### Board Thickness:

#### Thermal Resistance (LTTR value) of: varies

#### Board Size: 4’ x 4’

#### Compressive Strength: 20 psi

* 1. COVER BOARD

### Rigid polyisocyanurate cover board, with coated polymer-bonded glass fiber mat facers on both major surfaces of the core foam conforming to or exceeding the requirements of ASTM C 1289, Type 2, Class 4, Grade 1. **EnergyGuard™ HD Polyiso Cover Board,** with the following characteristics:

* + - 1. Board Thickness: ½” or 12.7mm
      2. Board Size: 4’ x 4’ or 4’ x 8’
      3. Minimum Compressive Strength: 80psi (551kPa)
      4. Thermal Resistance (LTTR value) of: >2.5

### Rigid polyisocyanurate cover board, with coated polymer-bonded glass fiber mat facers on both major surfaces of the core foam conforming to or exceeding the requirements of ASTM C 1289, Type 2, Class 4, Grade 2.  **EnergyGuard™ HD Plus Polyiso Cover Board**, with the following characteristics:

#### Board Thickness: ½” or 12.7mm

#### Board Size: 4’ x 4’ or 4’ x 8’

#### Minimum Compressive Strength: 110psi (758 kPa)

#### Thermal Resistance (LTTR value) of: >2.5

### Rigid, non-halogenated polyisocyanurate cover board, with coated polymer-bonded glass fiber mat facers on both major surfaces of the core foam. Holds a Health Product Declaration (HPD), is GreenCircle third-party recycled content certified, and is a Red List Free product with a Declare label designation. Conforms to or exceeds the requirements of ASTM C 1289, Type 2, Class 4, Grade 1. **EnergyGuard™ NH HD Polyiso Cover Board**, with the following characteristics:

#### Board Thickness: ½” or 12.7mm

#### Board Size: 4’ x 4’ or 4’ x 8’

#### Minimum Compressive Strength: 80psi (551kPa)

#### Thermal Resistance (LTTR value) of: 2.5

### Rigid polyisocyanurate cover board, with coated polymer-bonded glass fiber mat facers on both major surfaces of the core foam conforming to or exceeding the requirements of ASTM C 1289, Type 2, Class 4, Grade 1. **EnergyGuard™ HD Barrier Polyiso Cover Board**, with the following characteristics:

#### Board Thickness: ½” or 12.7mm

#### Board Size: 4’ x 4’ or 4’ x 8’

#### Minimum Compressive Strength: 80psi (551kPa)

#### Thermal Resistance (LTTR value) of: >2.5

**\*This product is subject to regional availability.**

### Underlayment or overlayment board with a water-resistant and silicone treated gypsum core with glass fiber facers embedded on both sides. **Dens-Deck® Roof Board**, distributed by GAF

* + - 1. Board Thickness:
      2. Board Size: 4’ x 4’ or 4’ x 8’
      3. Thermal Resistance (R value) of:

### Fiber-reinforced gypsum panel with an integral water-resistant core. **Securock® Brand Ultralight Glass Mat Roof Board** by US Gypsum.

* + - 1. Board Thickness:
      2. Board Size: 4’ x 8’
      3. Thermal Resistance (R value) of:

### Gypsum panel with coated fiberglass facers bonded to a moisture and mold resistant gypsum core. **DEXcell® Glass Mat Roof Board by National Gypsum**.

* + - 1. Board Thickness:
      2. Board Size: 4’ x 8’
      3. Thermal Resistance (R value) of:

### Overlayment board made of cellulose fiber conforming to or exceeding the requirements of FS LLL-I-535, Class C, ANSI/ASTM C 208, **Structodek® High Density Fiberboard** (**with Primed Red** **Coating)** with the following characteristics:

#### Board Thickness: 1/2"

#### Board Size: 2’ x 4’, 4’ x 4’, 4’ x 8’

#### Thermal Resistance (R value) of: 1.32

* 1. MEMBRANE MATERIALS
     1. A smooth type, polyester scrim reinforced thermoplastic polyolefin membrane for use as a single ply roofing membrane. Meets or exceeds the minimum requirements of ASTM D-6878. UL Listed, FM Approved, Dade County Product Approval, Florida Building Code Approved. White membrane is Energy Star Listed, CRRC Listed and Title 24 Compliant.
        1. **EverGuard® TPO 60 Mil Membrane by GAF**.
           1. 10’ X 100’, each roll contains 1000 sq. ft. of material weighing 322 lbs.
           2. Half sheet rolls are required to be used in the perimeter for mechanically attached systems.
           3. Color: White
  2. CURB/WALL FLASHING MEMBRANE
     1. GENERAL
        1. EverGuard® membrane flashing should be of the same type and thickness as the roof membrane.
        2. Because colored TPO membranes may exhibit different welding characteristics, please call the GAF Design Services hotline at 800-766-877-423-7663 Option 4, Option 3 before attempting to weld different-colored TPO membranes with white membranes or flashings.
        3. EverGuard® TPO Fleece-Back membranes are optional flashing membranes for all EverGuard® TPO systems. These membranes may be a solution when a contaminated substrate is encountered.
     2. FLASHING MEMBRANE
        1. A smooth type, polyester scrim reinforced thermoplastic polyolefin membrane for use as a single ply roofing membrane. Meets or exceeds the minimum requirements of ASTM D-6878. UL Listed, FM Approved, Dade County Product Approval, Florida Building Code Approved. White membrane is Energy Star Listed, CRRC Listed and Title 24 Compliant.
           1. **EverGuard® TPO 60 Mil Membrane by GAF**.
  3. ADHESIVES, SEALANTS AND PRIMERS
     1. Sprayable, solvent-based contact adhesive used for bonding smooth EverGuard® TPO membranes. One canister covers 10 squares. **EverGuard® TPO Quick Spray Adhesive** by GAF.

#### **Note: Do not use in VOC-restricted areas**.

### Sprayable, Low VOC solvent-based contact adhesive used for bonding smooth EverGuard® TPO membranes. One canister covers 10 squares. **EverGuard® TPO Quick Spray Adhesive LV50** by GAF.

* + 1. Solvent based primer for preparing surfaces to receive butyl based adhesive tapes, **EverGuard® TPO Primer**, by GAF.

#### **Note: Do not use in VOC-restricted areas**.

* + 1. Solvent based seam cleaner used to clean exposed or contaminated seam prior to heat welding, **EverGuard® TPO Seam Cleaner, by GAF.**

#### **Note: Do not use in VOC-restricted areas**.

* + 1. Solvent based, trowel grade synthetic elastomeric sealant. Durable and UV resistant suitable for use where caulk is typically used. Available in 10 oz. tubes, **FlexSeal™** **Caulk Grade Roof Sealant** by GAF.

#### **Note: Do not use in VOC-restricted areas**.

* + 1. Commercial grade roofing sealant suitable for sealing the upper lip of exposed termination bars and penetrations and around clamping rings and comes with a 20 yr. ltd warranty against leaks caused by manufacturing defects. Meets the performance criteria of ASTM D412, ASTM D2196, ASTM D1475 and ASTM D1644, **FlexSeal™** Roof Sealant, by GAF.

#### **Note: Do not use in VOC-restricted areas**.

* + 1. Low VOC solvent based primer for preparing surfaces to receive butyl based adhesive tapes, **EverGuard® TPO Low VOC Primer**, by GAF.
    2. Low VOC TPO cleaner designed to clean exposed or contaminated seams prior to heat welding to remove any residual soap or revitalize aged membranes. Contains only 50 grams per liter of Volatile Organic Content and has been formulated using a blend of primarily VOC-exempt ingredients to be in compliance with air quality regulations for single ply roofing products. **EverGuard® TPO CleanWeld® Conditioner** by GAF.
    3. One part butyl based high viscosity sealant suitable for sealing between flashing membrane and substrate surface behind exposed termination bars and for sealing between roofing membrane and drain flange. **EverGuard® Water Block**, by GAF.
    4. One-part, moisture-cure, self-leveling sealant designed for use in pitch pans on single ply roof systems. **EverGuard® One-Part Pourable Sealant**.
  1. FASTENERS AND PLATES

### Fasteners

#### **Drill-Tec™ #12 Fastener**: Standard duty alloy steel fastener with CR-10 coating with a .220” diameter thread. Factory Mutual Standard 4470 Approved, #3 Phillips head used to secure insulation to steel and wood decks. May be used on lightweight insulating concrete decks (fastener must penetrate LWIC to engage structural deck).

#### **Drill-Tec™ #14 Fastener**: Heavy gauge alloy steel fastener with CR-10 coating with a .245” (6.2 mm) diameter thread. Miami Dade and Factory Mutual Standard 4470 Approved, #3 Phillips truss head used to secure membrane and insulation to wood, concrete and steel decks. May be used on lightweight insulating concrete decks (fastener must penetrate LWIC to engage structural deck).

#### **Drill-Tec™ XHD Fastener (#15):** Heavy gauge alloy steel fastener with CR-10 coating with a .275” (6.9 mm) diameter thread. Miami Dade and Factory Mutual Standard 4470 Approved, #3 Phillips truss head used to secure membrane and insulation to steel and wood decks. May be used on lightweight insulating concrete decks (fastener must penetrate LWIC to engage structural deck).

#### **Drill-Tec™ CD-10 Fastener:** Hammer-in, non-threaded fastener with a CR-10 coating designed to secure insulation and membrane to structural concrete decks. Miami Dade and Factory Mutual Standard 4470 approved.

* + 1. Plates

#### **Drill-Tec™ Insulation Plates**: Galvalume, 3” (76 mm) diameter suitable for use with Drill-Tec™ #12 Fasteners, #14 Fasteners, XHD #15 Fasteners and CD-10 Fasteners.

#### **Drill-Tec™ XHD Plates**: Galvalume, 2 3/8” (60 mm) diameter membrane plates, with a barbed underside. Suitable for use with Drill-Tec™ #14 Fasteners, XHD #15 Fasteners and CD-10 Fasteners.

#### **Drill-Tec™ Double Barbed XHD Plates**: Galvalume, 2” (52 mm) diameter membrane plates, with a double barbed underside. Suitable for use with Drill-Tec™ #14 Fasteners, XHD #15 Fasteners and CD-10 Fasteners.

* 1. FLASHING ACCESSORIES
     1. GENERAL FLASHING ACCESSORIES
        1. A smooth type, unreinforced thermoplastic polyolefin based membrane for use as an alternative flashing/reinforcing material for penetrations and corners. Required whenever preformed vent boots cannot be used, 0.055 inches (55 mils) nominal thickness and sheet size: 24in x 50ft. **EverGuard® TPO UN-55 Detailing Membrane**, by GAF.
        2. An 8 inch (20 cm) wide smooth type, polyester scrim reinforced thermoplastic polyolefin membrane strip for use as a cover strip over coated metal and stripping-in coated metal flanges and general repairs: 0.045 inches (45 mils) nominal thickness with 100 foot length, **EverGuard® TPO 45 Mil Utility Flashing Membrane**, by GAF.
        3. 24 gauge steel with 0.025” thick TPO based film as required for fabrication into metal gravel stop and drip edge profiles, metal base and curb flashings, sealant pans, and scupper sleeves. Standard sheet size 4’ x 10’, sheet weight 47 lbs. Custom sizes available, **EverGuard® TPO Coated Metal**,by GAF.
        4. Extruded aluminum termination bar with angled lip caulk receiver and lower leg bulb stiffener. Pre-punched slotted holes at 6” on center or 8” on center. ¾” x 10’ with 0.090” cross section, **DRILL-TEC™ Termination Bar,** by GAF.
        5. Pre-manufactured expansion joint covers used to bridge expansion joint openings in a roof structure. Fabricated to accommodate all roof to wall and roof to roof applications, made of .060” reinforced TPO membrane, available in 5 standard sizes for expansion joint openings up to 8” wide. **EverGuard® TPO Expansion Joint Covers,** by GAF
        6. .055” thick smooth type, unreinforced thermoplastic polyolefin membrane designed for use as a conforming membrane seal over T-joints in 60 and 80 mil membrane applications. **EverGuard® T-Joint Patches**, by GAF.
     2. ROOF EDGE ACCESSORIES
        1. A 6 inch (14 cm) wide, smooth type, heat-weldable polyester scrim reinforced thermoplastic polyolefin membrane strip. Designed for use as a cover strip over non-coated metal edges and flanges. Each full roll contains approximately 100 Lineal Ft. of material, 6” X 100’. **EverGuard® TPO Heat-Weld Cover Tape**, by GAF.
     3. WALL & CURB ACCESSORIES
        1. .045” reinforced TPO membrane with pressure sensitive adhesive, to be installed on horizontal surfaces using plates and fasteners as a base attachment in fully adhered systems. Size 6” x 100’, **EverGuard® RTA (Roof Transition Anchor) Strip™,** by GAF
        2. 55 mil TPO membrane and 24 gauge coated metal prefabricatedinto standard and custom size thru wall scuppers**.** Available in two sizes: 4" x 6" x 12" (l x w x d) with a 5.75" x 3.75" opening and 8" x 10" x 12" (l x w x d) with a 9.75" x 7.75" opening, **EverGuard® TPO Scupper,** by GAF
        3. .045” or .060” thick reinforced TPO membrane fabricated corners. Available in four standard sizes to flash curbs that are 24”, 36”, 48”, and 60” in size. Four corners are required to flash the curb, **EverGuard® Corner Curb Wraps,** by GAF.
        4. 0.060” thick molded TPO membrane outside corners of base and curb flashing. Hot-air welds directly to EverGuard® TPO membrane. Size 4” x 4” with 6” flange, **EverGuard® TPO Universal Corners** by GAF.
        5. 0.055” molded TPO membrane inside corners of base and curb flashing. Hot-air welds directly to EverGuard TPO membrane. Size 6” x 6” x 5.5” high **EverGuard® TPO Preformed Corners** by GAF.
        6. 8” diameter, nominal .050” vacuum formed unreinforced TPO membrane for use in flashing outside corners of base and curb flashings, **EverGuard® TPO Fluted Corner**, by GAF.
     4. PENETRATION ACCESSORIES
        1. 0.075” thick molded TPO membrane sized to accommodate most common pipe and conduits, (1” to 6” diameter pipes), including square tube. Hot-air welded directly to EverGuard TPO membrane, supplied with stainless steel clamping rings, **EverGuard® TPO Preformed Vent Boots** by GAF.
        2. 0.045” thick molded TPO membrane preformed boots are split to accommodate most common pipes and conduits and available in three standard sizes, **EverGuard® TPO Split Pipe Boots**, by GAF.
        3. 0.045” thick molded TPO membrane preformed square boots are split to accommodate most common square penetrations and conduits and available in three standard sizes, **EverGuard® TPO Square Tube Wraps**, by GAF.
        4. .070 thick molded penetration pocket to provide structure and foundation for the application of a pourable sealant for a variety of roof penetrations, weldable and 9" x 6" x 4" (l x w x h). **EverGuard® TPO Pourable Sealer Pocket**
        5. Constructed from spun aluminum and preflashed using .055” thick smooth type, unreinforced thermoplastic polyolefin membrane. Available in a wide range of sizes to allow a proper fit into any size roofing drain. **EverGuard® TPO Drain** by GAF
        6. Aluminum drain unit coated with a weldable TPO compound. TPO membrane can be heat welded directly to the drain body, resulting in a strong, secure installation. Each drain is fitted with a BlueSeal® mechanical drain seal for a secure, tight seal into the building drain system. Available in two sizes (3” and 4”), and custom sizes are available. **EverGuard® TPO Coated Metal Drain** by GAF
     5. WALKWAYS
        1. 1/8” thick extruded and embossed TPO roll 34.25” x 50’, heat welds directly to roofing membrane. Unique “diamond tread” traction surface and features a 2” (51 mm) welding strip (smooth border) along each longitudinal edge that is compatible with hand or automatic welders. Available in gray or safety yellow, **EverGuard® TPO Walkway Rolls**, GAF.

1. **EXECUTION**
   1. SITE CONDITIONS
      1. Obtain verification that the building structure can accommodate the added weight of the new roofing system.
      2. Confirm the adequacy of the new roofing system to provide positive slope to drain. Eliminate ponding areas by the addition of drainage locations or by providing additional pitch to the roof surface.
      3. Prepare substrate surfaces thoroughly prior to application of new roofing materials. This is particularly important for re-cover and reroofing applications. Providing a smooth, even, sound, clean, and dry substrate minimizes the likelihood that underlying deficiencies will cause premature deterioration or even failure of the new roofing system.
      4. All defects in the roof deck or substrate must be corrected by the responsible parties before new roofing work commences. Verify that the deck surface is dry, sound, clean, and smooth, and free of depressions, waves, or projections.
      5. Protect building surfaces against damage and contamination from roofing work.
      6. Where work must continue over completed roof areas, protect the finished roofing system from damage.
      7. Deck preparation is the sole responsibility of the building owner or roofing contractor. All defects in the roof deck or substrate must be corrected before roofing work commences.
      8. Refer to GAF Roof Guarantee Program for specific requirements for extended guarantees.
   2. SUBSTRATE PREPARATION
      1. Steel Deck
         1. Metal decks must be a minimum uncoated thickness of 22 gauge (0.8 mm) and shall have a G-90 galvanized finish on all panels.
         2. When re-roofing over steel decks, surface corrosion shall be removed, and repairs to severely corroded areas made. Loose or inadequately secured decking shall be fastened, and irreparable or otherwise defective decking shall be replaced.
         3. Code standards apply when their requirements exceed those listed here.

### Structural Concrete Deck

#### Minimum Min. 2,500 psi compressive resistance (98,066 kilogram-force/square centimeter)

#### The deck must be smooth, level and cannot be wet or frozen. If deck is determined to be wet, it must be allowed to dry.

#### Only poured in place concrete decks that provide bottom side drying are acceptable. Decks that are installed over non-vented metal decks or pans that remain in place may trap moisture in the deck beneath the roof system and are not acceptable.

#### The roof deck shall be properly cured prior to application of the roofing system; twenty-eight (28) days is normally required for proper curing. Curing agents must be checked for compatibility with roofing materials. Prior to the installation of the roof assemblies, GAF recommends the evaluation of the surface moisture and deck’s dryness through the use of ASTM D-4263 or hot bitumen test.

#### Treat cracks greater than 1/8” (3 mm) in width in accordance with the deck manufacturer’s recommendations.

#### Sumps for the roof drains shall be provided in the casting of the deck.

#### 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 prior to the new roof application.

#### Code standards apply when their requirements exceed those listed here.

### Wood Deck (Plank / Heavy Timber)

#### Wood boards must be at least 1” nominal thickness and have a nominal width of 4’-6”. Tongue and groove or shiplap lumber is preferred to square edge material since subsequent shrinkage or warping of square edge planks may cause ridging of the roof system above adjacent boards.

#### All boards must have a bearing on rafters at each end and be securely nailed.

#### Lumber shall be kiln dried.

#### Preservatives or fire retardants used to treat decking must be compatible with roofing materials.

#### Decking shall be kept dry and roofed promptly after installation.

#### Knotholes or large cracks in excess of ¼” (6 mm) shall be covered with securely nailed sheet metal.

#### In all retrofit roof applications, it is required that the 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.

#### Code standards apply when their requirements exceed those listed here.

### Plywood Deck

#### Plywood sheathing must be C-D Exposure 1 APA Rated, minimum 4 ply, and not less than 15/32” thick.

#### Preservatives or fire retardants used to treat the decking must be compatible with roofing materials.

#### The deck must be installed over joists that are spaced 24” (61 cm) o.c. or less.

#### The deck must be installed so that all four sides of each panel bear on and are secured to joist and cross blocking. The panels must be secured in accordance with APA–The Engineered Wood Association recommendations, “H” clips are not acceptable.

#### Panels must be installed with a 1/8” to 1/4” (3mm – 6mm) gap between panels and must match vertically at joints to within 1/8” (3mm).

#### Decking should be kept dry and roofed promptly after installation.

#### Moisture content not to exceed 16%.

#### Insulation above the deck may be necessary to prevent condensation from adversely affecting the deck.

#### Must meet minimum pull out values. Minimum 5 test pulls per 1,000 sq. ft. (93 sq. m.).

#### Code standards apply when their requirements exceed those listed here.

### Oriented Strand Board (OSB) Deck

#### Oriented Strand Board must be C-D Exposure APA rated and carry a Structural 1 performance rating.

#### Preservatives or fire retardants used to treat decking must be compatible with roofing materials.

#### The deck must be installed over joists that are spaced 24” (61 cm) o.c. or less.

#### The deck must be installed so that all four sides of each panel bear on and are secured to joist and cross blocking; the APA/Engineered Wood Association (APA) recommendations. “H” clips are not acceptable.

#### Panels must be installed with a 1/8” to 1/4” (3mm – 6mm) gap between panels and must match vertically at joints to within (1/8” (3mm).

#### Decking should be kept dry and roofed promptly after installation.

#### Moisture content not to exceed 16%.

#### Insulation above the deck may be necessary to prevent condensation from adversely affecting the deck.

#### Must meet minimum pull out values. Minimum 5 test pulls per 1,000 sq. ft. (93 sq. m.).

##### OSB values vary greatly by manufacturer and with exposure to moisture. OSB exposed to daily condensation or nightly dew has seen significant loss of pull out values. GAF will not accept any liability for substandard or moisture-damaged OSB.

#### Code standards apply when their requirements exceed those listed here.

### Lightweight Insulating Concrete Deck

#### Insulating concrete decks are required to have a minimum thickness of 2” (52 mm), a minimum compressive strength of 125 psi (9 kg/cm) and a minimum density of 22 pcf (208 g/m²). Individual deck manufacturer’s standards apply when their specifications exceed the minimum thickness, compressive strength, or density requirements.

#### Cellular lightweight insulating concrete decks can be installed over non-slotted, galvanized metal decking designed for cellular lightweight insulating concrete or structural concrete.

#### Aggregate lightweight insulating concrete decks must be installed over permanent venting steel forms.

#### The insulating deck/fill must be installed by an applicator approved by the deck manufacturer.

#### The roof system shall be installed immediately following deck curing to prevent damage from exposure to precipitation. The deck manufacturer determines the minimum curing time and maximum exposure limitations.

#### LWIC should not be poured during rainy periods. Deck areas that have frozen before they have cured must be removed and replaced. Decks which receive precipitation prior to installation of the roof membrane must be checked for moisture content and dryness.

#### Where the mean January temperature (Reference current ASHRAE Fundamentals Handbook) is below 40oF (4.4oC), lightweight insulating concrete decks must be poured and roofed between April 1st and October 31st. This type of deck is unacceptable in Alaska.

#### Insulation and membrane must be fastened through the LWIC to engage the structural deck.

#### Code standards apply when their requirements exceed those listed here.

* 1. NAILER INSTALLATION
     1. Acceptable Wood
        1. Solid Blocking: Non-pressure treated wood as required, #2 Grade or better, nominal 1 1 /4" (30 mm) x 4" (102 mm) with a minimum thickness of 3 1 /2" (88 mm).
        2. Shim Material: Plywood, 1 /2" (13 mm) x width to match solid blocking.
        3. Verify the condition of existing roof nailers and anchor to resist 250 lb. per ft. (550 kg) load applied in any direction. New nailers should meet same load requirements.
        4. DRILL-TEC™ HD screws 18" (457 mm) o.c. attachment to structural wood, steel decks with a 1" (25 mm) thread embedment.
        5. DRILL-TEC™ spikes or HD screws 18" (457 mm) o.c. attachment to concrete decks. Min. 1" (25 mm) shank or thread penetration.
        6. Wood nailers attached to gypsum, concrete, cellular concrete and cementitious wood fiber must be fastened 12" (305 mm) o.c., through the nailer into the substrate with substrate approved DRILL-TEC™ fasteners.
        7. Three anchors per length of wood nailer minimum.
     2. Metal Blocking
        1. 20 Ga. galvanized steel box with pre-punched holes and supplied with corrosion-resistant fasteners.
        2. Closure and finish strip required for metal decking.
        3. Secure in place using provided #14 x 1½-in. universal fasteners through pre-punched holes to roof edge.
        4. Install end cap and top of box section with #14 x 1½-in. universal fasteners.
  2. INSTALLATION – GENERAL
     1. Install GAF’s EverGuard® TPO roofing system according to all current application requirements in addition to those listed in this section.
     2. GAF EverGuard® TPO Specification #: **TMANI60**
     3. Start the application of membrane plies at the low point of the roof or at the drains, so that the flow of water is over or parallel to, but never against the laps.
  3. VAPOR RETARDER

### GAF SA Vapor Retarder XL

#### (Optional) Mechanically attach roof board to deck prior to installing GAF SA Vapor Retarder XL per GAF requirements. Roll out the vapor retarder over roof board and allow to relax.

#### Roll out the GAF SA Vapor Retarder XL over clean, dry deck and allow to relax. For metal decks, the width of the membrane is designed to match with the top of the flute.

#### Place vapor retarder in desired position. Once the membrane is in place, while holding the membrane tight, peel off the silicone release film by pulling diagonally from the underside of the sheet.

#### Install subsequent rolls of membrane in the same way, taking care to overlap the longitudinal side laps a minimum of 3” (76 mm) and end laps a minimum of 6” (152 mm).

#### For metal decks, at the end of the roll, install a metal plate 6” x 42” (152 mm x 1.07 m) to support the membrane end lap between the metal flutes ensuring a complete end lap seal. Overlap end laps a minimum of 6” (152 mm).

#### Once installed, pressure must be applied over the whole surface using a weighted roller to ensure adequate adhesion to the substrate.

#### Seal perimeter and penetration areas with closed-cell foam sealant. The vapor retarder must be tied into the building’s air/vapor retarder system as appropriate with compatible SBS asphaltic materials.

#### Because the water resistance characteristics of vapor retarders can be compromised by storms, physical damage and installation issues, vapor retarders should be covered by a primary roof covering as soon as possible after installation. If the vapor retarder is not immediately covered, particular attention should be paid to implementation of details to ensure a temporary seal or GAF will have no responsibility for any moisture infiltration that results. All T-joints and 90 degree transitions must be sealed with Matrix™ 201 SBS Flashing Cement. If fishmouths or other openings are created at overlap, they must be sealed with Matrix™ 201 SBS Flashing Cement**.** All damage to or leaks through the vapor retarder must be repaired before installing the finished roof.

#### GAF SA Vapor Retarder XL is UV resistant up to 90 days. 90-day UV resistance refers to standardized testing conducted to ensure the product will not physically degrade when exposed to UV.

* 1. INSULATION
     1. GENERAL
        1. Do not apply roof insulation or roofing until all other work trades have completed jobs that require them to traverse the deck on foot or with equipment. A vapor retarder coated lightly with asphalt may be applied to protect the inside of the structure prior to the insulation and final roofing installation. Before the application of the insulation, any damage or deterioration to the vapor retarder must be repaired.
        2. Do not install wet, damaged or warped insulation boards.
        3. Insulation boards installed in multiple layers must have the joints between boards staggered in all directions a minimum of 6" (152 mm) between layers.
        4. Butt insulation boards together with a 1/4" (6.3 mm) maximum space between adjoining boards. Fit insulation boards around penetrations and perimeter with a 1/4" (6.3 mm) maximum space between board and penetration. Do not kick insulation boards into place.
        5. Insulation boards installed over steel decking must have boards placed perpendicular to deck flutes with edges over flute surface for bearing support.
        6. Install tapered insulation to provide a sump area a minimum of 36" x 36" (914 mm x 914 mm) where applicable.
        7. Wood nailers must be 3-1/2” (8.9 cm) minimum width or 1” (25 mm) wider than metal flange. They shall be of equal thickness as the insulation, and be treated for rot resistance. All nailers must be securely fastened to the deck.
        8. Miter and fill the edges of the insulation boards at ridges, valleys and other changes in plane to prevent open joints or irregular surfaces. Avoid breaking or crushing of the insulation at the corners.
        9. Insulation should not be installed over new lightweight insulating concrete.
        10. Remove and replace insulation boards that become wet or damaged after installation.

#### Drill-Tec™ “flat” plates (without the countersunk fastener holes protruding from the bottom of the plates) are required when plates are installed over gypsum cover boards to allow the plates to rest flush on the surface.

* + - 1. Do not install any more insulation than will be completely waterproofed each day.
  1. INSULATION ATTACHMENT

### MECHANICALLY ATTACHED

* + - 1. All insulation layers must be securely attached to the roof deck using Drill-Tec™ Fasteners and 3” plates. Refer to local code or GAF attachment tables for appropriate fasteners and fastening pattern.
      2. Use only fasteners with a minimum 3 inch (7.6 cm) stress plate when mechanically attaching insulation. Do not attach insulation with nails.
  1. SINGLE PLY MEMBRANE APPLICATION
     1. GENERAL
        1. Substrates must be inspected and accepted by the contractor as suitable to receive and hold roof membrane materials.
        2. Place roof membrane so that wrinkles and buckles are not formed. Any wrinkles or buckles must be removed from the sheet prior to permanent securement.
        3. Membrane that has been exposed for more than 12 hours or has become contaminated will require additional cleaning methods.
           1. Light Contamination - Membrane that has been exposed overnight up to a few days to debris, foot traffic, or dew or light precipitation can usually be cleaned with a white cloth moistened with EverGuard® TPO Cleaner (or EverGuard® CleanWeld™ Conditioner, a low-VOC cleaner) for TPO membranes.
           2. Dirt-Based Contamination - Membrane that is dirt encrusted will require the use of a low-residue cleaner, such as Formula 409® and a mildly abrasive scrubbing pad to remove the dirt. This must be followed by cleaning with a white cloth moistened with EverGuard® TPO Cleaner (or EverGuard® CleanWeld™ Conditioner) for TPO membranes.
           3. Exposure-Based Contamination - Membrane that is weathered or oxidized will require the use of EverGuard® TPO Cleaner, EverGuard® CleanWeld™ Conditioner and a mildly abrasive scrubbing pad to remove the weathered/oxidized top surface layer. This must be followed by cleaning with a white cloth moistened with EverGuard® TPO Cleaner (or EverGuard® CleanWeld™ Conditioner) for TPO membranes. Unexposed membrane left in inventory for a year or more may need to be cleaned as instructed above. Be sure to wait for solvent to flash off prior to welding.
           4. Chemical-Based Contamination - Membrane that is contaminated with bonding adhesive, asphalt, flashing cement, grease and oil, and most other contaminants usually cannot be cleaned sufficiently to allow an adequate heat weld to the membrane surface. These membranes should be removed and replaced.

### Mechanically Attached:

#### Place membrane so that wrinkles and buckles are not formed. Any wrinkles or buckles must be removed from the sheet prior to permanent attachment. Roof membrane shall be mechanically fastened immediately after it is rolled out, followed by welding to adjacent sheets.

#### Overlap roof membrane a minimum of 6" (152 mm) for side laps of mechanically attached systems. Membranes are provided with lap lines along the side laps; the inside line is for mechanically attached system overlaps. TPO fastener spacing marks should resemble a "pyramid" pattern.

#### For selvage edge laps of EverGuard® TPO membrane, overlap the roof membrane a minimum of 3" (76 mm) and heat weld the laps. Non-salvage end laps of TPO Fleece-Back membranes are made by butting adjacent sheets and heat welding an 8" (203 mm) wide EverGuard® TPO reinforced membrane flashing strip over the end laps.

#### Install membrane so that the side laps run across the roof slope lapped towards drainage points.

#### On metal decking, install sheets perpendicular to deck direction so that fasteners will penetrate the top flanges and not the flutes; however, there will be limited areas of the roof (i.e., perimeter areas) where this is not practical. If the deck is running opposite the slope of the roof (flutes running horizontally), then the membrane should run ridge-to-gutter to ensure proper fastening to the top flanges of the deck.

#### All exposed sheet corners shall be rounded a minimum of 1”.

#### Use full width rolls in the field of roof and half width rolls in the perimeter and corner region of the roof and mechanically fastened in the side lap area to the roof deck. Width of the perimeter region must be determined in accordance with the Perimeter Half Sheet Table in the EverGuard® specification manual.

#### Membrane laps shall be heat-welded together. All welds shall be continuous, without voids or partial welds. Welds shall be free of burns and scorch marks.

#### Weld shall be a minimum of 1-1/2” in width for automatic machine welding and a minimum 2” in width for hand welding.

#### Cut edges of reinforced membrane can be sealed with EverGuard® TPO Cut Edge Sealant.

#### The membrane shall be mechanically fastened in the side lap area to the roof deck with appropriate Drill-Tec™ fasteners and plates as required by roof system specification and/or code requirements. See latest EverGuard® attachment tables for minimum requirements.

#### The metal plates must be placed within ¼” to ¾” of the membrane edge. Plates shall not be placed less than ¼” from the membrane edge.

#### Pre-drilling is required for concrete decks.

#### In the corner regions, additional fasteners shall be installed through the perimeter membrane to form a grid pattern, with an 8” (40.5 cm) wide EverGuard® TPO reinforced membrane flashing-strip welded over the additional fasteners. Corners include both outside and inside corners that measure 75° - 105° angle.

#### Membrane attachment to the roof deck is required at locations of deck angle changes in excess of five (5) angle degrees (1” in 12”).

#### Supplemental membrane attachment is required at the base of all walls and curbs, and where the angle of the substrate changes by more than ten (10) degrees (1” in 12”). Roofing membrane shall be secured to the structural deck with screws and plates of the same type and spacing used for in-lap attachment. The screws and plates must be installed no less than ½” from the membrane edge. Alternatively, the roofing membrane may be turned up the vertical plane a minimum of 3” and secured with screws and termination bar. Fastener spacing is the same as is used for in-lap attachment. The termination bar must be installed within 1-1/2” to 2” of the plane of the roof membrane, with a minimum of 1” of membrane extending above the termination bar.

#### Supplemental membrane attachment to the structural deck is required at all penetrations. Roofing membrane shall be secured to the deck with appropriate Drill-Tec™ screws and plates.

#### Fasteners must be installed to achieve the proper embedment depth. Install fasteners without lean or tilt.

#### Install fasteners so that the plate or termination bar is drawn down tightly to the membrane surface. Properly installed fasteners will not allow the plate or termination bar to move (underdriving), but will not cause wrinkling of the membrane (overdriving).

* 1. FLASHINGS
     1. GENERAL
        1. All penetrations must be at least 24” (61 cm) from curbs, walls, and edges to provide adequate space for proper flashing.
        2. Flash all perimeter, curb, and penetration conditions with coated metal, membrane flashing, and flashing accessories as appropriate to the site condition.
        3. All coated metal and membrane flashing corners shall be reinforced with preformed corners or non-reinforced membrane.
        4. Hot-air weld all flashing membranes, accessories, and coated metal. A minimum 2” wide (hand welder) weld or minimum 1 - 1/2" automatic machine weld is required.
        5. Non-coated metal edge details must be installed in accordance with current EverGuard® construction details and requirements.
        6. All twenty (20) year EverGuard® systems require the use of coated metal edges where applicable. Bonding adhesive and/or cover tape is not acceptable.
        7. All cut edges of reinforced membrane must be sealed with EverGuard® TPO Cut Edge Sealant.
        8. Consult the EverGuard® *Application and Specifications Manual* or GAF Contractor Services for more information on specific construction details.
  2. TRAFFIC PROTECTION
     1. Install walkway rolls at all roof access locations and other designated locations including roof-mounted equipment work locations and areas of repeated rooftop traffic.
     2. Walkway pads must be spaced 6" apart to allow for drainage between the pads.
     3. Heat-weld walkway rolls to the roof membrane surface continuously around the perimeter of the roll.
  3. ROOF PROTECTION
     1. Protect all partially and fully completed roofing work from other trades until completion.
     2. Whenever possible, stage materials in such a manner that foot traffic is minimized over completed roof areas.
     3. When it is not possible to stage materials away from locations where partial or complete installation has taken place, temporary walkways and platforms shall be installed in order to protect all completed roof areas from traffic and point loading during the application process.
     4. Temporary tie-ins shall be installed at the end of each workday and removed prior to commencement of work the following day.
  4. CLEAN-UP
     1. All work areas are to be kept clean, clear and free of debris at all times.
     2. Do not allow trash, waste, or debris to collect on the roof. These items shall be removed from the roof on a daily basis.
     3. All tools and unused materials must be collected at the end of each workday and stored properly off of the finished roof surface and protected from exposure to the elements.
     4. Dispose of or recycle all trash and excess material in a manner conforming to current EPA regulations and local laws.
     5. Properly clean the finished roof surface after completion, and make sure the drains and gutters are not clogged.
     6. Clean and restore all damaged surfaces to their original condition.

**END OF SECTION**