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North America's
Largest Roofing
Manufacturer!™*

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EverGuard[®] Freedom[™] Self-Adhered Roofing System

Overview & General
Requirements Manual



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Note: Refer to gaf.com for a complete list of Product Data Sheets and Chemical Resistance Guidance Table.

WELCOME

Thank you for consulting Version 1.0 of the *EverGuard Freedom™ TPO Self-Adhered Roofing System Overview & General Requirements Manual*. You can find further information at gaf.com, or contact GAF Technical Services at 1-800-ROOF-411 (1-800-766-3411).

WHO IS GAF?

Founded in 1886, GAF has grown to become North America's largest manufacturer of commercial and residential roofing. Professional roofing contractors have long preferred the rugged, dependable performance that only a GAF roof can offer.

For roofing contractors and distributors:

- Helping to build your business and avoid hassles

For property owners & architects:

- Helping to ensure your best choice in roofing

WHAT IS IN THIS MANUAL?

This Manual contains the following sections:

- Welcome
- Guarantee Program
- Roof Design
- Design Considerations & Application Guidelines: EverGuard® Freedom™ TPO Self-Adhered Roofing System
- Roofing Details

WHAT ARE OUR PRODUCTS AND SERVICES?

No one offers a wider range of reliable, proven, cost-effective roofing solutions:

COMMERCIAL PRODUCTS

- **EverGuard® Freedom™ TPO Self-Adhering Roofing Systems**
- **EverGuard Extreme® TPO Single-Ply Roofing Systems**
- **EverGuard® TPO and PVC Single-Ply Roofing Systems**
- **RUBEROID® SBS and APP Modified Bitumen Roofing Systems**
- **LIBERTY™ SBS Self-Adhering Roofing Systems**
- **GAFGLAS® Fiberglass Built-up Roofing Systems**
- **TOPCOAT® Liquid-Applied Membrane Roofing Systems**
- **United Coatings™ Liquid-Applied Roof Coatings**
- **HydroStop® Liquid-Applied Roof Membrane**
- **StreetBond® Pavement Coatings**
- **GardenScapes™ Roofing...** Hassle-free Garden Roofing System

RESIDENTIAL PRODUCTS

- **Lifetime Designer Shingles...** Camelot® , Camelot II® , Country Mansion® , Slateline® , Grand Canyon® , Grand Sequoia® , Grand Sequoia® IR, Sienna™ , Woodland® , Monaco® and Glenwood® Shingles
- **Timberline® Lifetime Shingles...** Timberline Ultra HD® , Timberline HD® , Timberline® Natural Shadow® , Timberline® American Harvest® , Timberline® Cool Series® , and Timberline® ArmorShield™ II
- **3-Tab Shingles...** Marquis® WeatherMax® and Royal Sovereign®
- **TruSlate® Roofing...** affordable Genuine Slate Roofing System

ACCESSORY PRODUCTS

- We offer an extensive line of accessory products for our roof systems, including: EverGuard® TPO and PVC Prefabricated Accessories; Single-Ply Adhesives, Primers & Sealants; Matrix™ Coatings and Cements; EnergyGuard™ Insulation; DRIL-TEC™ Fasteners; M-WELD® Preflashed Accessories; Metalastic® Expansion Joint Covers; Lexsuco® Roof System Accessories; Cobra® and Master Flow® Ventilation Products; Timbertex® Premium Ridge Cap Shingles; WeatherWatch® and StormGuard® Leak Barriers; and Shingle-Mate® and Deck-Armor™ Roof Deck Protection.

SERVICES

- Every GAF roofing product benefits from the substantial resources available only from a multibillion-dollar corporation dedicated to roofing. Our 32 plants mean manufacturing expertise. Our extensive R&D organization means a constant focus on product and process improvement. Over 250 sales and technical personnel mean that GAF is there, in person, to provide you with the service and information you need. GAF is a team of over 3,000 people dedicated to your roofing satisfaction.
- GAF has a network of sales representatives and distributors to supply and service its quality roofing systems throughout North America.
- Our Technical Helpline is a technical assistance service that allows you to contact us directly to speak with a technical representative about specifications, applications, code approvals, and product information. The Helpline number is 1-800-ROOF-411 (1-800-766-3411).
- Architectural Information Services (AIS) is a specification service that helps you to specify your exact roofing needs and will send you a general specification that outlines your job summary, application method, product description, and detail drawings. The phone number for AIS is 1-800-522-9224.
- Our Tapered Design Group (TDG) is one of the many services available to our customers to help reduce their hassles. We provide tapered insulation take-offs for architects, contractors, and distributors nationwide. Just send your roof plans and specifications to tdg@gaf.com. The phone number for TDG is 1-800-766-3411.
- Visit GAF on the web at gaf.com for extensive product information, specifications, and technical literature.

WELCOME

A FEW THINGS TO CONSIDER...

- This Manual contains the latest information relating to the application of GAF's EverGuard® Freedom™ TPO Self-Adhered Roofing Systems and is based on our years of experience in the commercial roofing field. It has been prepared as a general guide to assist architects, engineers, roofing contractors, and owners in the use of our roofing systems.
- GAF manufactures and sells roofing materials and does not practice architecture or engineering. GAF is not responsible for the performance of its products when damage to its products is caused by such things as improper building design, construction flaws, or defects in workmanship.
- The design responsibility remains with the architect, engineer, roofing contractor, or owner, and construction details illustrated and described herein are furnished solely for guidance purposes. These guidelines should not be construed as being all-inclusive, nor should they be considered as a substitute for good application practices.
- Under no circumstances does GAF have any liability for expenses arising out of or associated with the preexisting presence of asbestos-containing materials or any other allegedly hazardous substances or materials on the roof to which the new GAF roofing materials are being applied.
- Information contained in this Manual is presented in good faith and, to the best of GAF's knowledge, does not infringe upon any patents, foreign or domestic.
- As a part of its continuing efforts to improve the performance of its products, GAF periodically makes changes to its products and application specifications. The Company reserves the right to change or modify, at its discretion, any of the information, requirements, specifications, or policies contained herein. This Manual supersedes all catalogs and previous manuals.
- GAF is Your Best Choice!

GUARANTEE PROGRAM

GENERAL

GAF offers roof guarantees for a fee for all roofing system specifications published in this Manual when installed by GAF Factory-Certified Low-Slope Roofing Contractors in accordance with the terms and conditions set forth in this Manual, and the procedures for obtaining a guarantee are followed.

All guaranteed roofing systems must be flashed in accordance with the GAF flashing requirements and details included in this Manual. All GAF insulation, fasteners, pre-flashed details, expansion joint covers, cements, coatings, and accessory products as job appropriate are required for guarantees unless otherwise approved in writing by a Field Services Manager or Director prior to installation.

GAF will be the sole judge as to whether or not a roofing guarantee will be issued to cover any proposed or completed roof. The issuance of a guarantee and its effectiveness or the continued liability thereunder is contingent upon payment of GAF's guarantee fee and payment in full to the roofing contractor and materials suppliers.

GAF has no obligation to issue a roofing guarantee on any roof. Any inspection prior to issuance is **solely** for the benefit of GAF and does not constitute a waiver of any terms or conditions in the guarantee. In the event that a roof system does not conform to GAF's standards and a guarantee is not issued, no portion of the guarantee fee is refundable.

GAF will not accept Notices of Award of Contract that indicate that the owner or architect has the option to accept or reject the guarantee upon completion of the roof.

Specifications not listed in this Manual may also be eligible for GAF guarantees. For further information on guarantee requirements and for approval of modifications to published specifications, consult with GAF at 800-766-3411.

GAF is not responsible for consequential damages in case of roof system failure. GAF has no control over a building's contents, type, quantity, positioning, or protection.

A GAF may be cancelled by GAF for violation of its terms and conditions.

GAF guarantees may be eligible for GAF WellRoof® guarantee extension. See guarantee for terms and conditions.

SPECIAL CONDITIONS

A guarantee will not be issued to cover less than the entire roof area of a single building.

A GAF roofing system guarantee will not be issued for the following without prior written approval from the Field Services Manager or Director:

- over any surface or deck not covered in this Manual
- over a cold storage building, unless a ventilated plenum isolates the cold storage area from the roofing system and substrate
- on storage silos, heated tanks, or domed structures
- on structures having conduit or piping between the roof deck and roofing membrane, unless the conduit or piping is installed in channels below the top deck surface
- on roofs that have an inadequate number and spacing of expansion joints or curbs
- on systems constructed with insulation not approved by GAF
- on any structure where there is limited or no access to the roof
- on a roof designed for or used as a water-insulated or spray roof
- on promenade or parking roofs
- on waterproofing applications
- for any structure where high-heat or humidity conditions exist such as, but not limited to, breweries, creameries, laundries, textile mills, pulp and paper plants, swimming pools, shower rooms, and canneries
- when roofing over an existing roof system that contains moisture, that is not adhered to the substrate or roof deck, and/or provides an improperly prepared surface
- on plywood decks without continuous solid end blocking
- on roofs containing sprayed-in-place polyurethane foam
- on any high-temperature condition that allows the roof membrane temperature to exceed 160°F (71°C).
- any unusual condition not specifically approved by GAF

GUARANTEE PROGRAM

GAF ROOF GUARANTEE PROGRAM

GAF offers an extensive selection of roof guarantees to meet the needs of most building owners. The following guarantees are available for use with selected EverGuard® Freedom TPO Roof Systems when installed by an eligible GAF factory-certified contractor. Contact GAF Technical Services for additional information and specific guarantee requirements.

GAF Roof Guarantee Type

All-American Pledge™ Steep- and Low-Slope Roof Guarantee

– Coverage: NDL

– Term: Up to 20 Years

GAF Diamond Pledge™ Roof Guarantee

– Coverage: NDL

– Term: Up to 20 Years

GAF System Pledge™ Roof Guarantee

– Coverage: Specified \$ per square

– Term: Up to 20 Years

WellRoof® Guarantee Extension*

– Coverage: Extends Diamond Pledge™ Coverage

– Coverage: 25% longer term

*A program that encourages property owners to utilize an annual maintenance agreement; when certain requirements are met, GAF will extend its Diamond Pledge™ Guarantee by 25%. Contact Technical Services at 1-800-766-3411 for qualifying specifications and detailed information. All work must be completed by a GAF Certified Maintenance Professional (CMP). See WellRoof® Guarantee Extension for complete coverage and restrictions.

GAF CERTIFIED CONTRACTOR PROGRAM

GAF does not install roofing systems. GAF does not own roof contracting companies, or have any interest in companies installing roofing systems. Accordingly, GAF shall not be responsible for any roofing contractor's workmanship except as specifically covered under the terms and conditions of the GAF roofing guarantee.

The term "GAF Factory-Certified Low-Slope Roofing Contractor" only identifies a contractor eligible to apply for a GAF roofing guarantee and is not intended to convey any other meaning. GAF Factory-Certified Low-Slope Roofing Contractors are not employees, agents, or representatives of GAF.

GAF will issue a roofing system guarantee only for roofs applied by a GAF Factory-Certified Low-Slope Roofing Contractor. The responsibility for proper application of the roof lies with the Roofing Contractor alone. It is the responsibility of the building owner and his designated representatives, as the employer of the Roofing Contractor, to enforce compliance with specifications and good workmanship practices, and such enforcement is not an obligation of GAF.

INSPECTIONS

GAF will inspect only those roofs where a guarantee is to be issued or where special inspection services have been agreed to be purchased prior to the start of the roof construction, and the current charge for the guarantee or inspection services has been paid. If an inspection is requested and the job is not ready or the owner's representative is not available, the owner will be charged for the visit at consultation fee rates.

GAF reserves the right to waive inspection of guaranteed roofs when, in its opinion, inspection is not necessary. In such cases, the owner or designer may request a special inspection for which an additional charge may be made.

Any inspections made by GAF are for its own use only and do not constitute a waiver of any of the terms and conditions of the guarantee.

Should a GAF Field Services Representative observe conditions on the job site that do not conform to the requirements of this Manual or standard good roofing practices, such conditions will be brought to the attention of the roofing contractor. GAF, at its sole discretion, has the right to require corrective action as it deems necessary to conform to the requirements of this General Requirements Manual and the requirements for the issuance of the GAF roofing system guarantee.

ROOF DESIGN

Provides a quick reference of technical requirements for EverGuard® Freedom™ TPO Self-Adhered Roofing System design

- General
- Sustainable Design
- Building Utilization
- Tear-off or Re-cover
- Roof Decks
- Parapet Walls
- Roof Drainage
- Expansion Joints
- Area Dividers
- Equipment Mountings
- Fire Resistance
- Wind Performance
- Energy Efficiency
- Water Vapor Transfer
- Air Barriers

GAF does not practice architecture or engineering. This section is provided for guidance purposes only based on GAF's experiences in the roofing industry. However, there are many factors that may affect roof design, including specific job site conditions, local building codes, building use, etc., which must be taken into account. GAF recommends consultation with a design professional to determine specific roofing needs and requirements for each particular project.

ROOF DESIGN

GENERAL

Proper roofing system design and selection requires the consideration of many factors. Although GAF's expertise is in materials manufacturing, and not in engineering, architecture, or specialized roof consulting, our company has decades of extensive experience in the practical aspects of roofing.

GAF is not responsible for moisture-related problems associated with any deck materials.

Our experience suggests that careful consideration of the following will provide a fundamentally sound basis for design and selection of EverGuard® single-ply roofing systems.

SUSTAINABLE DESIGN

ENERGY STAR® is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy. It is designed to help our nation save energy and money, and to protect the environment through energy-efficient products and practices. Energy-efficient choices can save building owners significantly on their energy bills with similar savings of greenhouse gas emissions, without sacrificing features, style, or comfort. ENERGY STAR® helps consumers, contractors, architects, and property owners make more knowledgeable, energy-efficient choices.

The LEED® (Leadership in Energy and Environmental Design) Green Building Rating System is a voluntary standard for developing high-performance, energy-efficient sustainable buildings. The LEED® Certification System is a program that awards building points for satisfying specified green-building criteria and requirements.

Green Globes® is a web-based program for green building guidance and certification that includes an on-site assessment by a third party and is an alternative to the LEED® rating system.

GAF's EverGuard® TPO membrane is the first to be certified by NSF International for the NSF/ANSI 347 *Sustainability Assessment for Single-Ply Roofing Membranes*. This Standard evaluates the sustainability of single-ply roofing membranes. The Standard includes criteria across the product life cycle from raw material extraction through manufacturing, use, and end-of-life management. Go to www.nsf.org for details.

BUILDING UTILIZATION

Building utilization can have a significant impact on roofing system selection and design. The most common building utilization considerations are as follows: PV (Solar Applications), extremes in internal temperature/humidity; positive internal pressure; rooftop traffic/abuse; rooftop-exhausted contaminants; and the use of the roof as living space.

PV (Solar Applications)

- Please contact GAF before installing any overburden on the roof.
- EverGuard® Extreme® TPO is not available for the EverGuard® Freedom™ TPO Self-Adhered Roofing System.

Internal Temperature/Humidity

Extremes in internal temperature/humidity are most often associated with cold storage/freezer buildings, swimming pool facilities, drying kilns, food processing plants, paper/pulp mills, and smelting/blow furnace facilities. What makes these building applications unusual is that the pronounced difference in vapor pressure between the building interior and the exterior can cause a pronounced vapor flow through the roof assembly. This can result

in a significant build-up of condensation within the roof assembly, and severe deterioration of both the roof assembly itself and the structural deck.

Relevant design considerations include:

- Incorporation of a vapor retarder at deck level to control vapor flow into and through the roof assembly;
- Attention to a vapor-tight seal between the roof and side walls/penetrations;
- Utilization of closed-cell foam insulation and stainless steel fasteners to minimize potential for condensation-related degradation of the roof system;
- Limitation of penetrations through the roof deck;
- Avoidance of roof system attachment that will puncture the vapor retarder.

Positive Internal Pressure

Positive internal pressure is most often associated with manufacturing/clean-room facilities, mechanical air-handling rooms, aircraft hangars, distribution centers with multiple overhead doors, and high-rise office/residential towers. In all these instances, positive internal pressures can adversely act on the underside of the roof system.

Conditions where the positive internal pressure is constant, as in the case of clean-room facilities and high-rise towers, may cause the roof system to billow up in a mechanically attached system, i.e., form a mattress effect, and may reduce the overall uplift resistance of the roofing system.

This effect can cause attachment concerns with other types of roof system installations including adhered systems. Conditions where the positive internal pressure is applied suddenly, as in the case of aircraft hangars and distribution centers, may cause failure of the roofing system due to pressure impact.

Relevant design considerations include:

- Use of air-impermeable deck construction, such as poured-in-place concrete or insulating cellular concrete over a steel pan;
- Alternatively, installation of an air barrier, such as polyethylene sheeting, at deck level beneath mechanically attached insulation with attachment sufficient to balance positive pressure;
- Attention to an air-tight seal between roof and side walls/penetrations.

Rooftop Traffic/Physical Abuse

Roofing installations that can be expected to experience a high degree of roof traffic due to equipment maintenance, vandalism or other unauthorized access, frequent hailstorms or high winds, and prolonged periods of temperature extremes or rapid fluctuations in temperature will require a more durable roofing system.

Relevant design considerations include:

- Use of thicker membrane or multiple-ply system;
- Installation of EverGuard® TPO Walkway Roll at high-traffic areas;
- Use of a higher compressive strength insulation substrate;
- Application of a concrete paver or insulated paver overlay for extreme conditions.

Contamination

Many roofing installations are exposed to oil, grease, and chemical contamination in excess of normal airborne contaminants. These conditions are most often associated with restaurants, food processing plants, chemical and pharmaceutical plants, refineries, machining and manufacturing facilities, and airports. Most roofing materials are degraded by certain families of contaminants, and will become brittle, swell and soften, or dissolve, depending on the material formulation and contaminant type.

Long-term exposure, i.e., 28-day immersion testing of roofing material and specific contaminant, remains the preferred method of determining material resistance. Even then, unforeseen combinations of contaminants, environmental exposure effects, and variation in contaminant concentration prevent an absolute prediction of resistance to contamination in all but the most common situations.

Relevant design/maintenance considerations include:

- Isolation of contaminated roof area with expectation of more frequent roof membrane replacement;
- Periodic power washing of roofing membrane with moderate pressure;
- Limitation of rooftop spillage/exhaust of contaminating materials, i.e., grease traps.

Please refer to gaf.com for detailed TPO Chemical–Resistance Charts.

NOTE: GAF guarantees do not cover damage due to chemical contamination.

TEAR-OFF OR RE-COVER

The decision to tear-off or to re-cover an existing roofing system is not always clear.

Although not an exhaustive list, the following additional design elements typically require consideration for any reroofing project:

- Replacement of damaged roof decking or structural components;
- Improvement of roof access;
- Removal of unused rooftop equipment and associated equipment mountings;
- Remounting of rooftop equipment to allow proper roofing and flashing technique;
- Matching of architectural elements such as special perimeter metalwork;
- Repair of deteriorated parapet and penthouse walls;
- Protection of roofing membrane by means of concrete paver overlay or walkway pad system.

Tear-off/Replace

Factors that support the tear-off approach include:

- Two or more existing roofs (building code restriction);
- Structural weight limitation;
- More than 25% of existing roof area is wet;
- Flashing height limitations;
- Need to maximize long-term performance.

The basis for any tear-off project is to provide a sound substrate for

the installation of a new roofing system and minimize potential damage from tear-off activities. *At a minimum, attention to the following considerations is recommended:*

- Thoroughly inspect decking, flashing substrates, and wood nailers before installing new materials;
- Plan a tear-off strategy so that roof drainage patterns are never blocked, and so that construction traffic is directed away from new roof areas;
- Protect new roof areas adjacent to tear-off areas from dirt, debris, and damage.

Re-cover

Factors that support the re-cover approach include:

- Need to minimize cost;
- Disposal restrictions;
- Difficult access to the roof;
- Only one roofing system in place.

The basis for any re-cover project is to eliminate defects in the existing roof assembly so that their effect on the new roofing system is minimized. *At a minimum, attention to the following considerations is recommended:*

- Raise all perimeter flashings, penetrations, and equipment to provide required flashing heights;
- Address drainage deficiencies to provide positive drainage;
- Remove and replace all wet roofing materials;
- Concentrate on thorough surface preparation.

Re-covering Over Coal Tar Pitch Roofing

Coal tar pitch has oils and vapors that can be harmful to various roofing membranes and may discolor white thermoplastic membranes. Coal tar pitch may also “cold flow” or self heal. For these reasons, GAF does not recommend re-covering over existing coal tar pitch roofs using an EverGuard® Freedom™ TPO Self-Adhered Roofing System.

ROOF DECKS

It is the responsibility of the engineer, architect, building owner, or roofing contractor to determine the fitness of a deck for a specific roofing system installation. Additionally, GAF is not responsible for moisture related problems associated with any deck materials.

Most common structural roof deck types are suitable substrates for the installation of an EverGuard® roofing system.

Structural Steel

- Min. 22 gauge (standard FM-approved steel decking is 22 gauge in thickness).
- 24-26 gauge decks require a GAF Field Services Manager's or Director's approval. Thinner-gauge steel decks usually require additional mechanical fasteners to achieve comparable roof attachment performance.
- 18 gauge, 20 gauge, and 22 gauge Grade E high-strength steel decks usually require fewer mechanical fasteners to achieve comparable roof attachment performance.

ROOF DESIGN

Structural Concrete

- Min. 2,500 psi compressive resistance (98,066 kilogram-force/square centimeter).
- Min. 2" (51 mm) thickness (pre-cast), min. 4" (102 mm) thickness (poured-in-place).
- Cannot be wet or frozen. If the deck is determined to be wet, it must be allowed to dry.
- For insulated decks, wood nailers of equivalent thickness to the roof insulation must be provided at perimeters and projection openings to act as an insulation stop and to provide for the nailing of the flanges of metal flashing.
- Ridges and other irregularities require grinding to provide a smooth and even substrate surface.
- For non-insulated decks, nailers must be flush with deck surfaces.
- When applying insulation directly to the deck in hot asphalt, prime with asphalt/concrete primer, meeting ASTM D41, at a rate of 1 gal/square (3.8 m/liter) and allow the primer to dry prior to the application of the roofing system.

Pre-cast Concrete Decks

- These decks are usually manufactured as planks or slabs and constructed of steel-reinforced Portland cement and solid aggregate; often they are made with hollow cores to minimize their weight.
- All deformed panels must be replaced.
- Joints must be filled with a masonry grout to correct imperfections between slabs and feathered to provide a slope not greater than $\frac{1}{8}$:12 for adhered insulated assemblies.
 - If the joints cannot be grouted and finished smooth, then a leveling course of lightweight insulating concrete (minimum 2" [51 mm] thickness) must be applied. Do not seal joints between the slabs; leave open to permit venting and drying of the roof fill from below.

Prestressed Concrete Decks

- GAF recommends a minimum 2" (51 mm) cellular lightweight concrete fill be installed over all prestressed concrete decks prior to installation of the roof system and/or insulation because variations in camber and thickness of prestressed concrete members may make securement of the roof system difficult.
- Provisions must be made for the curing or drying of the fill installed over the top of the prestressed deck members. Do not seal joints between the slabs. Leave joints open to permit venting and drying of the roof fill from below.

Poured Structural Concrete Decks

- Should be properly cured prior to application of the roofing system; twenty-eight (28) days is normally required for proper curing. Check curing agents for compatibility with roofing materials. Prior to the installation of the roof assemblies, GAF recommends the evaluation of surface moisture and deck dryness through the use of ASTM D4263 or a hot bitumen test.
- Should be poured over removable forms or must provide for bottom side drying. Poured-in-place structural concrete decks that are poured over non-vented metal decks or pans that remain in place can trap moisture in the deck under the roof system.
- The underside of the concrete decks, either the vented metal forms or exposed concrete, should remain unobstructed to

allow the escape of water vapor. Materials that retard the flow of vapor must not be installed directly below the deck. Foil-faced insulation secured to the bottom of the deck, spray-on fireproofing or paint, which obstruct the venting of the concrete, are just three examples of unacceptable deck assemblies.

- GAF recommends that a vapor retarder be used directly over any poured structural concrete installed over non-removable form decks or any impermeable substrate and **requires** the use of a vapor retarder for lightweight aggregate poured decks in this configuration..
- Roofing professionals must take care with lightweight structural concrete decks. The selection of the deck material and its suitability for use is the responsibility of the designer of record, who must make appropriate design accommodations to address high moisture content encountered in lightweight structural concrete. GAF is not responsible for moisture-related problems associated with lightweight structural concrete decks.

Wood Planking

- Min. 1" (25 mm) nominal thickness.
- Tongue & groove or splined edges required.
- All boards must have a bearing on rafters at each end and be securely fastened.
- Lumber should be kiln-dried.
- Check compatibility of preservatives or fire retardants used to treat decking with roofing materials.
- Decking should be kept dry and roofed promptly after installation.
- Tape and staple fastening systems may be used on wood decks when they comply with local building codes and agencies.

Plywood

- Min. 15/32" (12 mm) thickness.
- Plywood sheathing shall be C-D Exposure 1 APA Rated, minimum 4 ply.
- Plywood sheathing shall comply with Structural 1 performance rating.
- Plywood sheathing shall comply with roof deck design requirements and local codes for roof deck construction.
- Tongue & groove edges or full blocking required.
- Must be installed over joists not greater than 24" (610 mm) o.c.
- Must be installed so that all four sides of each panel bear, and are secured to, joists 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" (3 mm – 6 mm) gap between panels and must match vertically at joints to within 1/8" (3 mm).
- Decking should be kept dry and roofed promptly after installation.
- Deck shall be attached with approved fasteners at required spacing. Consult local building codes for specific requirements.

ROOF DESIGN

Oriented Strand Board (OSB)

- Min. 15/32" (12 mm) thickness.
- Minimum 2" (51 mm) of polyisocyanurate insulation above deck, one or more layers
- Must meet minimum pull out values
- Minimum 5 test pulls per 1,000 sq. ft.
- Oriented strand board (OSB) shall be C-D Exposure 1 APA Rated.
- OSB shall comply with Structural 1 performance rating.
- OSB shall comply with roof deck design requirements and local codes for roof deck construction.
- Tongue & groove edges or full blocking required.
- Must be installed over joists not greater than 24" (610 mm) o.c.
- Must be installed so that all four sides of each panel bear, and are secured to, joists 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" (3 mm – 6 mm) gap between panels and must match vertically at joints to within 1/8" (3 mm).
- Decking should be kept dry and roofed promptly after installation.
- Deck shall be attached with approved fasteners at required spacing. Consult local building codes for specific requirements.

Note: 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.

Gypsum Concrete

- Min. 2" (51 mm) thickness.
- Steel reinforcing mesh and permanent form boards required for poured-in-place monolithic decks.
- Steel-reinforced edges required for pre-cast decking units.
- An average fastener withdrawal resistance as recommended by the fastener manufacturer must be obtained. If proper mechanical attachment cannot be achieved, contact the GAF Technical Hotline at 1-800-ROOF-411 for assistance with installation recommendations.
- If surface is either wet or frozen, a poured gypsum deck is not suitable to receive a roof.

Cementitious Wood Fiber

- Min. 2" (51 mm) thickness.
- Tongue & groove panel edges required.
- OSB or insulation composite decks for use with fully adhered systems require approval from the GAF Field Services Manager or Director.
- Should not be installed over high humidity occupancies.
- All structural wood fiber deck panels must be anchored against uplift and lateral movement.

Lightweight Insulating Concrete (LWIC)

- Min. 2" (51 mm) thickness.
- 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.
- Insulating concrete installed over structural concrete or existing roof membrane substrates requires approval from the GAF Field Services Manager or Director.
- Lightweight insulating concrete decks are required to have a minimum compressive strength of 125 psi (9 kg/cm) and a density of 22 pcf (208 g/cm). Individual deck manufacturers' standards apply when their specifications exceed these GAF minimum thicknesses, compressive strengths, and density requirements.
- Where the January Mean Temperature (reference current ASHRAE Fundamentals Handbook) is below 40°F (4.4°C), lightweight insulating concrete decks must be poured and roofed between April 1 and October 31; this type of deck is unacceptable in Alaska and Northern Canada.
- Lightweight insulating concrete should not be poured during rainy periods: Deck areas that have frozen before they have cured must be removed and replaced. Check decks for moisture content and dryness if exposed to precipitation prior to installation of roof membrane.
- Roofing professionals must take care with lightweight structural concrete decks. The selection of the deck material and its suitability for use is the responsibility of the designer of record, who must make appropriate design accommodations to address the high moisture content in lightweight structural concrete. GAF is not responsible for moisture-related problems associated with lightweight structural concrete decks.

Loadmaster Decks

- Roof deck must be installed by a Loadmaster-approved contractor according to Loadmaster specifications.
- Min. 25 gauge steel decking, 15/16" (22 mm) deep with 1/2" thick (13 mm) mineral board top panel.
- Polystyrene or polyisocyanurate insulation is optional.
- Install only white or light colored membranes on Loadmaster Decks.
- Consult a GAF Field Services Manager or Director for reroofing and re-covering requirements.

PARAPET WALLS

Most common structural wall types are suitable substrates for the installation of EverGuard® membrane flashing.

Brick/Block Masonry

- Standard-finish brick and concrete block with standard tooled mortar joints are suitable substrates.
- Split-face block, textured block and brick, and deeply tooled mortar joints require a cementitious coating or plywood facing to provide a smooth and even substrate surface.

ROOF DESIGN

Structural Concrete

- Steel trowel, wood float, or removable form finish are suitable substrates.
- Ridges and other irregularities require grinding to provide a smooth and even substrate surface.

Stucco/EIFS

- Stucco finish and EIFS systems must be removed to the underlying substrate surface.

Plywood/Oriented Strand Board (OSB)

- Plywood must be exterior grade, minimum 4 ply, and not less than $\frac{15}{32}$ " (12 mm) thick.
- OSB must comply with Structural I rating and be not less than $\frac{7}{16}$ " (11 mm) thick.
- Tongue-and-groove edges or full blocking required.
- Adhesives should only be used with untreated plywood/OSB.

Sheet Metal

- Min. 24-gauge steel.
- Min. .032" (8 mm) aluminum.
- Corrugated panels require overlay of $\frac{15}{32}$ " (12 mm) plywood/oriented strand board or silicone-impregnated gypsum panel.

Gypsum Panel

- Min. $\frac{1}{2}$ " (13 mm) thickness.
- Silicone-impregnated fiberglass-faced panels required.
- Underlying substrate must allow securement of flashing at prescribed spacing. Mechanical attachment to gypsum panels is not acceptable.
- Use of gypsum panel decks requires GAF Field Services Area Manager's approval.

ROOF DRAINAGE

Providing positive roof drainage is important. Standing water can result in deck deflection and possible structural damage. In addition, in the event of an opening through the roofing membrane, standing water can significantly worsen damage to the roof system, the building itself, and interior contents by providing a reservoir of water ready to gravitate through the membrane opening. Providing structural slope in the deck assembly, installing a tapered lightweight cellular concrete overlay, installing a tapered insulation system, or adding additional drains are the most common methods of achieving positive drainage.

National building codes generally require a minimum $\frac{1}{4}$:12 slope to drain in order to provide positive drainage and accommodate deck irregularities. Although existing buildings may or may not be required by code to achieve this degree of roof slope, providing positive slope to drain remains an important design consideration.

In situations where roof edge conditions, window/door height above the roof surface, parapet wall height, weep hole locations, rooftop equipment mountings, or other factors prevent the installation of a full slope-to-drain system, a combination of additional drain locations, tapered saddles, and crickets to direct drainage to drain points should be considered.

EXPANSION JOINTS

The function of a structural expansion joint is to minimize the effect of stresses and movements on building components and to prevent these stresses from adversely affecting the roof. The design, location, and use of building structural expansion joints must be considered at the time of original building design and are the responsibility of the architect, engineer, and building owner.

Expansion Joints:

- Must be continuous along the break in the structure and not terminated short of the end of the roof deck.
- Should never be bridged with insulation or roofing membrane.
- Construction ties must be removed in order for expansion joints to function properly.
- Extend expansion joints at least 8" (203 mm) above the roof surface on curbs and use either EverGuard® Prefabricated Expansion Joint Covers or metal expansion jointcovers. Alternately, a low-profile expansion joint can be used. See EverGuard® details for construction.
- Design drainage flow patterns so they are not blocked by any structural expansion joints.
- Where possible, position walkways on roof access points to limit roof traffic over expansion joints; provide protective coverings for expansion joints at locations of anticipated roof traffic.

AREA DIVIDERS

Area dividers are not considered structural expansion joints. They can be installed to separate different roofing systems and can be either a curb or low-profile type. Contact GAF Technical Services at 1-800-ROOF-411 for recommendations regarding area dividers.

EQUIPMENT MOUNTINGS

Proper mounting of equipment is an important consideration. In general, rooftop equipment should be mounted in such a way as to provide (i) adequate flashing height for both new and anticipated re-cover roof system applications; (ii) sufficient clearance around and beneath the equipment to facilitate roof system installation; and (iii) compatibility with roofing and flashing materials so that standard flashing methods can be readily applied.

Alternately, lightweight equipment and gas/conduit lines can be installed on wood blocking or other prefabricated devices that do not penetrate the roofing system. Do NOT use this type of installation for heavy equipment and gas/conduit lines, or where excessive movement can damage the substrate or membrane.

FIRE RESISTANCE

Resistance by the roofing system to fire on the exterior roof surface is important. Typically, a UL Class A or B rating is required by building code. Occasionally, depending on the use of the building, special resistance to fire applied from within the building is required. This is normally expressed in the form of hourly ratings, and usually requires the use of a specialized roof assembly. Refer to current EverGuard® listings in the appropriate UL directory or Factory Mutual Approval Listing to verify roof assembly requirements for specific fire ratings.

WIND PERFORMANCE

Ideally, roofing systems should be capable of resisting the forces generated by the maximum anticipated wind speed for a specific building. One widely accepted method for specifying wind performance is to require the appropriate FM 1-60, 1-90, or other rated system as appropriate for a specific building based upon location and exposure.

The following are common standards and approvals typically used in conjunction with wind performance of EverGuard® roofing systems:

- **Factory Mutual Approvals**
 - Testing based on method described in Approval Standards 4450 and 4470.
 - Measures resistance to upward pressure applied to the roof system.
- **American Society of Civil Engineers (ASCE) document ASCE 7, “Minimum Design Loads for Buildings and Other Structures”**
 - A comprehensive analysis of wind forces acting on buildings. Requires detailed calculations to determine actual wind pressures at different regions of the roof.
 - Referenced by building codes.

Refer to Factory Mutual Loss Prevention Data Sheets 1-28 and 1-29 for specific installation guidelines.

ENERGY EFFICIENCY

Thermal transmission standards have been established by building codes for most buildings. Roof insulation installed above the roof deck is a practical means of achieving the necessary energy efficiencies. In addition, the use of white-colored reflective membranes can help reduce the heat load on air-conditioning equipment, as well as provide a moderating effect on the temperature in proximity to the building.

- **U-Value**
 - Thermal Transmittance: The number of BTUs (energy) that pass through a 1-square-foot (0.1 sq. m.) sample of a total material assembly in one hour with a temperature difference between the two surfaces of 1°F (-17°C).
 - Thermal transmittance applies to an actual total material assembly, and as such is a quantitative physical property that can be used to represent the overall thermal performance of a system.
- **R-Value**
 - Thermal Resistance: The number of degrees difference between two surfaces (energy difference) that is required to obtain an energy flow of 1 BTU through a 1-square-foot (0.1 sq m) sample of a given material thickness in one hour.
 - The R-value is the reciprocal of the C-value. The C-value represents thermal conductance and depends on the thickness of the material
 - Thermal resistance applies to an actual thickness of a material, and as such is a quantitative physical property that can be used for determining insulation requirements.
- **Reflectance**
 - A measure of the % of solar energy that is reflected away from a surface.

- Dark materials absorb more heat from the sun and can be up to 70°F (21°C) hotter than a reflective white surface given the same outside temperature and conditions such as wind speed, location, etc.

- **Emittance**

- A measure of the infrared radiation emitted from a roof surface. Unlike reflectance, infrared emissivity may not be affected by dirt or discoloration of the surface of a material.

The following references provide useful information regarding energy efficiency:

- **ASHRAE Fundamentals Handbook**

- Provides detailed design calculations and material energy transfer information utilized by mechanical engineers in the design of heating, ventilation, and air-conditioning systems.
- Suitable for complex energy evaluation considerations such as solar heat gain, exterior shading, total building envelope, building usage, and lighting.

- **Guidelines for Complying With Energy Code Requirements for Roof Assemblies: International Energy Conservation Code**

- Provides useful information for determining the amount of insulation necessary to construct an energy-efficient low-slope roof system.
- Provides a simplified method for determining the energy cost savings resulting from the installation of additional roof insulation.
- Suitable for most roofing-related energy evaluations.

- **The NRCA Energy Wise Roof Calculator**

- Provides a simplified method for determining the amount of insulation necessary to construct an energy-efficient low-slope roof system.
- Provides a simplified method for determining the energy cost savings resulting from the installation of additional roof insulation.
- Suitable for most roofing-related energy evaluations.
- Go to www.energywise.nrca.net

- **DOE Energy Calculator**

- Go to www.ornl.gov/sci/roofs+walls/facts/CoolCalcEnergy.htm to find the Cool Roof Calculator.
- This tool measures the energy savings for low-slope roofs with non-black roof surfaces.

WATER VAPOR TRANSFER

Typical single-ply roof assemblies do not include vapor retarders as a standard assembly component. For these applications, there is a natural transfer of water vapor into the roof assembly during a portion of the year, followed by a natural transfer of water vapor out of the roof assembly during the balance of the year. Under normal conditions, this type of cyclical water vapor flow does not cause significant deterioration of the roof insulation or reduction in insulation thermal performance.

ROOF DESIGN

However, for projects where there is a significant difference in vapor pressure between building interior and exterior, the volume of water vapor flow is much greater, and control of water vapor transfer into and through a roof system becomes an important consideration. Without adequate control provisions, the roof insulation can become saturated with water, with a corresponding reduction in insulation thermal performance. Structural deck damage and/or condensation into the building interior may also occur. GAF is not responsible for leaks or other conditions caused by condensation.

Vapor flow is referenced in various ways. The following is a description of common terminologies:

• Permeance

- The time rate of vapor transmission through a flat material or construction induced by vapor pressure difference between two specific surfaces, under specified temperature and humidity conditions.
- Units of permeance are expressed as: (gr.) / (h) (sq.ft.) (in Hg).
- The permeance, or perm rating, of a material is a performance evaluation specific to a sample of material, and not a specific property of the material.

• Relative Humidity

- Relative humidity is the ratio of the pressure of water vapor present in air to the pressure of fully saturated water vapor at the same temperature.
- Relative humidity is expressed as a percentage.

• Dew Point Temperature

- The temperature at which air becomes saturated with saturated vapor (100% relative humidity) and condensation begins to form.
- Dew Point Temperature is expressed as °F (°C).

• Temperature and Relative Humidity

- Vapor flows due to a difference in vapor pressure between two locations, and flows from higher to lower pressure regions.
- Normally, the higher the temperature, the higher the vapor pressure, and this is typically called the "warm side."
- In determining the need for a vapor retarder for most typical conditions, the exterior winter temperature and the interior winter relative humidity are the most critical factors.
- Temperature information is readily available from the National Weather Service.
- Relative humidity information is typically available from the building HVAC design professional or the building operations manager. Relative humidity can also be field measured.

• Vapor Retarder Location

- A number of basic considerations factor into the need and location of a vapor retarder. **Determining the need and location of the vapor retarder is the responsibility of the design professional.**
- Vapor retarders are intended to be installed as close to the "warm side" as possible. Normally, this places the vapor retarder directly on the structural deck or directly over a minimal layer of EnergyGuard™ insulation or fire barrier.

- Typically a sufficient amount of EnergyGuard™ insulation must be installed over the vapor retarder to raise the location of the dew point temperature above the level of the vapor retarder.

• Sealing At Perimeter And Penetrations

- Vapor retarders shall be completely sealed at all perimeter and penetration locations.
- Sealing methods shall be selected in accordance with the type of vapor retarder being installed.
- Air leakage at the perimeter and penetrations will significantly reduce the effectiveness of the vapor retarder by allowing moist air to penetrate into the roof assembly, where it can condense and cause roof deterioration.

• Building Usage

- Normal building usage such as offices, schools, retail, warehousing, etc., will not typically require the use of a vapor retarder except when located in the most northerly climates.
- Building usage such as swimming pools, food processing, paper manufacturing, foundries, etc., that result in increased internal temperatures and humidity conditions will likely require the use of a vapor retarder (except when located in the most southern climates).
- These generalizations are not intended to substitute for actual vaporflow calculations based upon specific building and climactic conditions.

• The Case For The Use Of A Vapor Retarder

- A vapor retarder can protect the long-term thermal resistance of insulation sandwiched between the vapor retarder and the membrane.
- A vapor retarder provides a good safeguard against vapor migration in case a building's use changes from a "dry" use to a "wet" use.

• The Case Against The Use Of A Vapor Retarder

- The vapor retarder, together with the roofing membrane, may seal entrapped moisture within the roof system that can eventually destroy the insulation, wrinkle the membrane, or, in gaseous form, blister it.
- In the event of a roof leak through the membrane, the vapor retarder will trap the water in the insulation and release it through punctures, breaks, or poor seals in the vapor retarder. This water may move some lateral distance from the roof leak, thus making leak discovery more difficult. A large area of insulation may be saturated before the punctured roof membrane is discovered and repaired.
- A vapor retarder is a disadvantage in summer, when vapor migration is generally downward through the roof. Hot, humid air can infiltrate the roofing "sandwich" through vents, or via diffusion through the roof membrane itself. If this occurs, moisture can condense within the roofing system.

The following resources may provide useful information regarding vapor retarders:

- NRCA Guidelines for Condensation and Air Leakage Control
- ASHRAE Fundamentals Handbook

TPO ATTACHMENT TABLE -- NEW CONSTRUCTION OR TEAR-OFF - EVERGUARD® FREEDOM™

Deck	Insulation/Substrate						Insulation/Substrate Attachment		
	ISO	Gypsum Board ¹	Wood Fiber ²	EPS/ XPS ³	None ⁴	Mech. Fast.	Adhesive ⁵	Hot	
Steel	√	√	√	√		√			
Wood	√	√	√	√	√	√	√	√ ⁶	
Structural Concrete & Gypsum	√	√	√	√		√	√	√	
Lightweight Insulating Concrete	√	√	√	√	√	√	√	√	
Cementitious Wood Fiber	√	√	√	√	√	√	√	√ ¹	

1. For faced boards, glass mat facer required for self-adhered membranes.

2. For base insulation only. Do not adhere Freedom directly to wood fiber.

3. Overlay board required with EPS/XPS, unless StormSafe® Anchor Sheet is used.

4. Requires the installation of mechanically attached StormSafe® Anchor Sheet over the deck.

5. Includes Olybond 500®, LRF-M, and GAF 2-Part Roofing Adhesive.

6. Insulation can be installed in hot asphalt only when mopping to mechanically attached base sheet.

TPO ATTACHMENT TABLE – RE-COVER - EVERGUARD® FREEDOM™

Existing Roofing System Type	Insulation/Substrate				Insulation/Substrate Attachment		
	ISO	Gypsum Board ¹	Wood fiber ²	EPS/XPS ³	Mech Fast.	Adhesive ⁴	Hot
Smooth BUR/MB	√	√ ⁵	√ ⁵	√	√	√	√
Single-Ply Membrane	√	√	√ ⁵	√	√		
Granule-Surfaced BUR/MB	√	√	√ ⁵	√	√	√	√
Gravel-Surfaced BUR/MB	√	√	√ ⁵	√	√	√	√
Standing Seam Metal ⁵	√	√	√ ⁶		√		

6. For base insulation only. Do not adhere Freedom directly to wood fiber.

1. For faced boards, glass mat facer required for self-adhered membranes.
2. Roof moisture scan required for use of wood fiber in re-cover roof systems.
3. Overlay board required with EPS/XPS, unless using StormSafe® Anchor Sheet.
4. Includes OlyBond 500® LRF-M, and GAF 2-Part Roofing Adhesive.
5. XPS is the only material allowed as flute fill with overlay board required.

INSULATION ATTACHMENT TABLE FOR FREEDOM™ SYSTEMS

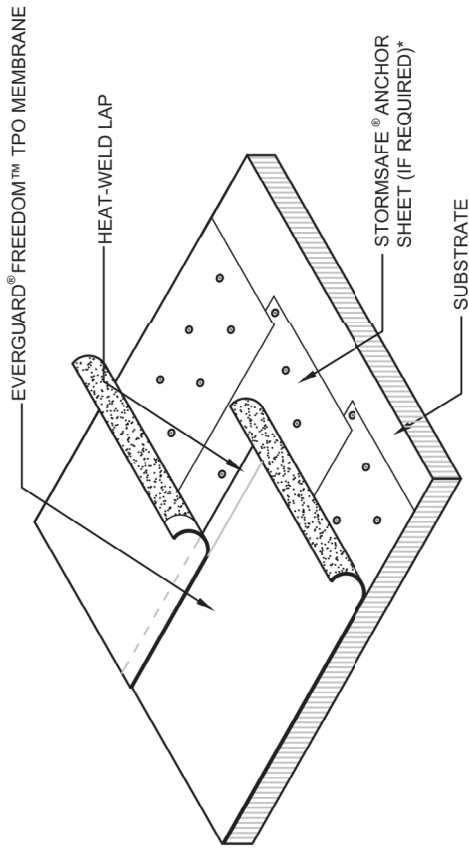
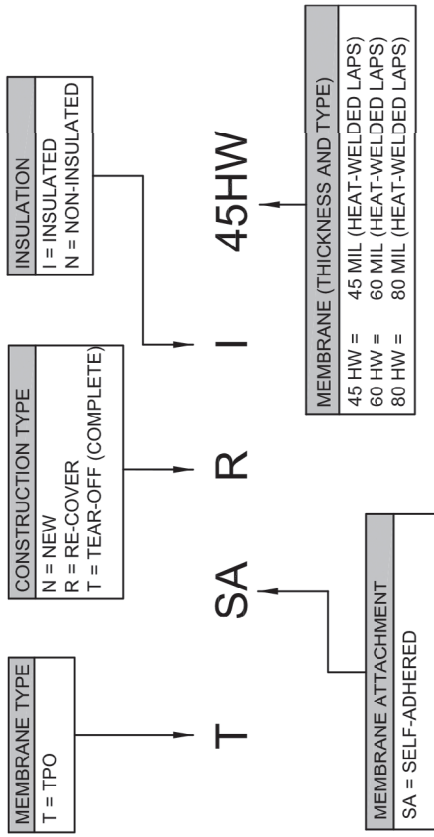
NUMBER OF FASTENERS								
Insulation Type	Board Size	Thickness	Standard Attachment Fasteners/Board			FM Attachment Fasteners/Board		
			Field	Perimeter	Corner	Field	Perimeter	Corner
Isocyanurate	4'x4' (1.2 m x 1.2 m)	1" - 1.4" (25 mm x 36 mm)	8	12	16			
	4'x4' (1.2 m x 1.2 m)	1.5" - 1.9" (38 mm x 48 mm)	6	8	12	8	12	14
	4'x4' (1.2 m x 1.2 m)	2" (51 mm) minimum	4	6	8	4	6	8
	4'x8' (1.2 m x 2.4 m)	5" - 1.4" (13 mm x 36 mm)	16	24	32			
	4'x8' (1.2 m x 2.4 m)	1.5" - 1.9" (38 mm x 48 mm)	11	18	22	16	24	28
	4'x8' (1.2 m x 2.4 m)	2" (51 mm) minimum	8	12	16	8	12	15
EPS/XPS¹	4'x4' (1.2 m x 1.2 m)	1" - 1.4" (25 mm x 36 mm)	8	12	16			
	4'x4' (1.2 m x 1.2 m)	1.5" - 1.9" (38 mm x 48 mm)	6	8	12			
	4'x4' (1.2 m x 1.2 m)	2" (51 mm) minimum	4	6	8			
	4'x8' (1.2 m x 2.4 m)	1" - 1.4" (25 mm x 36 mm)	16	24	32			
	4'x8' (1.2 m x 2.4 m)	1.5" - 1.9" (38 mm x 48 mm)	11	18	22			
	4'x8' (1.2 m x 2.4 m)	2" (51 mm) minimum	8	12	16			
Gypsum Board²	4'x8' (1.2 m x 2.4 m)	1/4" - 5/8" (6 mm x 16 mm)	16	24	32			
	4'x8' (1.2 m x 2.4 m)	1/2" (13 mm) minimum	16	24	32	21	32	42
Wood Fiber	4'x4' (1.2 m x 1.2 m)	1/2" (13 mm) minimum	6	8	12			
	4'x4' (1.2 m x 1.2 m)	1" (25 mm) minimum	4	6	8			
	4'x8' (1.2 m x 2.4 m)	1/2" (13 mm) minimum	16	24	32			
TYPE OF INSULATION FASTENER								
Deck	Fastener		Plate			Penetration (minimum)		
Steel – all gauges	DRILL-TEC™ HD (#14) or Standard (#12)		DRILL-TEC™ 3" (76 mm) Galvalume			3/4" (19 mm) through the deck		
Wood – plank and sheathing	DRILL-TEC™ HD (#14) or Standard (#12)		DRILL-TEC™ 3" (76 mm) Galvalume			1" (25 mm) thread into/through the deck		
Structural Concrete	DRILL-TEC™ HD (#14) or DRILL-TEC Spike		DRILL-TEC™ 3" (76 mm) Galvalume			1" (25 mm) thread/shank into the deck		
Insulating Concrete	DRILL-TEC™ HD (#14)		DRILL-TEC™ 3" (76 mm) Galvalume			3/4" (19 mm) thread through steel form		
Gypsum Concrete	DRILL-TEC™ Polymer Screw		DRILL-TEC™ 3" (76 mm) GypTec™ Plate			1 1/2" (38 mm) thread into the deck		
Cementitious Wood Fiber	DRILL-TEC™ Polymer Screw		DRILL-TEC™ 3" (76 mm) GypTec™ Plate			1 1/2" (38 mm) thread into the deck		

¹ Require a Coverboard.

² Includes approved DensDeck® and SECUROCK® Roof Board products.

Note: Attachment requirements to meet determined uplift resistance are dependent on deck type, specific fastener, etc. Refer to the Everguard® TPO/PVC Membrane Attachment Table in the Everguard® TPO/PVC Mechanically Attached Roofing System Manual for minimum pull-out values and deck requirements.

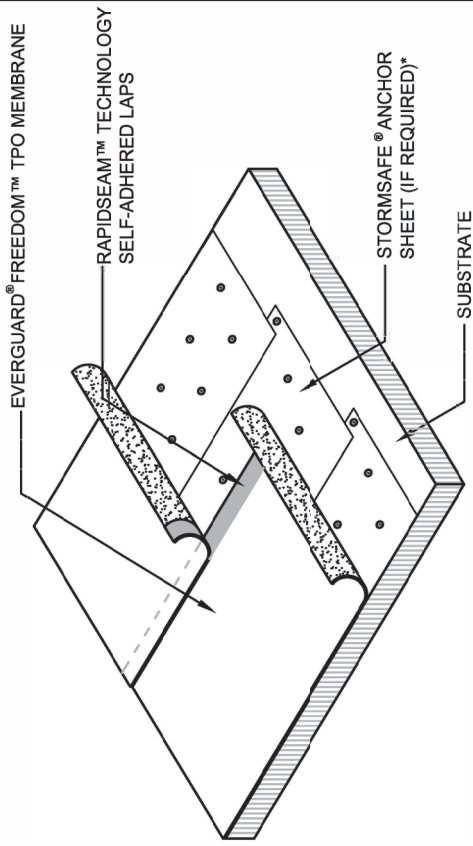
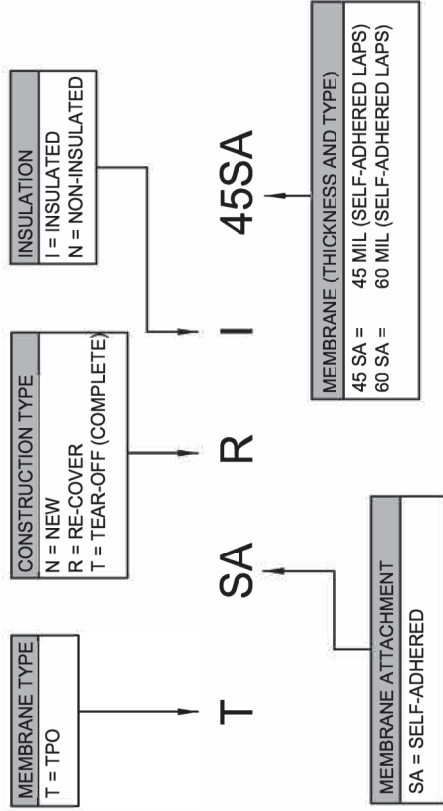
INSULATED & NON-INSULATED EVERGUARD® FREEDOM™ TPO SELF-ADHERED SYSTEMS SPECIFICATION PLATE (HW)



MEMBRANE TYPE	MEMBRANE ATTACHMENT	CONSTRUCTION TYPE	INSULATION	MEMBRANE LAPS	GUARANTEE LENGTH UP TO (YEARS)	
					15	20
T	SA	N R T	I N	HW	45	60 80
MINIMUM MEMBRANE REQUIREMENTS (MILS)						

*Note: Refer to Section 2.10 for anchor sheet requirements.

INSULATED & NON-INSULATED EVERGUARD® FREEDOM™ TPO SELF-ADHERED SYSTEMS SPECIFICATION PLATE
(RAPIDSEAM™ TECHNOLOGY)



MEMBRANE TYPE	MEMBRANE ATTACHMENT	CONSTRUCTION TYPE	INSULATION	MEMBRANE LAPS	GUARANTEE LENGTH UP TO (YEARS)
T	SA	N R T	I N	SA	10 45 60
					MINIMUM MEMBRANE REQUIREMENTS (MILS)

*Note: Refer to Section 2.10 for anchor sheet requirements.

DESIGN CONSIDERATIONS & APPLICATION GUIDELINES: EVERGUARD® FREEDOM™ TPO SELF-ADHERED ROOFING SYSTEM

Contents

- EverGuard® Freedom™ TPO Installation Specification

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Part 3: Execution	23

DESIGN CONSIDERATIONS & APPLICATION GUIDELINES: SELF-ADHERED ROOFING SYSTEMS

TPO

PART 1 – GENERAL

1.01 System Description

- A. Self-adhering thermoplastic sheet roof membrane system.

1.02 Specification Designations

- A. See Specification Plates included in this Manual.

1.03 Regulatory Requirements & Pre-Job Conference

- A. Conform to all applicable building and jurisdictional codes, including roof assembly, wind uplift, and fire-resistance requirements and slope limitations. GAF recommends at least ¼:12 slope with proper grading and placement of drainage outlets.
- B. Follow your local jurisdiction requirements for disposing of used or expired adhesives, sealants, and other products subject to disposal regulations.
- C. Potential problems in roofing applications, as well as potential conditions that may be detrimental to installation and performance of the roof system, should be resolved prior to the start of the application. This can best be accomplished by a pre-job meeting with the architect, roofing contractor, general contractor, all other subcontractors whose work will involve the roof system/related systems, and the GAF representative.
- D. The following are common items of discussion at a pre-job conference:
 - 1. Roof deck conditions.
 - 2. Flashing and expansion joint details.
 - 3. Insurance underwriters or building code requirements.
 - 4. Unusual project conditions.
 - 5. Protection of the roof, building, building occupants, and contents during and after application.
 - 6. Application techniques.
 - 7. Coordination and scheduling of other trades that will be working on the project.
 - 8. Designation by the roofing contractor of a qualified person responsible for quality control. This person must be on the project full time during application of the roof system, and must not be changed without the approval of GAF.
 - 9. Scheduling of material shipments, material storage, and rooftop loading.
 - 10. Submittals of materials, drawings, and project documents.

1.04 Delivery, Storage, and Protection

- A. Deliver products to site in original containers with seals unbroken and labeled with manufacturers' names, product brand names, and types.
- B. Store materials in a weather-protected environment, clear of the ground and moisture, in accordance with GAF instructions. Store all adhesives, coatings, and sealants/caulks to protect them from freezing. Frozen material must be discarded and replaced. Properly seal all liquid material containers after use.

- C. Outside storage of roofing materials.

- 1. All materials stored outside must be raised above ground or roof level on pallets and covered with a tarpaulin or other waterproof and "breathable" material. Insulation products should be properly stored and weighted to avoid weather and wind damage.
 - 2. Factory-installed plastic covers are not designed as protective covering for insulation materials and should be removed. Use "breathable" type covers such as canvas tarpaulins to allow venting and protection from weather and moisture.
 - 3. Cover and protect materials at the end of each day's work.
 - 4. Do not remove any protective tarpaulins until immediately before material will be installed. Extreme heat or cold conditions may require special storage requirements. Reference product data sheets for product storage requirements.
 - 5. Do not expose release film on EverGuard® Freedom™ TPO membrane to long periods of direct sunlight.
- D. Follow GAF directions and requirements for protection of roofing materials prior to and during installation.
 - E. Do NOT use materials that are wet or damaged to the extent that they will no longer serve their intended purposes. All roof insulation that has been wet is considered damaged, even if later dried out. Remove all damaged materials from the job site.
 - F. When staging materials on the roof during application, ensure the deck and structure are not temporarily overloaded by the weight of construction materials.
 - G. At the job site, no more material should be stored than what will be used within two weeks. For periods longer than two weeks, the materials should be properly warehoused; i.e., dry, ventilated, on pallets, etc. No more material should be stored on the rooftop than can be used within five days. When prolonged inclement weather threatens, e.g., rainy seasons, no more roofing materials should be supplied to the rooftop than can be used within two days.

1.05 Environmental Requirements & Restrictions

- A. Do not apply roofing materials during inclement or threatening weather.
- B. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during the same day.
- C. Be aware that high or gusting winds make the installation of some materials more difficult.
- D. Material installation during periods of high ambient temperature and/or humidity levels (typically above 90°F [32°C] and/or 90% relative humidity) can result in poor installation quality due to condensation on the membrane surface, or excessively fast adhesive drying rates in hot, dry weather. Do not install materials when moisture, in any form, is present on the roof deck or substrate to which the materials are to be applied.
- E. Material installation during periods of low ambient temperatures, typically below 50°F (10°C), can result in poor installation quality. To avoid these problems:

DESIGN CONSIDERATIONS & APPLICATION GUIDELINES: SELF-ADHERED ROOFING SYSTEMS

TPO

1. Store accessory materials in a warming box.
2. Use as soon as possible.
3. Adjust welder settings to ensure proper welds for applicable ambient conditions.

Note: Membrane, accessories, and insulation must be at 50°F (10°C) and rising before installation of the EverGuard® Freedom™ TPO roof system. If nighttime ambient temperatures fall below 50°F (10°C), then steps must be taken to keep all materials at 50°F (10°C) or above.

1.06 Working Environment

- A. Work should only begin when the contractor has decided to his/her satisfaction that all specifications are workable as specified, and that the contractor can meet project and code requirements.
- B. The contractor should only begin roofing work when the substrate(s) have been prepared as necessary and are ready to accept the roofing materials installed as specified.
- C. Provide a safe working environment, including, but not limited to, adequate fall protection, restriction of unauthorized access to the work area, and protection of the building and its occupants.
- D. Safe work practices should be followed, including, but not limited to, keeping tools in good operating order; providing adequate ventilation if adhesives are used; and daily housekeeping to remove debris and other hazards. See Section 1.07 for further details on safety.
- E. Protect the building, contents, surrounding area, building occupants, and contractor personnel during work. Coordinate all work operations with the building owner and building occupants so that adequate interior protection, as necessary, is provided and disruption to normal building operations is minimized.
- F. Where heavy wheeled or other traffic over the partially completed roofing is unavoidable, provide and use adequate plank or plywood, set over a minimum thickness of rigid board insulation to protect the newly installed roof.
- G. Provide temporary water cut-offs and tie-ins at the end of each workday. Remove all temporary work at the beginning of the next workday.
- H. When tearing off an existing membrane, limit removal to the area that will be completely reroofed that day with the new roofing system.
- I. If conditions are discovered or created that would be detrimental to the proper execution of specified work, immediately notify the building owner and GAF of these conditions for consultation on acceptable remedies or resolution of the problem (if any).

1.07 Safety Considerations and Warnings

- A. As with any construction project, safety is a key element. All applicable safety standards and good roofing practices must be followed. Read and understand the Design Considerations & Application Guidelines in this Manual before starting

application. Follow all precautions and directions.

- B. Only properly trained and professionally equipped roofing contractors experienced in the installation of TPO roofing applications should install these systems. Never allow contact between the heated surface of a hot welder or other tool and the applicator's hair, skin, or clothing. Always wear protective gear, including but not limited to: hardhats, goggles, heavy-duty gloves, and snug-fitting clothing.
- C. Solvent-containing accessories may be combustible and should always be kept away from heat, flame, or any source of ignition. Empty containers must be disposed of in posted toxic substance landfills in accordance with local, state, and federal regulations.
- D. Thoroughly train all personnel in first-aid procedures, and always comply with all OSHA safety standards and fire codes. Also, use extreme caution when working around equipment that has electrical or gas connections, such as gas lines or HVAC units.

PART 2 – PRODUCTS

2.01 Membrane

- A. EverGuard® Freedom™ TPO Self-Adhering thermoplastic polyolefin membrane HW (heat-welded seam).
- B. EverGuard® Freedom™ TPO Self-Adhering thermoplastic polyolefin membrane with RapidSeam™ Technology.

Note: EverGuard® Freedom™ TPO roof systems are not compatible with asphalt-based materials.

2.02 Flashing

- A. EverGuard® Freedom™ membrane flashings should be of the same type and thickness as the roofing membrane. EverGuard® Freedom™ TPO 5' (1.5 m) Dual HW Flashing is also available.

2.03 Flashing Accessories

- A. For a full listing and descriptions of the latest EverGuard® Freedom™ TPO preformed flashing accessories, see the appropriate Product Data Sheets for the specific membranes you are working with.
- B. All EverGuard® Freedom™ TPO accessories must be stored indoors and protected from moisture and extreme temperatures. See specific instructions on packaging for further details.
- C. For EverGuard® Freedom™ TPO RapidSeam™ flashing systems, refer to the RapidSeam™ flashing section in Section 3.13 of this Manual.
- D. EverGuard® Double-Sided Tape.

2.04 Fasteners

- A. Refer to the Insulation Attachment Table in this Manual for the correct type, length, and diameter of fastener.

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- B. Use fasteners that are suitable for the deck type, and ensure that the deck is of the required thickness and condition to ensure reliable installation and performance.
- C. Fasteners used in flashings should always be dictated by the substrate.

2.05 Adhesives, Sealants, Primers, and Cleaners

A. Adhesives (Vertical Flashings Only)

- 1. Solvent-Based
 - a. EverGuard® TPO 1121 Bonding Adhesive
 - b. EverGuard® TPO Low VOC Bonding Adhesive
- 2. Water-Based
 - a. EverGuard® WB181 Bonding Adhesive
- 3. EverGuard® Low-Rise Foam (LRF) Adhesives are to be used for adhering insulation only.
 - a. LRF-M Adhesive
 - b. GAF 2-Part Roofing Adhesive
 - c. OlyBond500® Adhesive

B. Sealants

- 1. EverGuard® One-Part Pourable Sealant (urethane based) for use in sealant (pitch) pans.
- 2. EverGuard® Two-Part Pourable Sealant (urethane based) for use in sealant (pitch) pans.
- 3. FlexSeal™ Caulk Grade Sealant, a white, solvent-based synthetic elastomeric sealant for use behind termination bars, stainless steel clamps, drain bowls, and other areas between the substrate and membrane. FlexSeal™ Caulk Grade Sealant is also available in a low-viscosity version called FlexSeal™ LV.
- 4. GAF WaterBlock Mastic

C. Primers

- 1. EverGuard® TPO Primer
- 2. EverGuard® Low VOC Primer

D. Cleaners

- 1. EverGuard® CleanWeld™ Conditioner (a low-VOC cleaner)
- 2. EverGuard® TPO Seam Cleaner

2.06 Traffic Protection

- A. EverGuard® TPO Walkway Roll. This product is designed to be heat-welded to the top of GAF EverGuard® TPO roofing membranes. The Walkway Roll is available in a standard gray or "safety" yellow color with a "diamond tread" pattern, and comes in 34.25" x 50' (870 mm x 15.2 m) rolls. The EverGuard® TPO Walkway Roll features a 2" (51 mm) welding strip (smooth border) along each longitudinal edge that is compatible with hand or automatic welders.

2.07 Insulation

- A. The selection of insulation type, thickness, and configuration is the responsibility of the architect, engineer, owner, or roof consultant. GAF reserves the right to accept or reject any roof insulation as an acceptable substrate for GAF roof systems. GAF

EverGuard™ insulations must be used in roofing systems to be guaranteed by GAF.

- B. EverGuard™ foam insulations of the types listed below are acceptable (the actual minimum thickness of insulation will depend on the deck/substrate; refer to specific Product Data Sheets for further information). Board size can be 4' x 4' or 4' x 8' (1.2 m x 1.2 m or 1.2 m x 2.4 m) panels for mechanical attachment, and 4' x 4' (1.2 m x 1.2 m) for adhered attachment and tapered panels. Total maximum acceptable insulation thickness is 8" (203 mm) for mechanical attachment.

- 1. EverGuard™ Polyisocyanurate insulation with glass-based facer meeting or exceeding the requirements of ASTM C1289, min. 16 psi (110 kPa) compressive strength.

- 2. EverGuard™ HD and HD Plus Polyisocyanurate insulation cover boards with glass-based facer meeting or exceeding the requirements of ASTM C1289; min. 80 psi (552 kPa) and min. 110 psi (758 kPa) respectively.

- 3. EverGuard™ Tapered Polyisocyanurate insulation with glass-based facer meeting or exceeding the requirements of ASTM C1289; min. 16 psi (110 kPa).

- 4. EverGuard™ Extruded Polystyrene insulation meeting or exceeding the requirements of ASTM C578, Type II nominal 1.5 pound (42 gram/cubic cm) density and minimum 15 psi (110 kPa) compressive strength (**requires cover board or GAF StormSafe® Anchor Sheet over the insulation**).

- 5. EverGuard™ Expanded Polystyrene insulation with plastic facer meeting or exceeding the requirements for ASTM C578, Type II nominal 1.5 pound (42 gram/cubic cm) density and minimum 15 psi (110 kPa) compressive strength (**requires cover board or GAF StormSafe® Anchor Sheet over the insulation**).

- C. The following additional insulations are acceptable for use in roofing systems to be guaranteed by GAF. For EverGuard® Freedom™ TPO membranes, the following must be used with a GAF StormSafe® Anchor Sheet over them:

Perlite

(ASTM C728/FS HH-1-529) Perlite may be used as a base insulation.

EverGuard™ Perlite roof insulation

EverGuard™ Perlite re-cover Board

EverGuard™ Perlite roof insulation (tapered)

EverGuard™ Tapered Edge Strip

Fiber Board

(ASTM C208/FS LLL-1-535b, Class C)

Blue Ridge Structodek® High Density Fiber Board roof insulation

Perlite/Polyisocyanurate/Wood Fiber Composites

(FS HH-1-1972, Gen./FS HH-1-1972, 3)

EverGuard™ Composite Board Polyiso Insulation

EverGuard™ Tapered Composite Board Polyiso Insulation

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2.08 High-Traffic Applications

A. EnergyGuard™ foam insulation of the following types in a minimum 1" (25 mm) thickness (however, actual thickness will be dependent on flute spacing; board size can be 4' x 4' or 4' x 8' [1.2 m x 1.2 m or 1.2 m x 2.4 m] panels for mechanical attachment, and 4' x 4' [1.2 m x 1.2 m] for adhered attachment and tapered panels):

1. EnergyGuard™ Polyisocyanurate Insulation with glass-based facer meeting or exceeding the requirements for ASTM C1289, min. 25 psi (172 kPa) compressive strength.
2. EnergyGuard™ Extruded Polystyrene Insulation meeting or exceeding the requirements of ASTM C578, Type II nominal 1.5 pound (42 gram/cubic cm) density and minimum 15 psi (110 kPa) compressive strength (**requires cover board**).
3. EnergyGuard™ Expanded Polystyrene Insulation with plastic facer meeting or exceeding the requirements for ASTM C578, Type II nominal 1.5 pound (42 gram/cubic cm) density and minimum 15 psi (110 kPa) compressive strength (**requires cover board**).

2.09 Cover/Re-cover Boards

A. EnergyGuard™ Foam Re-cover Board of the following types (board size can be 4' x 4' or 4' x 8' [1.2 m x 1.2 m or 1.2 m x 2.4 m] panels for mechanical attachment, and 4' x 4' [1.2 m x 1.2 m] for adhered attachment and tapered systems):

1. EnergyGuard™ HD 1/2" (13 mm) Polyisocyanurate Insulation Re-cover Board with glass-based facer meeting or exceeding the requirements for ASTM C1289 (> 80 psi [552 kPa] compressive strength).
2. EnergyGuard™ HD PLUS 1/2" (13 mm) Polyisocyanurate Insulation Re-cover Board with glass-based facer meeting or exceeding the requirements for ASTM C1289 (> 110 psi [758 kPa] compressive strength).

B. SECUROCK® Roof Board, available in 1/4" (6 mm), 3/8" (9 mm) and 5/8" (16 mm) thicknesses. It can be used as a fire barrier, an overlay board, or as a re-cover board.

C. DensDeck® Prime™ Roof Boards (ASTM C1177) in 1/4" (6 mm), 1/2" (13 mm).

D. Blue Ridge Structodek® High Density Fiber Board Roof Insulation, minimum 1/2" (13 mm), meeting or exceeding the requirements of ASTM C208, Class E. **StormSafe® Anchor Sheet must be installed over this board.**

2.10 Anchor Sheet

A. GAF StormSafe® Anchor Sheet is a tough, non-breathable synthetic anchor sheet coated on both sides with polypropylene. The use of an anchor sheet such as GAF StormSafe® Anchor Sheet to minimize the effects of system movement is required in many EverGuard® Freedom™ TPO installation specifications. The requirements of an anchor sheet are as follows:

1. Any roof greater than 50 squares (464 sq. m) requires the use of StormSafe® Anchor Sheet.
2. Systems over a single layer of GAF-approved insulation require the use of StormSafe® Anchor Sheet.

3. Systems over lightweight insulating concrete or non-insulated wood plank, plywood, OSB or cementitious wood fiber decks require the use of StormSafe® Anchor Sheet.

4. Systems that include an acceptable gypsum cover board as the top layer do not require the use of StormSafe® Anchor Sheet for jobs less than 50 squares (464 sq. m); however, an anchor sheet may be used for improved appearance and adhesion.

5. Systems with two layers of insulation where the top layer is an acceptable substrate do not require the use of StormSafe® Anchor Sheet for jobs less than 50 squares (464 sq. m); however, an anchor sheet may be used for improved appearance and adhesion.

2.11 Other Accessories

A. Subject to compliance with requirements, provide the following products not available from GAF may be required:

1. Wood Nailers: New wood nailers must be #2 or better quality lumber. Do NOT use asphaltic or creosote-treated lumber.
2. Roofing Nails: Galvanized or non-ferrous type and size as required to suit application.
3. Temporary Sealant: Polyurethane foam sealant or similar as required to provide temporary watertight sealing of roofing.
4. Air/Vapor Retarder: Polyethylene sheeting (6 mil minimum) or Permamate® Vapor Retarder Sheet, only when covered with mechanically attached insulation.
5. Fire Barrier: Water-resistant gypsum board, min. 1/4" (6.3 mm) thick, or TOPCOAT® FireOut™ Fire Barrier Coating.

PART 3 – EXECUTION

3.01 Site Conditions

- A. Obtain verification that the building structure can accommodate the added weight of the new roofing system.
- B. 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.

3.02 Preparation of Roofing Substrate

- A. 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.
- B. 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, free of depressions, waves, or projections.
- C. Protect building surfaces against damage and contamination from roofing work.
- D. Where work must continue over completed roof areas, protect the finished roofing system from damage.

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- E. 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.

3.03 Preparation of Roofing Area – New and Tear-Off Applications

- A. Remove all existing roofing materials to the roof decking, including flashings, metal edgings, drain leads, pipe boots, and pitch pockets. Also, clean substrate surfaces of all asphalt and adhesive contaminants.
- B. Confirm the quality and condition of the roof decking by visual inspection and by fastener pull-out testing. Fastener pull-out testing must be conducted by roof fastener manufacturer.
- C. Remove abandoned equipment and equipment supports.
- D. Confirm that the height of equipment supports will allow the installation of full-height flashings.
- E. The EverGuard® Freedom™ TPO roof system is not compatible with asphalt-based products. In addition, EverGuard® TPO must be divorced from all asphalt-based flashings.

3.04 Preparation of Roofing Area – Re-Cover Applications

- A. It is strongly recommended that the building owner have a moisture survey performed to ascertain the condition and suitability of the existing roofing materials to receive a re-cover system. A moisture survey is required if perlite or wood fiber insulation is used in a re-cover system as a base insulation not in direct contact with the EverGuard® Freedom™ TPO membrane. GAF will not be responsible for damage to the roofing system resulting from moisture in the existing roofing system. Remove and replace all existing roofing materials that contain moisture.
- B. Test cuts
 - 1. Take test cuts to verify the existing roof construction and condition. Three test cuts should be made for roofs under 100 squares (920 sq. m) and one test cut per 100 squares (920 sq. m) above the minimum amount.
 - 2. Test cuts must be statistically representative of the roofing system.
- C. Confirm quality and condition of roof decking by visual inspection and by fastener pull-out testing (fastener pull-out testing must be conducted by roof fastener manufacturer). Remove and replace all deteriorated decking.
- D. Remove all stone ballast, loose gravel, and debris from the roof surface.
- E. The existing roof surface must be free of visible moisture, such as ponding water, ice, or snow.
- F. Remove blisters and ridges from the roof membrane.
- G. Remove all existing flashings, including metal edgings, drain leads, pipe boots, and pitch pockets, and clean substrate surfaces of all asphalt and adhesive contaminants. If the wall/curb flashings are in good condition and tightly adhered to

the substrate, new dry-hung TPO flashing materials may be installed over these to a height of 24" (610 mm).

- H. Remove abandoned equipment and equipment supports.
- I. Raise equipment supports to allow the installation of full-height flashings.
- J. When re-covering over an existing single-ply roof, an insulation approved for directly adhering to the EverGuard® Freedom™ TPO membrane or an acceptable insulation used in conjunction with GAF StormSafe® Anchor Sheet must be installed. The insulation should be attached per GAF specifications. Refer to sections 2.09 and 2.10 for further requirements.

3.05 Wood Nailer Installation

A. General

- 1. GAF recommends perimeter blocking and flashing be installed in accordance with the most current version of ANSI/SPRI ES-1 and FM Global Property Loss Prevention Data Sheet 1-49.
- 2. GAF does not guarantee the attachment of the wood nailers, nor the performance of the wood nailers or any leaks that may be caused by nailer installation.

3.06 Gypsum Fire Barrier Board Installation

A. General

- 1. Gypsum fire-barrier board must typically be installed when required by design professional or code authority to address code or approval requirements.

B. Placement

- 1. Butt gypsum boards together with a 1/4" (6.3 mm) maximum space between adjoining boards. Fit gypsum boards around penetrations and perimeter with a 1/4" (6.3 mm) maximum space between board and penetration.
- 2. Install gypsum boards in pieces a minimum of 2' x 2' (610 mm x 610 mm) in size.
- 3. Gypsum boards installed over steel decking must have boards placed perpendicular to deck flutes with edges over flute surface for bearing support.
- 4. Do NOT use gypsum boards that are wet, warped, or buckled; they must be discarded. Boards that are broken, cracked, or crushed must not be installed unless the damaged area is first removed and discarded.
- 5. Remove and replace gypsum boards that become wet or damaged after installation.
- 6. The roof assembly must be mechanically fastened through the gypsum fire barrier board
- 7. Install no more gypsum board than can be properly covered by the end of each day with roofing membrane.

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3.07 Air/Vapor Retarder Installation

A. General

1. Air/vapor retarder components must typically be installed when required by design professionals to address internal building air pressure or humidity conditions.
2. Designers should consider requiring air retarders:
 - a. On all air porous decks with openings in the walls or area directly below the roof deck that exceeds 10% of the total wall area.
 - b. When the internal pressurization of the building is in excess of 5 lbs. per sq. ft. (239 Pa).
 - c. When the building height exceeds 100 ft. (30.5 m).
 - d. When buildings have large openings or overhangs.
 - e. In conditions where positive internal pressure is applied suddenly, as may be the case with aircraft hangers or distribution centers — otherwise, the roofing system may fail due to pressure impact.
3. Refer to FM Global Loss Prevention Data Sheets 1-28 and 1-29 for specific installation procedures for all roofs with large openings.

B. Air/Vapor Retarder Application – Loose-Applied

1. Install the air/vapor retarder components loose-applied to the deck or fire-barrier board so that wrinkles and buckles are not formed.
2. Overlap air/vapor retarder components per applicable installation recommendations of the supplier. If minimum 6 mil polyethylene is used, overlap a minimum of 6" (152 mm).
3. Seal perimeter and penetration areas with foam sealant.
4. Seal all perimeter nailers with adhered roof membrane placed over the nailer and covering the exterior face of the nailer by 1" (25 mm).
5. Install insulation boards over the air/vapor retarder and mechanically attach the boards to the deck.

C. Air/Vapor Retarder Application – Adhered

1. Apply compatible adhesive to the structural deck or fire-barrier board per air vapor retarder manufacturer's recommendations.
2. Install the air/vapor retarder components to the deck or fire-barrier board so that wrinkles and buckles are not formed. Broom air/vapor barrier components to ensure embedment into the adhesive.
3. Overlap air/vapor retarder components a minimum of 6" (152 mm) for side and end laps. Adhere laps together with compatible adhesive.
4. Seal perimeter and penetration areas with foam sealant.
5. Install insulation boards over the air/vapor barrier and mechanically attach the boards to the deck or adhere the boards to the air/vapor retarder with compatible adhesive to achieve the desired roof system uplift resistance.

3.08 Cover/Re-cover Board/Insulation Installation

A. General

1. Refer to Section 2.07 and 2.09 of this Manual for specific GAF requirements on insulation, cover/re-cover boards.
2. GAF StormSafe® Anchor Sheet may also be used over one or more layers of acceptable insulation or cover board.
3. Install insulation board and re-cover board as required in accordance with the Design Tables in this Manual.
4. If expanded or extruded polystyrene insulation is used in the roof assembly, a re-cover board must be installed, unless StormSafe® Anchor Sheet is used.
5. The use of extruded and expanded polystyrene insulations when used beneath StormSafe® Anchor Sheet within an approved cover board is limited to a maximum roof membrane temperature of 160°F (71°C).

B. Placement

1. Butt insulation boards together with a ¼" (6.3 mm) maximum space between adjoining boards. Fit insulation boards around penetrations and perimeter with a ¼" (6.3 mm) maximum space between board and penetration. Do not kick insulation boards into place.
2. Install insulation boards in pieces a minimum of 2' x 2' (610 mm x 610 mm) in size. Every piece must be properly secured to the substrate.
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. Insulation boards installed over steel decking must have boards placed perpendicular to deck flutes with edges over flute surface for bearing support.
5. Install tapered insulation to provide a sump area which is a minimum of 36" x 36" (910 mm x 910 mm) at drains.
6. Do NOT install insulation boards that are wet, warped, or buckled; they must be discarded. Insulation boards that are broken, cracked, or crushed must not be installed unless the damaged area is first removed and discarded.
7. Remove and replace insulation boards that become wet or damaged after installation.
8. Install no more insulation than can be properly covered by the end of each day with roofing membrane.
9. EPS, XPS, or polyiso insulation may be used to fill in flutes of steel decking.

C. Securement

1. Mechanical Attachment of Insulation.
 - a. Use appropriate type and length of Drill-Tec™ Fastener for structural deck type. See Insulation Attachment Table in this Manual.
 - b. Install required number of fasteners per board size, and type of roofing system installed. Refer to the construction details in this Manual.
 - c. Install fastener so as to firmly secure the plate to the insulated surface without overdriving.

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- d. Additional fasteners must be installed in corner/perimeter roof areas for all EverGuard® systems.
- e. Refer to section 2.10 for StormSafe Anchor Sheet requirements.

Note: Before installing the EverGuard® Freedom™ TPO membrane to the substrate, ensure that that substrate is free of gypsum dust and/or debris.

2. Adhered Securement of insulations

a. Low-Rise Foam Adhesive - Ribbon Adhered

1. Ribbon-adhere insulation with LRF Adhesive with the ribbons spaced 12" (305 mm) o.c. maximum for the field of the roof, and 6" (152 mm) o.c. maximum for perimeters and corners. Adhesive ribbons must be applied at a width of 1" (25 mm) wet bead. When using GAF 2-Part Roofing Adhesive, a 2.5" (62 mm) wide, wet continuous bead is required.
2. Adhesive beads must be evenly spaced at the rate required for the specification.
3. Apply adhesive when the air and surface temperatures are 40°F (4.4°C) and rising.
4. Additional adhesive beads must be installed in perimeter and corner roof areas, according to GAF specifications. A 6" (152 mm) o.c. bead spacing is required in perimeter areas for all standard GAF guarantees. For buildings up to 34' (10 m) in height or less and 200' (60 m) wide or less, a 5' (1.5 m) perimeter with 6" (152 mm) bead spacing is required. For buildings from 34' (10 m) to 100' (30 m) in height and 200' (60 m) wide or less, a 10' (3 m) perimeter with 6" (152 mm) bead spacing is required. For buildings taller or wider than the dimensions above, refer to the Perimeter Securement Table in the *EverGuard® TPO/PVC Adhered Roofing System Overview & General Requirements Manual* for bead spacing requirements.
5. Walk-in the insulation boards after installation to ensure a proper bond.
6. Maximum board size is 4' x 4' (1.2 m x 1.2 m) for polyiso only.
7. Maximum board size for SECUROCK® Roof Board, DensDeck®, or ½" (12 mm) gypsum board is 4' x 8' (1.2 m x 2.4 m).

b. Low Rise Foam Adhesive-Splatter Pattern

1. When installing crickets, saddles, or cut tapered insulation panels, it may be advantageous to use GAF OlyBond®, GAF 2-Part Roofing Adhesive, or LRF-M Adhesive in lieu of mechanical attachment.
3. **Crickets and Saddles**
 - a. The GAF 2-Part Roofing Adhesive can be applied in a "spatter pattern" with a spatter nozzle. A 3.75 lb./sq. (18.3 kg/m²) thickness is required for full coverage on substrates. Application rates will vary and must be increased for rougher surfaces..
 - b. Allow adhesive rows to spread and rise approximately

3/4" (19 mm) to 1" (25 mm) in height prior to installation of insulation boards. The spatter pattern should yield a heavily textured, even coating of approximately 1/4" (6.2 mm) to 1/2" (12 mm) nominal thickness height on the peaks of the spattered adhesive. Set boards into the wet adhesive and walk in place until the adhesive sets, which takes approximately 4 to 8 minutes, depending on ambient air temperature. Boards that will not lay flat due to cupping, warping, crowning, or surface irregularities of the substrate should have weights placed on the boards until the low-rise foam adhesive has achieved proper adhesion to hold the board in place.

- c. In areas where voids exist between the adhesive and the bottom of the insulation, or where adhesive rows have become tack-free, set-up or cured due to excessive exposure time, install additional rows of adhesive.
- d. Cold-weather applications affect adhesive reaction and set times. Insulation materials must be set into the wet adhesive prior to its reaching a tack-free state. Follow all product installation instructions.
- e. Due to the large variety of potential roof assemblies, contact GAF Technical Services for specific information and requirements on current UL, FM, or other code and insurance approvals for installations incorporating GAF's Low-Rise Foam Adhesive.

3.09 StormSafe® Anchor Sheet Installation

A. General

1. The use of GAF StormSafe® Anchor Sheet is required in many EverGuard® Freedom™ TPO with RapidSeam™ or HW membranes. See Section 2.10 for more information.

2. During installation, fasteners and plates must be installed flush to the membrane surface. Overdriven or underdriven fasteners may prevent adequate adhesion or create voids and other application defects. All improperly set fasteners must be replaced or corrected prior to installation of succeeding courses.
3. Fastener density shall be increased in corner and perimeter as needed for design wind uplift resistance.

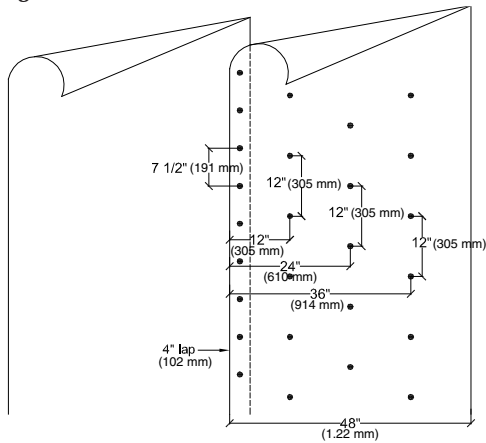
B. Lightweight Insulating Concrete, Non-insulated Plywood, Wood Plank, OSB or Cementitious Wood FiberDecks

1. Starting at the low point of the roof, install one ply of StormSafe® Anchor Sheet, lapping 4" (102 mm) on the sides and 6" (152 mm) on the ends. All end laps must be staggered and offset from adjacent courses a minimum of 3" (914 mm).
2. Place the first row of fasteners 7 ½" (191 mm) o.c., through the 4" (102 mm) side lap, 2" (51 mm) from the leading edge of the sheet. The second, third, and fourth rows of fasteners should be installed 12" (305 mm) o.c., 12" (305 mm), 24" (610 mm), and 36" (914 mm) from the leading edge. All rows of fasteners must be staggered. Refer to Figure 1 below.

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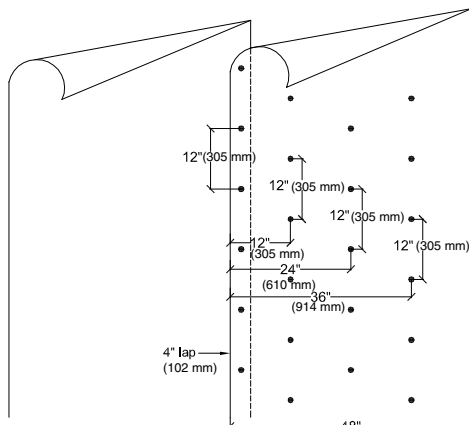
Figure 1



C. Insulated Decks

1. Starting at the low point of the roof, install one ply of StormSafe® Anchor Sheet over loose-laid insulation, lapping the anchor sheet 4" (102 mm) on the sides and 6" (152 mm) on the ends.
2. Mechanically fasten the anchor sheet and the insulation simultaneously to the roof deck with four rows of Drill-Tec™ Screws and 3" (76 mm) diameter flat plates. Place the first row of fasteners 12" (305 mm) o.c., through the 4" (102 mm) side lap, 2" (51 mm) from the leading edge of the sheet. The second, third, and fourth rows of fasteners should be installed 12" (305 mm) o.c., 12" (305 mm), 24" (610 mm), and 36" (914 mm) from the leading edge. All rows of fasteners must be staggered. Refer to Figure 2.

Figure 2



3.10 EverGuard® Freedom™ TPO Membrane Installation—General

- A. Substrates must be inspected and accepted by the contractor as suitable to receive and hold roof membrane materials.

- B. Prepare substrate surfaces thoroughly prior to application of new roofing materials. This is particularly important for re-cover and reroofing applications.
- C. Preparation includes, but is not limited to, removal of existing flashings; replacement of wet/damaged existing roofing materials; removal of loose aggregate; removal of abandoned equipment, supports, and penetrations; replacement of damaged decking, etc.
- D. Providing a smooth, even, sound, clean, and dry substrate minimizes the likelihood that underlying deficiencies will cause premature deterioration or failure of the new roofing system.
- E. Apply membranes only when the ambient temperature is 50°F (10°C) and rising. Ensure that the substrate, adhesive, and sheet are 50°F (10°C) or warmer. This may require a hot box for storage or inside storage of the materials overnight.
- F. Membrane Installation using EverGuard® R.T.A. Strip for both EverGuard® Freedom™ TPO HW and EverGuard® Freedom™ TPO with RapidSeam™ Technology

1. Follow membrane application instructions in Section 3.12 G.
2. Use a roof-to-wall layout, using an EverGuard® R.T.A. Strip at the base of the walls. Installing the R.T.A. Strip will allow the EverGuard® Freedom™ TPO with RapidSeam™ Technology to be attached anywhere along the membrane, resulting in an adhesive bond.

3.11 EverGuard® Freedom™ TPO Membrane Installation—Hot-Air Weld (HW) Seam Method

A. Membrane Placement for Hot-Air Welding of Seams

1. Starting at the low point of the roof, roll out and position the EverGuard® HW membrane over the approved substrate without stretching the sheet so that wrinkles and buckles are not formed. Any wrinkles or buckles must be removed from the sheet prior to permanent securement.
2. Position the first sheet for either a parapet wall or metal edge condition.
3. Best practice is to install membrane so that the side laps run across the roof slope lapped toward drainage points.
4. Unroll the EverGuard® Freedom™ TPO membrane roll and fold the membrane in half longitudinally, exposing the split in the release liner.
5. Peel the upper half of the release liner from the adhesive film back of the membrane and lay to the side of the panel. Do not cut the release liner.
6. Roll the membrane with the exposed adhesive onto the substrate in line with the original layout position. Maintain a rounded radius at the longitudinal fold when rolling out to avoid creating wrinkles.
7. Apply pressure to the membrane using a fully loaded, 240-lb. (110 kg) lawn roller. Roll the remaining installed EverGuard® Freedom™ TPO membrane sheet to promote maximum adhesion to the substrate. This installed area will be the anchor point and alignment guide for the installation of the remainder of the roll. Rolling in the width-direction of the membrane will help avoid creating wrinkles in the sheet.

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8. Install the other side of the sheet by folding the EverGuard® Freedom™ TPO membrane back to the point that the release liner becomes accessible. Be careful to avoid creasing the membrane at the fold. Peel the remaining release liner from the adhesive on the rest of the roll. Roll the membrane into place while maintaining a rounded radius at the fold.
 9. Apply pressure to the membrane using a lawn roller as specified above. Roll the remaining installed EverGuard® Freedom™ TPO membrane sheet to promote maximum adhesion to the substrate. Again, rolling in the width-direction of the membrane will help avoid creating wrinkles in the sheet.
 10. Position the next sheet to overlap the installed first course membrane a minimum of 3" (76 mm) while ensuring the laps are installed shingle-fashion to prevent backwater laps.
- B. Membrane Surface Preparation for Hot Air Welding of Seams**
1. Membrane must be clean of dirt and contaminants, and free from dew, rain, and other sources of moisture. Factory-fresh EverGuard® Freedom™ TPO typically will not require cleaning provided that it is installed and heat welded immediately after placement of the membrane.
 2. Membrane that has been exposed for more than 12 hours or has become contaminated will require additional cleaning methods.
 3. 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® CleanWeld™ Conditioner (a low-VOC cleaner). Be sure to wait for solvents to flash off prior to welding.
 4. 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). Be sure to wait for solvent to flash off prior to welding.
 5. Exposure-Based Contamination - Membrane that is weathered or oxidized will require the use of EverGuard® TPO Cleaner (or 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). Be sure to wait for solvents to flash off prior to welding.
 6. Chemical-Based Contamination - Membrane that is contaminated with bonding adhesive, asphalt, flashing cement, grease and oil, or most other chemical contaminants cannot be cleaned sufficiently to allow an adequate heat weld to the membrane surface. These membranes should be removed and replaced.
- C. Hot Air-Welding of Seams**
1. Fabricate field seams using a current-generation automatic hot-air welding machine and a 10,000-watt voltage-controlled generator at minimum. In addition, fabricate detail seams with automated hot-air welders where possible. Outdated welding equipment and inadequate or fluctuating electrical power may cause of poor seam welds.
 2. Equipment Settings - The correct speed and temperature settings for automatic welders are determined by preparing test-welds at various settings. The welds are tested by application of pressure causing the seam to peel apart. A satisfactory weld will fail by exposing the scrim reinforcement, which is called a "film-tearing bond." A deficient weld fails by separating between the two layers of the membrane.
 3. Adjustments to Equipment Settings - Many factors will affect the settings: thicker membranes, lower air temperatures, and overcast skies will generally require a slower speed than would be required with thinner membranes, higher air temperatures, and sunny skies. The slower speed provides additional heat energy to compensate for heat-draining conditions. The test weld procedure should be conducted at the beginning of every work period (i.e., morning and afternoon) using bag-fresh material and following a significant change in weather (i.e., air temperature, wind speed, cloud cover).
 4. Membrane laps must be heat-welded together. All welds must be continuous, without voids or partial welds. Welds must be free of burns and scorch marks.
 5. For automatic machine welding (robotic welders), a maximum film-tearing bond of 1.5" (38 mm) is acceptable. The weld must provide a minimum 1" (25 mm) film-tearing bond.
 6. All reinforced membrane seams of EverGuard® membranes should be made using a robotic welder.
 7. All TPO cut edges must be sealed with EverGuard® TPO Cut Edge Sealant.
- Cautions and Warnings**
1. Any attempt to run a robotic welder at a speed greater than 16' (5 m) per minute may result in defective seam welds.
 2. Setting the speed of the welder too fast can also pose potential problems with the ability of the operator to maintain control of the welder. This is particularly true in reroofing or over uneven substrates.
 3. Robotic welders running too fast may not allow the operator to monitor the 1.5" (38 mm) minimum weld and ensure that critical T-joint areas have been correctly creased.
 4. The operator must keep in mind the relationship between ambient temperature and robotic welding speed in order to achieve an acceptable weld.
 5. Increasing the speed of the robotic welder can also compromise the appearance of a non-bonded system.
- D. Adjoining the Butt-Ends with Hot Air-Welding of Seams**
1. Install the new sheet tightly against the previously installed sheet.
 2. For butt-end seaming of EverGuard® Freedom™ TPO HW membrane, position an 8" (203 mm) EverGuard® TPO Flashing Strip evenly over the seam extending at least 2" (52 mm) onto the adjacent sheets.
 3. Using a hand-held heat gun and silicone roller, weld the 8" (203 mm) EverGuard® TPO Flashing Strip into place using the two-pass welding method.
 4. Finish the detail by applying EverGuard® TPO Cut Edge Sealant to all edges to complete the detail.

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3.12. EverGuard® Freedom™ TPO Membrane with RapidSeam™ Technology Installation

A. RapidSeam™ Technology Overview

1. Adhesive has been added to the top of the sheet in a 6" (152 mm) width on one edge going down the length of the sheet. Correspondingly, a 6" (152 mm) edge of "special" adhesive has been applied to the bottom sheet. The RapidSeam™ Technology adhesive seams on both sheets must be aligned. Refer to Detail 102C in this Manual.
2. There are three options for membrane roof layout:
 - a. Option #1: Use a roof-to-wall layout, which would incorporate the use of an EverGuard® R.T.A. Strip at the base of the walls. Installing the R.T.A. Strip will allow the EverGuard® Freedom™ TPO with RapidSeam™ Technology to be attached anywhere along the membrane, resulting in an adhesive bond.
 - b. Option #2: Beginning at the low point of the roof, the installer must apply the first sheet to meet the roof configuration. Install the subsequent sheets across the roof until a wall or curb is encountered. Mate the top sheet (with the RapidSeam™ Technology adhesive in a 6" (152 mm) width down the length of the sheet) with the 6" (152 mm) edge of "special" adhesive on the bottom sheet. To achieve this, the first sheet may need to be cut length-wise, so that the RapidSeam™ portion butts against the specific curb/wall location.
 - c. Option #3: To create a seam anywhere on the sheet without the need for mating the RapidSeam™ Technology seams, use EverGuard® Double-Sided Tape along with EverGuard® TPO Primer and EverGuard® TPO Cleaner (or EverGuard® CleanWeld™ Conditioner).

B. Membrane Placement - EverGuard® Freedom™ TPO Membrane with RapidSeam™ Technology

1. Place the EverGuard® Freedom™ TPO Membrane with RapidSeam™ Technology so that wrinkles and buckles are not formed. Any wrinkles or buckles must be removed from the sheet prior to permanent securement.
2. Measure the roof area to ensure the last sheet installed has the RapidSeam™ Technology seams against the wall or curb.
3. Starting at the low point of the roof, the installer must configure the layout of the membrane to ensure that the "special" adhesive seams line up properly. This will ensure that the new seam area is located at the roof/wall junction. In this way, the wall flashing can be installed with the RapidSeam™ Technology adhesive installed over the top and mated with the previously installed horizontal sheets with RapidSeam™ Technology adhesive. Again, this will require knowledge of the sheet layout dimension of the building so that the top sheet with RapidSeam™ Technology will butt up against the base of the wall at the opposite end of the building. For this reason, the first sheet may need to be cut. However, when trimming the first sheet, use caution not to discard the edge of the sheet with the RapidSeam™ Technology adhesive on it.

C. RapidSeam™ Technology - Adhering and Seaming

1. Roll out the EverGuard® Freedom™ TPO Membrane with RapidSeam™ Technology so the RapidSeam™ Technology edge is on the "roof side" of the sheet. The opposite side of

the sheet must butt up to the parapet wall or extend past the roof's edge and be turned down the face of the building.

2. Fold the membrane in half longitudinally, exposing the split in the release liner.
3. Peel the upper half of the release liner from the adhesive film back of the membrane and lay to the side of the panel.
4. Roll the membrane with the exposed adhesive onto the substrate in line with the original layout position. Maintain a rounded radius at the longitudinal fold when rolling out to avoid creating wrinkles.
5. Apply pressure to the membrane using a fully loaded, 240-lb. (110 kg) lawn roller. Roll in the installed section of the EverGuard® Freedom™ TPO with RapidSeam™ Technology to promote maximum adhesion to the substrate. This installed area will be the anchor point and alignment guide for the installation of the remainder of the roll. Note that rolling in the width-direction of the panel helps keep the membrane from creating wrinkles in the sheet.
6. Install the other side of the sheet by folding the EverGuard® Freedom™ TPO with RapidSeam™ Technology back to the point where the release liner becomes accessible. Be careful to avoid creasing the membrane at the fold. Peel the remaining release liner from the adhesive on the rest of the roll. Roll the membrane into place while maintaining a rounded radius at the fold.
7. Apply pressure using the lawn roller specified above. Roll in the remaining installed EverGuard® Freedom™ TPO with RapidSeam™ Technology to promote maximum adhesion to the substrate. Again, rolling in the width-direction of the membrane will help avoid creating wrinkles in the sheet.
8. Next, roll out the subsequent sheet next to the previously installed sheet. Position the next sheet to overlap the installed first course membrane a minimum of 6" (152 mm), ensuring the lap is installed in shingle-fashion to prevent backwater laps.
9. Fold the membrane in half longitudinally, exposing the split in the release liner. This will be the side with the alignment markings.
10. Peel the upper half of the release liner from the adhesive film back of the membrane and lay to the side of the panel.
11. Roll the membrane with the exposed adhesive onto the substrate in line with the original layout position. Maintain a rounded radius at the longitudinal fold when rolling out to avoid creating wrinkles.
12. Apply pressure to the membrane using a lawn roller as specified above. Roll in the installed section of the EverGuard® Freedom™ TPO with RapidSeam™ Technology to promote maximum adhesion to the substrate. This installed area will be the anchor point and alignment guide for the installation of the remainder of the roll. Note that rolling in the width-direction of the panel helps keep the membrane from creating wrinkles in the sheet.
13. Roll back the remaining non-adhered half of the EverGuard® Freedom™ TPO with RapidSeam™ Technology over the previously adhered portion.
14. Remove the release liners from the overlapping RapidSeam™ Technology area and carefully roll the adhesive/ membrane into place.

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15. Apply pressure to the adhered membrane using the lawn roller as specified above. Roll the membrane surface in order to achieve maximum adhesion to the roofing substrate. The rolling motion should be across the short dimension of the membrane panel in order to avoid creating wrinkles in the EverGuard® Freedom™ TPO with RapidSeam™ Technology panel.
16. Use a 2" (51 mm) silicone coated roller to apply maximum pressure in the 6" (152 mm) RapidSeam™ area. Roll the seam area at a 45° angle to the seam, in the machine direction of the sheet.

Note: EverGuard® Double-Sided Tape along with EverGuard® TPO Primer and EverGuard® TPO Cleaner (or EverGuard® CleanWeld™ Conditioner) can be used to fashion a seam anywhere on the sheet without the need for mating RapidSeam™ Technology seams.

D. Adjoining the Butt-ends with RapidSeam™ Technology Seams

1. Install the butt-end of the new sheet tightly against the previously installed sheet, and clean both butt-ends extending 3" (76 mm) past the butt-ends on both sides.
2. Use EverGuard® TPO Cleaner (or EverGuard® CleanWeld™ Conditioner) and a clean, white dampened rag. Brush or roller-apply EverGuard® TPO Primer a minimum 3" (76 mm) on each sheet, carrying the primer past the butt-ends by a minimum 3" (76 mm).
3. After the primer flashes off, install the 8" (203 mm) EverGuard® Strip-In Tape or the 6" (152 mm) EverGuard® TPO Cover Tape over the primed area and roll with a silicone roller.
4. Add EverGuard® TPO Cut Edge Sealant to all edges to complete the detail.

Note: Any wrinkles that impede the flow of water drainage must be cut out, laid flat, and repaired using EverGuard® TPO Cover Tape.

3.13 Flashing Installation - General

Refer to the construction details in this Manual. These drawings depict flashing requirements for typically encountered conditions. Install flashing materials as shown in the construction details.

A. General - EverGuard® Freedom™ TPO HW and EverGuard® Freedom™ TPO with RapidSeam™ Technology

1. All vertical surfaces must be primed with EverGuard® TPO Primer.
2. Flash all perimeter, curb, and penetration conditions with coated metal, membrane flashing, and flashing accessories as appropriate to the site conditions.
3. All coated metal and membrane flashing corners must be reinforced with preformed corners or non-reinforced membrane.
4. All flashing membranes and accessories are to be heat-welded to achieve a nominal 1.5" (38 mm) wide film-tearing bond using a two-pass with a hand welder. The weld must provide a minimum 1" (25 mm) film-tearing bond. When using robotic welders, refer to Section 3.11 C.
5. All cut edges of reinforced TPO membrane must be sealed with EverGuard® TPO Cut Edge Sealant.
6. When using bonding adhesive, be sure to use adhesive specific to membrane and ambient weather conditions.

7. Minimum flashing height is 8" (203 mm).
8. The maximum distance from the wall that the horizontal mechanical attachment is installed is 6" (152 mm). When you must go past 6" (152 mm), move the attachment to the vertical substrate.
9. For existing vertical flashings up to 24" (610 mm), the EverGuard® Freedom™ TPO release liner must be kept in place for dry-hung vertical flashings.
10. For EverGuard® Freedom™ TPO adhered applications over rough surfaces, a barrier board must be installed and primed with EverGuard® TPO primer.

Note: When installing details with RapidSeam™ Technology, premolded or preformed accessories must be used in conjunction with EverGuard® Double-Sided Tape and EverGuard® TPO Primer. See appropriate Product Data Sheets for these accessories.

B. Parapet and Building Walls

1. There are three options for flashing parapet and building walls:
 - a. Loose-hung flashings
 - b. Metal flashings
 - c. Adhered membrane flashings
2. Secure membrane flashing at the top edge with a termination bar. Apply FlexSeal™ Caulk Grade or GAF WaterBlock Mastic between the wall surface and membrane flashing, and underneath all termination bars. Exposed termination bars must be mechanically fastened 12" (305 mm) o.c. (15 year max. guarantee); termination bars that are counter flashed must be fastened 12" (305 mm) o.c. (20 year max guarantee).
3. Roof membrane must be mechanically attached along the base of walls that are flashed with membrane flashing with either screws and plates or a termination bar at a fastener spacing of 12" (305 mm) o.c. maximum spacing.
4. Metal counterflashings are required on 20-year guarantees. All termination bars must be sealed with FlexSeal™ Caulk Grade or GAF WaterBlock Mastic. If using EverGuard® Freedom™ TPO with RapidSeam™ Technology, refer to Section 3.15 for flashing options.
5. Flash wall scuppers with a scupper insert of coated metal that is mechanically attached to the wall and integrated as part of the wall flashing. Refer to Section 3.14 J for other detail options.
6. EverGuard® Freedom™ TPO membrane may be used up to 54" (1.4 m) in height over appropriate substrates primed with EverGuard® TPO Primer.
7. Metal cap flashings must have continuous cleats or be face-fastened 12" (305 mm) o.c. on both the inside and outside of the walls.
8. DensGlass® Gold Gypsum Board is NOT to be used as a substrate for adhered attachment on parapet walls, according to the manufacturer.
9. Use fire-treated plywood/wood for parapet walls only if covered with an approved gypsum board for (fully) adhered or EverGuard® Freedom™ TPO materials.
10. For existing granule-surfaced modified bitumen flashings up to 24" (610 mm), the EverGuard® Freedom™ TPO release

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liner must be kept in place for dry-hung flashings. For EverGuard® Freedom™ TPO adhered applications, a barrier board must also be installed.

C. EverGuard® Coated Metal Flashings

1. Coated metal flashing allows much of the metalwork used in typical roofing applications to benefit from the security of heat-welded membrane seaming, with a corresponding reduction in required metalwork maintenance during the life of the roofing system.
2. EverGuard® coated metal must be formed in accordance with construction details and SMACNA guidelines.
3. Coated metal sections used for roof edging, base flashing, and coping must be butted together with a 1/4" (6.3 mm) gap to allow for expansion and contraction. Heat-weld a 6" (152 mm) wide non-reinforced membrane strip to both sides of the joint, with approximately 1" (25 mm) on either side of the joint. A 2" (51 mm) wide aluminum tape can be installed over the joint as a bond-breaker to prevent welding in this area.
4. EverGuard® coated metal used for sealant pans and scupper inserts, corners of roof edging, base flashing, and coping must be overlapped or provided with separate metal pieces to create a continuous flange condition, and pop-riveted securely. TPO coated metal flashings must be stripped in using 6" (152 mm) non-reinforced membranes.
5. Provide a 1/2" (13 mm) hem for all exposed metal edges to provide corrosion protection and edge reinforcement for improved durability.
6. EverGuard® coated metal base flashings must be provided with min. 4" (102 mm) wide flanges screwed to wood nailers. Coated metal base flashings must be formed with a 1" (25 mm) cant.
7. In addition, provide a 1/2" (13 mm) hem for all metal flange edges whenever possible to prevent excessive wearing of the roofing and flashing membranes at the flange edge.
8. EverGuard® coated metal flashings are attached to wood nailers or otherwise mechanically attached to the roof deck or to the wall or curb substrate, in accordance with construction detail requirements.
9. When installing coated metal on walls or curbs that completely cover the existing flashing, the flashing does not need to be removed provided that it is in good condition and tightly adhered.

3.14 Flashing Methods - Specific to EverGuard® Freedom™ TPO HW Systems

A. General

1. The thickness of the flashing membrane must be the same as the thickness of the roofing membrane.
2. When using EverGuard® Freedom™ TPO, use any one of the following substrates: polyisocyanurate insulation (with glass-based facer); gypsum roof board; cured structural concrete absent of curing and sealing compound; untreated OSB; untreated CDX plywood; Type X gypsum board; or dry, sound masonry absent of curing or sealing compounds. All vertical substrates must first be primed with EverGuard® TPO Primer.

3. Apply flashings only when the ambient temperature is 50°F (10°C) and rising. Ensure that the substrate, adhesive, and sheet are 50°F (10°C) or warmer. This may require a hot box for storage or inside storage of the materials overnight.
4. The membrane flashing shall be carefully positioned prior to application to avoid wrinkles and buckles.
5. All laps in EverGuard® Freedom™ TPO flashing membrane must be heat-welded in accordance with heat-welding guidelines or have a heat-welded cover strip.
6. Porous substrates may require double applications of EverGuard® TPO Primer or a separation board.
7. For 20-year guarantees, a separate counterflashing is required; exposed termination bars are not acceptable.
8. All vertical butt-ends of flashings must be stripped in. Refer to Section 3.14 F on irregularly shaped penetrations.
9. All EverGuard® Freedom™ TPO flashings MUST be rolled-in to complete the flashing detail.

B. EverGuard® Freedom™ TPO 5' (1.5 m) Dual HW Flashing

1. The advantage of EverGuard® Freedom™ TPO 5' (1.5 m) Dual HW Flashing over standard 10' (3 m) EverGuard® Freedom™ membrane is that the 5' (1.5 m) Dual HW Flashing features two surfaces that can be welded together to reduce waste.
2. The EverGuard® Freedom™ TPO 5' (1.5 m) Dual HW Flashing can be measured for the height of the wall or curb, and split if necessary. Hang Dual HW Flashing just like conventional wall flashings after priming the vertical surface with EverGuard® TPO Primer and fastening the base attachment at 12" (305 mm) o.c.
3. All EverGuard® Freedom™ TPO flashing membranes, including the EverGuard® Freedom™ TPO 5' (1.5 m) Dual HW Flashing, must be rolled in with a silicone roller.
4. Finish butt-ends of the flashing and apply EverGuard® TPO Cut Edge Sealant and top-edge terminations per specifications.

C. Non-reinforced TPO Membrane Flashings for HW Systems

1. Non-reinforced TPO membrane can be used as a field-fabricated penetration/reinforcement flashing only where preformed corners and pipe boots cannot be properly installed.
2. Penetration flashings constructed of non-reinforced membrane are typically installed in two sections: a vertical piece that extends up the penetration and a horizontal piece that extends onto the roofing membrane. The two pieces are overlapped and heat-welded together.
3. The non-reinforced vertical membrane flashing may be adhered to the penetration surface. For pipe penetrations, the use of adhesive is optional. Finish the penetration with FlexSeal™ Caulk Grade or GAF WaterBlock Mastic between the pipe and the membrane; install clamping band and FlexSeal™ Caulk Grade. Refer to most current product data sheet for appropriate adhesive application rates.

4. T-Joint Cover Patches

- a. T-joint cover patches are to be a minimum 4" (102 mm) in size and made of non-reinforced membrane material. They must be completely hot air-welded over the T-joint at the intersection of the three pieces of reinforced

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membrane. During installation, care must be taken to “crease in” the unsupported membrane at the three step-off locations.

- b. Prefabricated or field-fabricated non-reinforced membranes that match the membrane being used in the field of the roof are acceptable for T-joints.
- c. T-joint patches are required for 60 mil EverGuard® Freedom™ TPO membranes or thicker.

D. Roof Edging

1. TPO roof edge flashing is applicable for both gravel stop/drip edge conditions, as well as exterior edges of parapet walls. For 20-year guarantees, use EverGuard® Heat-Weldable Cover Tape, EverGuard® TPO Coated Metal, or the EverGuard® EZ Fascia prefabricated extruded aluminum fascia system.
2. Flash roof edges with TPO coated metal flanged edging with a minimum 3" (76 mm) wide flange nailed 4" (102 mm) o.c. to wood nailers. Then heat-weld an 8" (203 mm) membrane strip to metal flanges and EverGuard® Freedom™ TPO membrane.
3. Metal roof edging must be provided with a continuous metal hook strip to secure the lower fascia edge. Secure the continuous hook strip to the building a minimum of 12" (305 mm) o.c.
4. When using the EverGuard® EZ Fascia system, adhere roof membrane to metal cant with bonding adhesive and face-nail the membrane 8" (203 mm) o.c. prior to installing the fascia.
5. For guarantees of up to 15 years, EverGuard® TPO Cover Tape is acceptable for use. EverGuard® TPO Cover Tape is a 6" (152 mm) wide, non-reinforced TPO membrane backed with a butyl tape adhesive. Wipe area to be primed with a damp wipe of EverGuard® TPO Cleaner (or EverGuard® CleanWeld™ Conditioner).
6. Prime surfaces mating with the butyl tape with EverGuard® TPO Primer, keeping primer only on the surface receiving the tape. After primer has flashed off, pull release paper on the back of the tape, exposing the butyl adhesive, and mate the two surfaces. Roll the tape portion of the cover strip at a 45-degree angle to ensure a good bond. Seal all end laps, miters, and T-joint intersections with EverGuard® TPO Cut Edge Sealant 6" (152 mm) past the intersection in all directions.
7. For 20-year guarantees, use EverGuard® TPO Heat-Weldable Cover Tape. This is a hybrid cover tape consisting of 6" (152 mm) of .045 reinforced TPO membrane with 3" (76 mm) butyl tape on half of the back surface. Refer to Step 6 (above) and follow procedures for the butyl tape preparation and installation. Then heat-weld the cover tape to the field membrane with a 2" (51 mm) hand weld or 1.5" (38 mm) auto weld, to all membrane-to-membrane surfaces.
8. Flash roof edge scuppers with a scupper insert of coated metal or EverGuard® prefabricated coated metal scupper that is mechanically attached to the roof edge and integrated as part of the metal edging.

E. Round and Square Tube Penetrations

1. Four options are available for penetration flashings: stepped pipe boots; split pipe boots; square tube wraps; and field fabrication with unsupported membrane and target.
2. All flashings require the installation of a stainless-steel draw band around the top of the flashing. Seal the top edge junction between the substrate and the membrane with FlexSeal™ Caulk Grade or GAF WaterBlock Mastic.
3. Roof membrane must be mechanically attached at the base of each penetration with screws and plates a maximum of 12" (305 mm) o.c., with a minimum of four fasteners per penetration.

F. Irregularly Shaped Penetrations

1. Flash irregularly shaped penetrations with flanged sealant pans formed of coated metal, secured to the deck through the roof membrane with screws 12" (305 mm) o.c. or a minimum of 4 fasteners per penetration.
2. Strip-in metal flanges and the vertical pop riveted seam with 8" (203 mm) wide membrane flashing strips heat-welded to both the roof membrane and the metal flanges.
3. Fill sealant pans with non-shrink quick-set grout, and top off sealant pans with a 2" (51 mm) minimum thickness of EverGuard® (One-Part) Two-Part Pourable Sealant or use EverGuard® One-Part sealant. When using FlexSeal™ Caulk Grade, after priming, increase the grout to within 1/2" (13 mm) from the top of the pocket and install the FlexSeal™ Caulk Grade to the very top or overfill the pocket. The use of an EverGuard One-Part Pourable Sealant is also acceptable.
4. Preformed TPO sealant pans/vent boots are also available.
 - a. TPO sealant pans require field membrane securement around the penetration. A minimum of four (4) system-appropriate screws and plates are required around the penetration. A membrane target must be installed prior to the installation of the TPO sealant pan if the location of the plates does not allow for a continuous 2" (51 mm) weld of the TPO sealant pan flange. Properly heat-weld the flange of the TPO sealant pan to the field/target membrane.
 - b. If the sealant pan is cut to install around the penetration, the cut must be stripped-in with a minimum 4" (102 mm) wide non-reinforced membrane. The non-reinforced strip-in membrane must extend a minimum of 2" (51 mm) beyond the outside edge of the sealant pan flange and be fully welded.
 - c. Prior to filling the TPO sealant pan, the inside vertical pan sides must be primed with EverGuard® TPO Primer. Fill the base of the pans with non-shrink grout and top with a minimum 2" (51 mm) thickness of EverGuard® Two-Part Pourable Sealant or use EverGuard® One-Part sealant. When using FlexSeal™ Caulk Grade, after priming, increase the grout to within 1/2" (13 mm) from the top of the pocket, and install the FlexSeal™ Caulk Grade to the very top or overfill the pocket. The use of an EverGuard One-Part Pourable Sealant is also acceptable.
 - d. If reinforced targets are used, they must be sealed as the particular roof system requires with EverGuard® TPO Cut Edge Sealant.

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G. Curbs

There are several options for flashing curbs:

1. Use EverGuard® Freedom™ TPO membrane after priming the curb substrate with EverGuard® TPO Primer. The smooth flange area must be hot air-welded to the roof membrane, and the top-edge termination fabricated using standard GAF detail specifications.
2. Curbs may be dry-hung up to 24" (610 mm) in height with a 6" (152 mm) seam area completed to GAF specifications.
 - a. Flash primed curbs with EverGuard® Freedom™ TPO flashing membrane adhered to the curb substrate.
3. For existing granulated modified bitumen flashings, the EverGuard® Freedom™ TPO release liner must be kept in place for dry-hung flashings. For EverGuard® Freedom™ TPO adhered applications, a barrier board must also be installed.

H. Expansion Joint Covers

1. Install expansion joint covers at all flat-type and raised, curb-type expansion joints. GAF offers EverGuard® TPO preformed expansion joint covers. TPO expansion joint covers can also be field fabricated to meet expansion joint needs.
2. Roof membrane must be mechanically attached along the base of flat and raised curb expansion joints with screws and plates a minimum of 12" (305 mm) o.c.
3. Expansion joint bellows must be twice the width of the expansion joint opening to allow for proper expansion and contraction.
4. Metal nailing strip must be set in FlexSeal™ Caulk Grade sealant and secured with fasteners and neoprene washers fastened 6" (152 mm) o.c.

I. Roof Drains

1. Roof drains must be fitted with compression clamping rings and strainer baskets. Cast iron drains and aluminum drains are acceptable.
2. Roof drains must be provided with a min. 36" x 36" (914 mm x 914 mm) sumped area if possible. Slope of tapered insulation within the sumped area must not exceed 4:12.
3. Extend the roofing membrane over the drain opening. Locate the drain and cut a hole in the roofing membrane directly over the drain opening. Provide a 1/2" (13 mm) membrane flap extending past the drain flange into the drain opening. Punch holes through the roofing membrane at drain bolt locations.
4. For cast iron and aluminum drains, the roofing membrane must be set in a full bed of FlexSeal™ Caulk Grade or EverGuard® WaterBlock Mastic on the drain flange prior to securing with the compression clamping ring. Typical FlexSeal™ Caulk Grade sealant application rate is one 10.5-oz. (298 gr.) cartridge per drain.
5. For tapered sumps up to 4:12, or where the EverGuard® Freedom™ TPO membrane won't conform to the substrate, cut the membrane just short of the drain flange. A separate smooth reinforced membrane drain flashing sheet is then

adhered and heat-welded to the roofing membrane and set into the drain above in a full bed of FlexSeal™ Caulk Grade or EverGuard® WaterBlock Mastic and secured as above.

6. Do NOT locate lap seams within the sump area. Where lap seams must be located within the sump area, a separate smooth reinforced membrane drain flashing a minimum of 12" (305 mm) larger than the sump area must be installed over the field membrane. The membrane flashing must be heat-welded to the roof membrane. Alternately, if the seam does not run under the clamping ring, it can be covered with a 6" (152 mm) wide reinforced membrane strip heat-welded to the membrane.
7. Tighten the drain compression clamping ring in place.

J. Scuppers

1. Coated metal wall scuppers must be provided with 4" (102 mm) wide flanges, with additional corner pieces pop-rieveted to the flanges to create a continuous flange. All flange corners must be rounded.
2. Install wall scuppers over the roof and wall flashing membrane and secure to the roof deck/wall with Drill-Tec™ Fasteners 6" (152 mm) o.c., a minimum of 2 fasteners per side.
3. All corners must be reinforced with EverGuard® TPO Universal Corners for field fabricated corners from EverGuard® TPO non-reinforced materials.
4. Strip-in scupper with flashing membrane target sheet.
5. Alternately, a sleeve of non-reinforced TPO membrane may be fully adhered inside the scupper box. Stretch the membrane so it can be flanged onto the previously installed wall flashing with a minimum 2" (52 mm) weld. Fully adhere to the scupper box and terminate on the outside wall face with a termination bar and FlexSeal™ Caulk Grade.
6. EverGuard® TPO prefabricated scuppers are available in standard and custom sizes. Consult your Territory Manager or local distributor for details.

K. Heater Stacks

1. Field-fabricated two-piece membrane flashings of EverGuard® TPO non-reinforced flashing are typically installed at heater stacks. EverGuard® TPO split pipe boot prefabricated pipe flashing may also work in these applications. If not, then field-fabricated membrane flashings, such as EverGuard® TPO detailing membranes, may be used. The temperature of any heater stack that comes into contact with the EverGuard® Freedom™ TPO membrane or flashings should not exceed 160°F (71°C).
2. Heater stacks must be equipped with either cone-shaped or vertical tube-type flashing sleeves so that the membrane flashing is not directly in contact with the heater stack.
3. Mechanically attach the roof membrane to the structural deck with Drill-Tec™ Fasteners and Plates around the penetration base prior to flashing installation.
4. All stack flashings must be secured at their top edge by a stainless-steel clamping band over FlexSeal™ Caulk Grade and then sealed with FlexSeal™ Caulk Grade.

DESIGN CONSIDERATIONS & APPLICATION GUIDELINES: SELF-ADHERED ROOFING SYSTEMS

TPO

L. Drain Inserts

1. Drain inserts must only be used in the event the original drain is damaged and cannot be repaired without complete replacement of the drain.
2. Roof drains must be open and functioning.
3. EverGuard® TPO drain inserts have an integral TPO target membrane for welding to the field membrane.
4. The drain insert is installed on top of the roofing membrane and is secured to the roof deck 6" (152 mm) o.c. with Drill-Tec™ Screws.
5. All drains must have strainer baskets installed.
6. Cleaning the length of the retrofit drain pipe is required so that the retrofit drain will seal to the pipe. Failure to clear this section of drain line can prevent the sealing of the drain and degrade the performance of the drain seal.
7. A target patch must be installed over the fasteners and out onto the field of the roof and a 2" (51 mm) weld completed on field membrane and coated metal.

M. Wood Support Blocking

1. Wood support blocking, typically 4" x 4" (102 X 102 mm), is usually installed under light-duty or temporary roof-mounted equipment, such as electrical conduits and gas, condensation, and light weight drain lines.
2. Install wood support blocking over a protective layer of EverGuard® TPO Walkway Rolls. Place wood blocking on oversized slip sheet, fold two sides vertically, and fasten with roofing nails into the blocking.

N. Satellite Dish Support Bases

1. Install satellite dish support bases over a protective layer of TPO membrane.

O. Lightning Suppression Clips

1. Secure lightning suppression clips to the roof surface by means of 2" (51 mm) wide EverGuard® TPO flashing membrane strips that are heat welded to the roof membrane.

3.15 Flashing Methods – Specific to EverGuard® Freedom™ TPO with RapidSeam™ Technology Systems

A. EverGuard® Freedom™ TPO with RapidSeam™ Technology Flashing Methods. There are two flashing methods for installing flashings on curbs and walls for EverGuard® Freedom™ TPO with RapidSeam™ Technology:

1. R.T.A. Strip Method

R.T.A. Strip must be fastened 12" (305 mm) o.c. The R.T.A. Strip may be fastened to the deck or may be fashioned in an "L" shape for attachment to vertical substrates.

2. Field-Fabricated R.T.A. Strip Method

Cut a 6" (152 mm) wide piece of EverGuard® Freedom™ TPO field sheet membrane to length as needed. Install the newly cut strip of membrane release-liner-side-up and fasten as you would the factory R.T.A. Strip. Next, score the release liner in front of the fasteners and remove excess liner. Lastly, roll the EverGuard® Freedom™ TPO field sheet into the angle change using a silicone roller, prime the vertical surface, and install the flashing up the wall.

B. Flashing Curbs & Parapet Walls - EverGuard® Freedom™ TPO with RapidSeam™ Technology

1. On all sides of the roof curbs or at wall intersections, terminate the field roofing membrane at the curb or wall, and fasten to the deck using Drill-Tec™ Seam Plates and Screws.
2. Using EverGuard® TPO Primer and EverGuard® TPO Cleaner (or EverGuard® CleanWeld™ Conditioner, a low-VOC cleaner), clean and prime at least 2" (51 mm) further out onto the roof. It is always recommended to clean and prime slightly further out onto the roof. Allow the primer to dry.
3. Measure the area to be flashed and precut flashing piece(s) so they extend a minimum 6" (152 mm) onto the field of the roof. Be aware that curb/wall heights under 8" (203 mm) and over 24" (610 mm) can result in leaks.
4. The entire curb or wall flashing can be created with one piece or multiple pieces of flashing. If using multiple pieces, overlap by 6" (152 mm). Like the end laps in the field of the roof, seal the overlaps by cleaning, priming, and installing EverGuard® Double-Sided Tape and Strip-In Tape on the underlying membrane by removing the bottom release liner and lining up against the edge of the roofing membrane. Roll with a silicone roller.
5. Dry-fit the flashing in place and make relief cuts at corners to ensure a flat, straight fit of the flashing membrane.
6. Clean and prime all surfaces that are to be secured with tape, including the back of the flashing sheet, the field of the roof, and the top flange of the flashing sheet, and let dry.
7. Install EverGuard® Double-Sided Tape on the entire 6" (152 mm) section of the field of the roofing membrane. Roll firmly in place with a silicone roller.
8. Align the flashing sheet and lift up the horizontal flap of roofing membrane and remove the top portion of the tape's liner.
9. Carefully and evenly lay the horizontal portion of the roofing membrane onto the EverGuard® Double-Sided Tape, taking care to avoid wrinkles. Roll this portion with a silicone roller. Continue to install all sides to complete the detail.
10. Complete the top edge termination per published detail included in this Manual.

C. Flashing Inside and Outside Corners - EverGuard® Freedom™ TPO with RapidSeam™ Technology

1. Install inside and outside corners as appropriate.
2. When vertical flashing is complete, clean and prime the flashing's membrane flange and the corner flange onto the field of the roof where corner is to be installed and allow to dry.
3. Wherever a corner is present, such as the corner on a curb, the corner must be flashed with an EverGuard® TPO Universal Corner.
4. Cut the top section of the corner off and discard.
5. Clean and prime the top and underside of the vertical flange and the horizontal flange of the corner, and allow to dry.

DESIGN CONSIDERATIONS & APPLICATION GUIDELINES: SELF-ADHERED ROOFING SYSTEMS

TPO

6. Cut sections of EverGuard® Double-Sided Tape and adhere them to the underside of the vertical flange and the horizontal flange of the corner.
 7. Remove the vertical flange release liners and carefully slide the piece into place. Reach under the corner and remove the remaining release liner one section at a time. Roll into place with a silicone roller and install EverGuard® Cut Edge Sealant around all edges.
 8. If an inside corner is present, use the inside corner portion of the universal corner. After primer has been installed on the corner and field membrane, let both surfaces dry. Cut, place, and roll the EverGuard® Double-Sided Tape over the primed bottom surface. Place this carefully in the corner area and roll with silicone roller to achieve full adhesion. Add EverGuard® Cut Edge Sealant around all edges to complete the detail.
- D. Penetration Flashings - EverGuard® Freedom™ TPO with RapidSeam™ Technology
1. Terminate the membrane around the perimeter of the penetration using Drill-Tec™ Seam Plates and Screws.
 2. Clean a 12" (305 mm) diameter of membrane around the penetration with EverGuard® TPO Cleaner or CleanWeld™ Conditioner. Dry-fit the penetration to determine the proper pipe dimension. Cut to fit over the pipe for a snug fit. Continue the dry-fit process by placing the vent boot over the penetration and tracing around the vent boot flange with a ballpoint pen. Remove the vent boot and prime both the top and bottom of the vent boot flange.
 3. Allow primer to dry completely.
 4. Prime the membrane inside the flange area.
 5. Beginning at the penetration, working from the inside out, apply EverGuard® Double-Sided Tape to a point approximately ½" (13 mm) outside the traced line on all sides of the flanged area by removing the release liner from the back of the tape and smoothing the tape into place by hand.
 6. Leave the top release liner in place and roll with a silicone roller.
 7. Position the vent boot on the pipe, removing one side of the release liner, and press into place. Continue removing sections of the release liner until the vent boot is firmly in place. Roll with a silicone roller. Finish the detail by running a continuous bead of EverGuard® Cut Edge Sealant around the entire cut edge of the boot. Finish top edge of boot per detail with EverGuard® flashing-grade caulking at substrate between boot and substrate, and again on top of the installed band clamp.
- E. T-Joint Cover Patches - EverGuard® Freedom™ TPO with RapidSeam™ Technology:
1. T-Joint Cover Patches are used wherever two sections of field membrane intersect.
 2. Fabricate T-Joint Cover Patches using the template on the back of the EverGuard® Strip-In Tape.
 3. Clean and prime the field membrane and allow the primer to dry.
 4. Center the fabricated T-Joint Cover Patch over the T-Intersection and carefully remove release liner, avoiding wrinkles. Roll with a silicone roller.

3.16 Traffic Protection

- A. Walkway protection must be installed at all roof access locations, including ladders, hatchways, stairs, and doors. Install walkway rolls at other designated locations, including roof-mounted equipment work locations and areas of repeated rooftop traffic.
- B. Walkway rolls must be spaced 6" (152 mm) to allow for drainage.
- C. For EverGuard® Freedom™ TPO HW, heat-weld walkway rolls to the roof membrane surface continuously around the walkway perimeter.
- D. EverGuard® TPO Walkway Roll may also be installed with EverGuard® TPO Primer and seam tape. First, roll or brush the EverGuard® TPO Primer on the back of the TPO roll along the edges and down the middle of the length of the roll. Clean and prime the roof membrane where the roll will be installed. Install tape to the back of the roll where cleaned (edges and middle), and roll in with a silicone hand roller. Remove the release paper and install the taped rolls directly onto the roof membrane. Secure the rolls by rolling into place.

3.17 Temporary Closures

- A. The roofing installation must be made watertight at the end of each day's activity to prevent water infiltration into the completed roofing system installation.
- B. Complete all flashings and terminations as the roofing installation progresses.
- C. At the edge of the completed roofing system installation, extend the roofing membrane a minimum of 6" (152 mm) beyond the edge. Seal the roofing membrane to the surrounding deck or substrate surface with foam sealant.
- D. Remove all temporary night seal materials prior to continuing with the roof installation and dispose of them properly.

3.18 Field Quality Control

- A. Inspect completed roof sections on a daily basis. It is the contractor's responsibility to probe all heat-welded seams and perform an adequate number of seam cuts to ascertain seam consistency.
- B. Immediately correct all defects, irregularities, and deficiencies identified during inspections. All voids that are found must be patched-over per specifications. Do NOT re-weld seam voids more than 24 hours after initial welding of the seam.
- C. Remedial work must be performed with like materials and in a manner consistent with the balance of the roofing installation so as to minimize the number of repair patches.
- D. Excessive patchwork will require replacement of the entire affected membrane section from lap to lap.

DESIGN CONSIDERATIONS & APPLICATION GUIDELINES: SELF-ADHERED ROOFING SYSTEMS

TPO

3.19 Cleaning

- A. Remove bonding adhesive, bituminous markings, and other contaminants from finished surfaces. In areas where finished surfaces are soiled by asphalt or any other source of soiling caused by work of this or other sections, consult manufacturer of surfaces for cleaning advice and conform to those instructions.
- B. Cut out and remove any sheet membrane contaminated with solvent-based adhesive, bituminous markings, and other contaminants from finished surface. Consult GAF Technical Services for appropriate insulation repair methods.

3.20 Maintenance

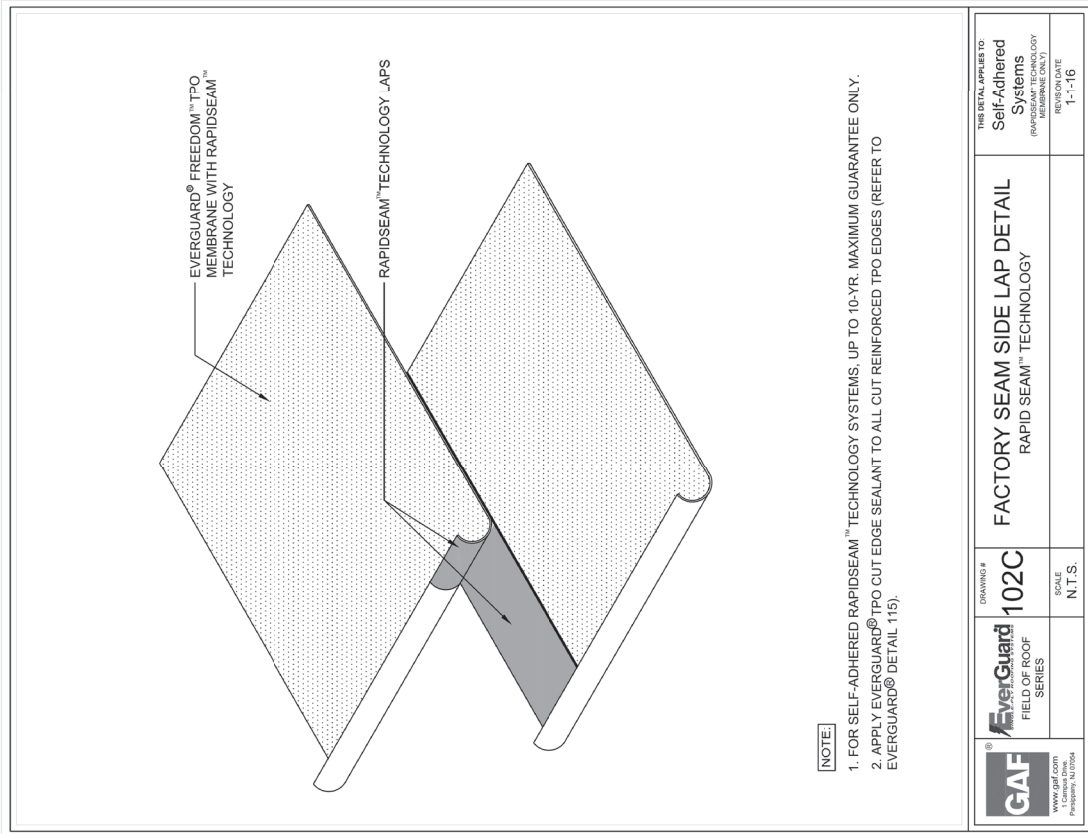
- A. Upon completion of the roofing system, the owner should establish a semi-yearly inspection and maintenance program in accordance with standard good roofing practices and guarantee requirements.
- B. Repair cuts, punctures, and other membrane damage by cleaning membrane (see Section 3.11 B), followed by heat-welding a membrane repair patch of sufficient size to extend a minimum of 2" (51 mm) beyond the damaged area.
 1. Alternately, for RapidSeam™ Technology membranes, use the specified cleaning methods above and prime areas to be repaired with EverGuard® TPO Primer. Cover cuts, punctures, and membrane damage with either EverGuard® TPO Cover Tape or 8" (203 mm) EverGuard® TPO Strip-In Tape. If tapes are to be overlapped, use a 2" (51 mm) overlap and prime the bottom of the overlapped surface with EverGuard® TPO primer.
- C. Any damage to adhered membrane areas or at locations of mechanical attachment, including insulation, must be repaired so that the repaired area remains fully adhered or mechanically attached.

ROOFING DETAILS

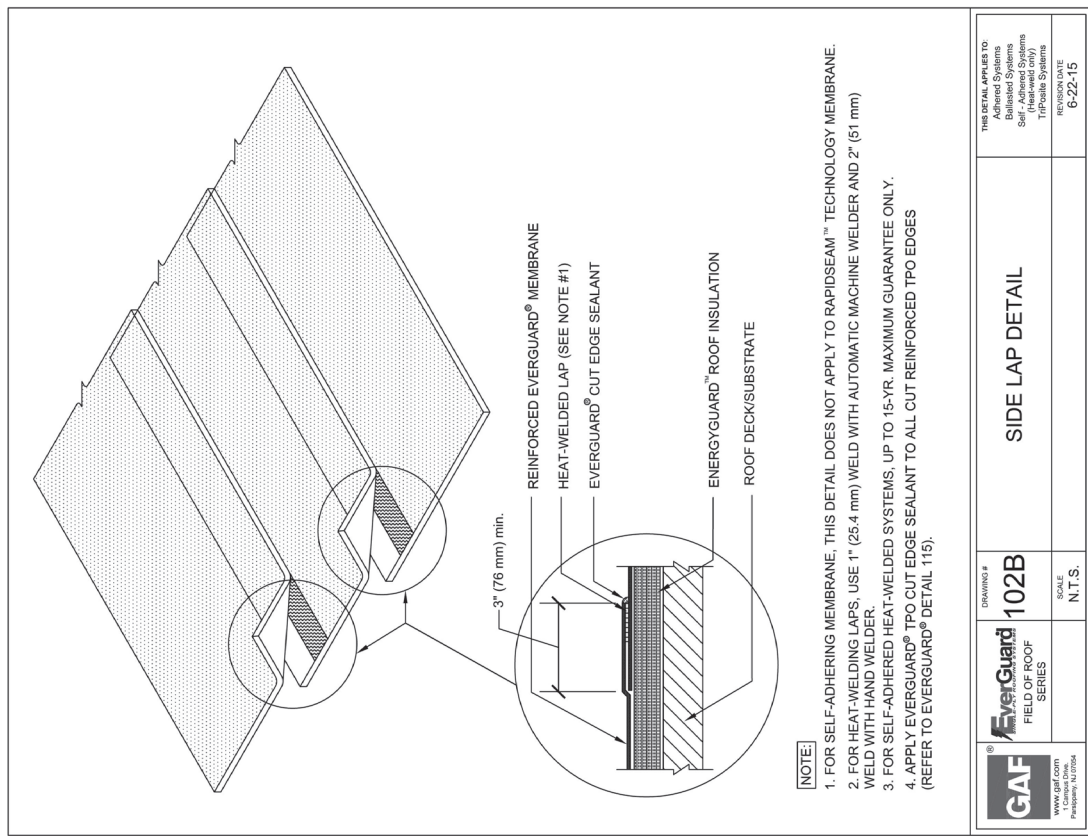
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NOTE: REFER TO GAF.COM FOR A COMPLETE LIST OF ACCEPTABLE GAF ROOFING DETAILS.

ROOFING DETAILS



 www.gaf.com Parsippany, NJ 07054	DRAWING # EverGuard FIELD OF ROOF SERIES	THIS DETAIL APPLIES TO Self-Adhered Systems POLYMER MEMBRANE ONLY
	102C SCALE N.T.S.	REVISION DATE 1-1-16



 www.gaf.com Parsippany, NJ 07054	DRAWING # EverGuard FIELD OF ROOF SERIES	THIS DETAIL APPLIES TO Ballasted Systems Self-Adhered Systems POLYMER MEMBRANE ONLY
	102B SCALE N.T.S.	REVISION DATE 6-22-15

ROOFING DETAILS

NOTE:

1. FOR SELF-ADHERED RAPIDSEAM™ TECHNOLOGY SYSTEMS, UP TO 10-YR. MAXIMUM GUARANTEE ONLY.
2. MEMBRANE MUST BE PRIMED AND DRY PRIOR TO APPLYING EVERGUARD® DOUBLE-SIDED TAPE.
3. APPLY EVERGUARD® TPO CUT EDGE SEALANT TO ALL CUT REINFORCED TPO EDGES (REFER TO EVERGUARD® DETAIL 115).

 www.gaf.com Parsippany, NJ 07054	 FIELD OF ROOF SERIES	DRAWING # 104B	THIS DETAIL APPLIES TO: Adhered Systems (RAPIDSEAM™ TECHNOLOGY MEMBRANE ONLY)
	END LAP DETAIL RAPID SEAM™ TECHNOLOGY	SCALE N.T.S.	REVISION DATE 6-22-15

NOTE:

1. FOR INSULATION THICKNESSES GREATER THAN 8" (203 mm), A HARD BOARD IS REQUIRED.
2. ADD BALLAST PER SPECIFICATION FOR BALLASTED SYSTEMS.
3. FOR SELF-ADHERED RAPIDSEAM™ TECHNOLOGY SYSTEMS, UP TO 10-YR. MAXIMUM GUARANTEE ONLY.
4. FOR SELF-ADHERED HEAT-WELDED SYSTEMS, UP TO 15-YR. MAXIMUM GUARANTEE ONLY.
5. APPLY EVERGUARD® TPO CUT EDGE SEALANT TO ALL CUT REINFORCED TPO EDGES (REFER TO EVERGUARD® DETAIL 115).

THIS DETAIL REQUIRED FOR ALL FLEECE-BACK MEMBRANES AND OPTIONAL FOR ALL LISTED SYSTEMS BELOW

 www.gaf.com Parsippany, NJ 07054	 FIELD OF ROOF SERIES	DRAWING # 103	THIS DETAIL APPLIES TO: Adhered Systems Ballasted Systems Self-Adhered Systems Tri-Ply Systems Mechanically Attached Systems
	COVER STRIP END LAP DETAIL	SCALE N.T.S.	REVISION DATE 6-22-15

ROOFING DETAILS

3' (0.914 m) TO 4' (1.22 m) MIN.

W2

H2

ROOF B

ROOF A

W1

H1

L1

PERIMETER ATTACHMENT

CORNER ATTACHMENT

PERIMETER ATTACHMENT

CORNER ATTACHMENT

ROOF B

ROOF A

B

A

NOTE:

1. WIDTH OF PERIMETER TREATMENT (A OR B) SHALL BE 10% OF THE BUILDING'S NARROWEST WIDTH (W) OR 40% OF THE BUILDING EAVE HEIGHT (H), WHICHEVER IS LESS, WITH 4' (1.22 m) BEING THE MIN. FOR STANDARD GAF GUARANTEE REQUIREMENTS. SEE HALF-SHEET REQUIREMENTS IN MECHANICALLY ATTACHED SECTION.
2. FOR ADHERED, SELF-ADHERED, AND RHINOBOND SYSTEMS, SEE INSULATION TABLE FOR ENHANCEMENTS.

 www.gaf.com 1 Corner, No Edge, Perimeter, No Edge	 FIELD OF ROOF SERIES	DRAWING # 106	SCALE N.T.S.	THIS DETAIL APPLIES TO Ballasted Systems Mechanically Attached Systems Self-Adhered Systems Rhino Bond Systems	REVISION DATE 6-1-16
	ROOF AREA ZONE LAYOUT DETAIL				

REINFORCED EVERGUARD® MEMBRANE

UNREINFORCED PREFABRICATED EVERGUARD® T-JOINT COVER PATCH OR FIELD-FABRICATED UNREINFORCED T-JOINT PATCH 4" (102 mm) MIN. IN DIAMETER

EVERGUARD® TPO CUT EDGE SEALANT

FOR EVERGUARD® FREEDOM™ TPO MEMBRANE, MEMBRANE SURFACE MUST BE PRIMED WITH EVERGUARD® TPO PRIMER (SEE NOTE #3)

APPLY SECOND T-JOINT COVER PATCH OVER ADJACENT HEAT-WELDED LAP

TRIM EDGE OF OVERLYING SHEET FOR EASY INSTALL OF T-JOINT (NOT REQUIRED)

NOTE:

1. FOR INSULATION THICKNESS GREATER THAN 8" (203 mm), A HARD BOARD IS REQUIRED ON MECHANICAL SYSTEMS ONLY.
2. T-JOINT IS TO BE USED FOR 60, 70 & 80 MIL TPO AND 80 MIL PVC ONLY.
3. APPLY EVERGUARD® TPO CUT EDGE SEALANT TO ALL CUT REINFORCED TPO EDGES (REFER TO EVERGUARD® DETAIL 115).

 www.gaf.com 1 Corner, No Edge, Perimeter, No Edge	 FIELD OF ROOF SERIES	DRAWING # 105A	SCALE N.T.S.	THIS DETAIL APPLIES TO Ballasted Systems Mechanically Attached Systems Rhino Bond Systems TPO Patch Systems	REVISION DATE 6-6-16
	T-JOINT COVER PATCH DETAIL			FCR 60 THRU 80 MIL TPO AND 80 MIL PVC MEMBRANES ONLY	

ROOFING DETAILS

15-YEAR MAX WARRANTY

THIS DETAIL APPLIES TO:
Adhered Systems
Mechanically Attached Systems
Self-Adhered Systems

REVISION DATE
5-1-16

NOTE:

1. FOR INSULATION THICKNESS GREATER THAN 8" (203 mm), A HARD BOARD IS REQUIRED ON MECHANICAL SYSTEMS ONLY.
2. BE SURE TO CLEAN METAL AND MEMBRANE WITH TPO CLEANER BEFORE ADDING PRIMER AND COVER TAPE.
3. EVERGUARD® TPO COVER TAPE ONLY TO BE USED WITH TPO MEMBRANE SYSTEMS.
4. THIS DETAIL IS NOT TO BE USED ON SLOPES GREATER THAN 1:12. FOR SLOPES GREATER THAN 1:12, REFER TO EVERGUARD® DETAIL 218 OR 219.

EverGuard
ROOF EDGE SERIES

www.gaf.com
Pondicherry, IN/INDIA

ROOF EDGE WITH TPO COVER TAPE DETAIL

DRAWING # **202B**

SCALE N.T.S.

THIS DETAIL APPLIES TO:
Adhered Systems
Mechanically Attached Systems
Self-Adhered Systems

REVISION DATE
5-1-16

REINFORCED EVERGUARD® MEMBRANE
REFER TO APPROPRIATE EVERGUARD® 100 SERIES FOR LAP DETAIL

EVERGUARD® CUT EDGE SEALANT
(ONLY IF APPLICABLE, SEE NOTE #1)

THIS DETAIL APPLIES TO:
Adhered Systems
Self-Adhered Systems
TPO/EPDM Systems
Mechanically Attached Systems

REVISION DATE
6-20-16

NOTE:

1. EVERGUARD® CUT EDGE SEALANT MUST BE USED ON ANY TPO CUT EDGES (REINFORCED ONLY).
2. FOR INSULATION THICKNESS GREATER THAN 8" (203 mm), A HARD BOARD IS REQUIRED ON MECHANICAL SYSTEMS ONLY.

EverGuard
FIELD OF ROOF SERIES

www.gaf.com
Pondicherry, IN/INDIA

CUT EDGE SEALANT DETAIL

DRAWING # **115**

SCALE N.T.S.

EVERGUARD® TPO MEMBRANE ONLY

THIS DETAIL APPLIES TO:
Adhered Systems
Self-Adhered Systems
TPO/EPDM Systems
Mechanically Attached Systems

REVISION DATE
6-20-16

ROOFING DETAILS

NOTE:

1. FOR INSULATION THICKNESS GREATER THAN 8" (203 mm), A HARD BOARD IS REQUIRED ON MECHANICALLY FASTENED SYSTEMS ONLY.
2. REFER TO EVERGUARD® DETAIL 204 FOR COATED METAL JOINTS.
3. A CONTINUOUS METAL CLEAT IS REQUIRED.
4. FOR SELF-ADHERED RAPIDSEAM™ TECHNOLOGY SYSTEMS, SEE EVERGUARD® DETAIL 330 FOR LAP APPLICATION.
5. 25-YEAR GUARANTEES AND ABOVE MUST USE EXTREME ACCESSORIES.
6. APPLY EVERGUARD® TPO CUT EDGE SEALANT TO ALL CUT REINFORCED TPO EDGES (REFER TO EVERGUARD® DETAIL 115).

 <small>WWW.GAF.COM</small> <small>1 Commerce Drive</small> <small>Peapack, NJ 07656</small>	 <small>ROOF EDGE SERIES</small>	DRAWING # 211	SCALE N.T.S.	THIS DETAIL APPLIES TO: Adhered Systems Self-Adhered Systems TPO/Pole Systems Mechanically Attached Systems	REVISION DATE 0-20-16
	GUTTER WITH COATED METAL EDGE DETAIL				

20-YEAR MAX WARRANTY

NOTE:

1. TERMINATION BAR MUST BE FASTENED 6" (152 mm) O.C. FOR THIS DETAIL.
2. FOR INSULATION THICKNESS GREATER THAN 8" (203 mm), A HARD BOARD IS REQUIRED ON MECHANICALLY FASTENED SYSTEMS ONLY.
3. APPLY EVERGUARD® TPO CUT EDGE SEALANT TO ALL CUT REINFORCED TPO EDGES (REFER TO EVERGUARD® DETAIL 115).

 <small>WWW.GAF.COM</small> <small>1 Commerce Drive</small> <small>Peapack, NJ 07656</small>	 <small>ROOF EDGE SERIES</small>	DRAWING # 208	SCALE N.T.S.	THIS DETAIL APPLIES TO: Adhered Systems Self-Adhered Systems TPO/Pole Systems Mechanically Attached Systems	REVISION DATE 0-20-16
	TERMINATION BAR ROOF EDGE DETAIL				

ROOFING DETAILS

15-YEAR MAX WARRANTY

NOTE:

- CLEAN METAL AND MEMBRANE WITH EVERGUARD® TPO SEAM CLEANER AND ALLOW TO DRY BEFORE PRIMING.
- PRIME MEMBRANE AND METAL EDGE BEFORE INSTALLING EVERGUARD TPO COVER TAPE
- APPLY EVERGUARD® TPO CUT EDGE SEALANT TO ALL CUT REINFORCED TPO EDGES (REFER TO EVERGUARD® DETAIL 115).

EVERGUARD
ROOF EDGE SERIES

DRAWING # **216**

**TPO COVER TAPE AT METAL DRIP
EDGE CORNER DETAIL**

SCALE
N.T.S.

THIS DETAIL APPLIES TO:
Adhered Systems
Mechanically-Adhered Systems
TPO/Pole Systems

REVISION DATE
6-20-16

15-YEAR MAX WARRANTY

NOTE:

- FOR INSULATION THICKNESS GREATER THAN 8" (203 mm), A HARD BOARD IS REQUIRED ON MECHANICALLY FASTENED SYSTEMS ONLY.
- CLEAN METAL AND MEMBRANE WITH EVERGUARD® SEAM CLEANER AND ALLOW TO DRY BEFORE PRIMING.
- WHEN ROOF SLOPE IS GREATER THAN 1:12 IN CLIMATES WITH SNOW AND ICE, REFER TO ALTERNATE EDGE DETAIL.
- EVERGUARD® TPO COVER TAPE IS ONLY TO BE USED WITH TPO MEMBRANE SYSTEMS ONLY.
- THIS DETAIL IS **NOT** TO BE USED ON SLOPES GREATER THAN 1:12. FOR SLOPES GREATER THAN 1:12, REFER TO EVERGUARD® DETAIL 218 OR 219.

EVERGUARD
ROOF EDGE SERIES

DRAWING # **215**

**TPO COVER TAPE OVERLAP AT
ROOF EDGE DETAIL**

SCALE
N.T.S.

THIS DETAIL APPLIES TO:
Adhered Systems
Mechanically-Adhered Systems
TPO/Pole Systems

REVISION DATE
6-20-16

FLASHING KEY

- 24" - 54" (610 mm - 1,37 m)
REQUIRES BONDING ADHESIVE
- UP TO 24" (610 mm) DRY HUNG

15-YEAR MAX GUARANTEE

NOTE:

1. FOR INSULATION THICKNESS GREATER THAN 8" (203 mm), A HARD BOARD IS REQUIRED ON MECHANICALLY FASTENED SYSTEMS ONLY.
2. IF EVERGUARD®FREEDOM™ MEMBRANE IS USED, BONDING ADHESIVE IS NOT NEEDED AND WALL MUST BE PRIMED
3. APPLY EVERGUARD® TPO CUT EDGE SEALANT TO ALL CUT REINFORCED TPO EDGES (REFER TO EVERGUARD® DETAIL 115).
4. FOR SELF-ADHERED RAPIDSEAM™ TECHNOLOGY SYSTEMS, SEE EVERGUARD® DETAIL 330 FOR LAP APPLICATION.

GAF <small>www.gaf.com Parsippany, NJ 07054</small>	EverGuard <small>PARAPET WALL & CURB SERIES</small>	DRAWING # 302	SCALE N.T.S.	THIS DETAIL APPLIES TO ALL SYSTEMS <small>REVISION DATE 6-20-16</small>
WALL/CURB FLASHING WITH TERMINATION BAR DETAIL				

FLASHING KEY

- 24" - 54" (610 mm - 1,37 m)
REQUIRES BONDING ADHESIVE
- UP TO 24" (610 mm) DRY HUNG

15-YEAR MAX GUARANTEE

NOTE:

1. FOR INSULATION THICKNESS GREATER THAN 8" (203 mm), A HARD BOARD IS REQUIRED ON MECHANICALLY FASTENED SYSTEMS ONLY.
2. EXISTING REGLET IS ACCEPTABLE IF METAL IS IN GOOD CONDITION.
3. IF EVERGUARD® FREEDOM™ MEMBRANE IS USED, BONDING ADHESIVE IS NOT NEEDED AND WALL MUST BE PRIMED.
4. FOR SELF-ADHERED RAPIDSEAM™ TECHNOLOGY SYSTEMS, SEE EVERGUARD® DETAIL 330 FOR LAP APPLICATION.
5. APPLY EVERGUARD® TPO CUT EDGE SEALANT TO ALL CUT REINFORCED TPO EDGES (REFER TO EVERGUARD® DETAIL 115).

GAF <small>www.gaf.com Parsippany, NJ 07054</small>	EverGuard <small>PARAPET WALL & CURB SERIES</small>	DRAWING # 301	SCALE N.T.S.	THIS DETAIL APPLIES TO ALL SYSTEMS <small>REVISION DATE 6-20-16</small>
PARAPET WALL FLASHING WITH COUNTERFLASHING				

ROOFING DETAILS

FLASHING KEY

- 24" - 54" (610 mm - 1.37 m) REQUIRES BONDING ADHESIVE
- UP TO 24" (610 mm) DRY HUNG

NOTE:

1. FOR INSULATION THICKNESS GREATER THAN 8" (203 mm), A HARD BOARD IS REQUIRED ON MECHANICALLY FASTENED SYSTEMS ONLY.
2. IF EVERGUARD®FREEDOM™ MEMBRANE IS USED, BONDING ADHESIVE IS NOT NEEDED AND WALL MUST BE PRIMED
3. APPLY EVERGUARD® TPO CUT EDGE SEALANT TO ALL CUT REINFORCED TPO EDGES (REFER TO EVERGUARD® DETAIL 115).

DRAWING #	304	SCALE	N.T.S.	THIS DETAIL APPLIES TO	ALL SYSTEMS
 www.gaf.com Parsippany, NJ 07054			EverGuard® PARAPET WALL & CURB SERIES		
WALL FLASHING WITH COATED METAL EDGE DETAIL			REVISION DATE		
6-20-16			6-20-16		

FLASHING KEY

- 24" - 54" (610 mm - 1.37 m) REQUIRES BONDING ADHESIVE
- UP TO 24" (610 mm) DRY HUNG

NOTE:

1. FOR INSULATION THICKNESS GREATER THAN 8" (203 mm), A HARD BOARD IS REQUIRED ON MECHANICALLY FASTENED SYSTEMS ONLY.
2. IF EVERGUARD®FREEDOM™ MEMBRANE IS USED, BONDING ADHESIVE IS NOT NEEDED AND WALL MUST BE PRIMED
3. APPLY EVERGUARD® TPO CUT EDGE SEALANT TO ALL CUT REINFORCED TPO EDGES (REFER TO EVERGUARD® DETAIL 115).
4. FOR SELF-ADHERED RAPIDSEAM™ TECHNOLOGY SYSTEMS, SEE EVERGUARD® DETAIL 330 FOR LAP APPLICATION.

DRAWING #	303	SCALE	N.T.S.	THIS DETAIL APPLIES TO	ALL SYSTEMS
 www.gaf.com Parsippany, NJ 07054			EverGuard® PARAPET WALL & CURB SERIES		
WALL CAP DETAIL			REVISION DATE		
6-20-16			6-20-16		

ROOFING DETAILS

NOTE:

1. FOR INSULATION THICKNESS GREATER THAN 8" (203 mm), A HARD BOARD IS REQUIRED ON MECHANICALLY FASTENED SYSTEMS ONLY.
2. REMEMBER TO INSTALL EVERGUARD® UNREINFORCED OR PREMANUFACTURED OUTSIDE CORNERS TO THE SCUPPERS' FOUR ROOF-SIDE CORNERS.
3. SCUPPER MUST BE SEALED OFF ON OUTSIDE OF BUILDING.
4. IF EVERGUARD® COATED METAL IS NOT AN OPTION ADHERE MEMBRANE TO THE NEW SCUPPER BOX.
5. APPLY EVERGUARD® TPO CUT EDGE SEALANT TO ALL CUT REINFORCED TPO EDGES (REFER TO EVERGUARD® DETAIL 115).

NOTE:

1. FOR MECHANICALLY ATTACHED SYSTEMS ONLY, INSULATION THICKNESSES GREATER THAN 8" (203 mm) REQUIRE A HARD BOARD OR COVERBOARD.
2. 24" (610 mm) MAX. DIMENSION FOR LOOSE-APPLIED FLASHINGS.
3. 54" (1.37 m) MAX. DIMENSION FOR FULLY ADHERED FLASHINGS.
4. IF EVERGUARD® FREEDOM™ MEMBRANE IS USED, BONDING ADHESIVE IS NOT NEEDED AND WALL MUST BE PRIMED.
5. APPLY EVERGUARD® TPO CUT EDGE SEALANT TO ALL CUT REINFORCED TPO EDGES (REFER TO EVERGUARD® DETAIL 115).

ROOFING DETAILS

NOTE:

1. FOR INSULATION THICKNESS GREATER THAN 8" (203 mm), A HARD BOARD IS REQUIRED ON MECHANICAL SYSTEMS ONLY.
2. IF EVERGUARD® FREEDOM™ MEMBRANE IS USED, BONDING ADHESIVE IS NOT NEEDED AND WALL MUST BE PRIMED.
3. FOR SELF-ADHERED RAPIDSEAM™ TECHNOLOGY SYSTEMS, SEE EVERGUARD® DETAIL 330 FOR LAP APPLICATION.
4. FOR SELF-ADHERED RAPIDSEAM™ TECHNOLOGY SYSTEMS, SEE EVERGUARD® DETAIL 330 FOR LAP APPLICATION.
5. APPLY EVERGUARD® TPO CUT EDGE SEALANT TO ALL CUT EDGE SEALANT TO ALL CUT REINFORCED TPO EDGES (REFER TO EVERGUARD® DETAIL 115).

THIS DETAIL APPLIES TO:
ALL SYSTEMS

REVISION DATE:
6-20-16

REVISION DATE:
6-20-16

NOTE:

1. FLEXSEAL™ CAULK GRADE SEALANT IS TO BE ADDED TO ALL TERMINATION BAR EDGES, OPEN HOLES, AND DRILL-TEC™ FASTENER HEADS.
2. FOR INSULATION THICKNESS GREATER THAN 8" (203 mm), A HARD BOARD IS REQUIRED ON MECHANICAL SYSTEMS ONLY.
3. IF EVERGUARD® FREEDOM™ MEMBRANE IS USED, BONDING ADHESIVE IS NOT NEEDED AND WALL MUST BE PRIMED.
4. FOR SELF-ADHERED RAPIDSEAM™ TECHNOLOGY SYSTEMS, SEE EVERGUARD® DETAIL 330 FOR LAP APPLICATION.
5. APPLY EVERGUARD® TPO CUT EDGE SEALANT TO ALL CUT REINFORCED TPO EDGES (REFER TO DETAIL EVERGUARD® 115).

THIS DETAIL APPLIES TO:
Adhered Systems
Mechanically Attached Systems
Self-Adhered Systems

REVISION DATE:
6-20-16

REVISION DATE:
6-20-16

FASTENED TO WALL / CURB

WALL / CURB

DRILL-TEC™ PLATES & SCREWS
12" (305 mm) O.C. (6" (152 mm) O.C.
FOR BALLASTED SYSTEMS)

EVERGUARD® R.T.A. STRIP
MUST EXTEND 1/2" (12.7 mm)
ABOVE SCREW PLATE.

12" (305 mm) O.C. MAX.

FASTENED TO DECK

WALL / CURB

DRILL-TEC™ PLATES &
FASTENERS 12" (305 mm)
O.C. MAX.

EVERGUARD® R.T.A. STRIP
MUST EXTEND MAX. 1/2" (12.7
mm) BEHIND SCREW PLATE.

12" (305 mm) O.C. (6" (152 mm) O.C. MIN.)

NOTE:

- THIS DETAIL IS NOT TO BE USED FOR EVERGUARD® PVC MEMBRANES OR MECHANICALLY ATTACHED SYSTEMS.
- R.T.A. STRIP MAY BE FIELD FABRICATED OUT OF EVERGUARD® FREEDOM™ MEMBRANE.
- IF EVERGUARD® FREEDOM™ MEMBRANE IS USED, BONDING ADHESIVE IS NOT NEEDED AND WALL MUST BE PRIMED.
- FOR INSULATION THICKNESS GREATER THAN 8" (203 mm), A HARD BOARD IS REQUIRED ON MECHANICAL SYSTEMS ONLY.
- APPLY EVERGUARD® TPO CUT EDGE SEALANT TO ALL CUT REINFORCED TPO EDGES (REFER TO EVERGUARD® DETAIL 115).

FASTENED TO WALL / CURB

DRILL-TEC™ PLATES & FASTENERS
6" (152 mm) MIN. OUT FROM
CORNER

WALL / CURB

EVERGUARD® R.T.A. STRIP
MUST EXTEND MAX. 1/2" (12.7
mm) ABOVE SCREW PLATE.

12" (305 mm) O.C.
MAX.

DRILL-TEC™ PLATES & FASTENERS 12"
(305 mm) O.C. MAX. (6" (152 mm) O.C.
FOR BALLASTED SYSTEMS)

FASTENED TO DECK

WALL / CURB

DRILL-TEC™ PLATES & FASTENERS
12" (305 mm) O.C. MAX.

GAP BETWEEN STRIPS 1/8" (3.18 mm)
MIN TO 1" (25.4 mm) MAX

EVERGUARD® R.T.A. STRIP MUST
EXTEND MAX. 1/2" (12.7 mm) BEHIND
SCREW PLATE.

12" (305 mm) O.C.
MAX.

NOTE:

- THIS DETAIL IS NOT TO BE USED FOR EVERGUARD® PVC MEMBRANES OR MECHANICALLY ATTACHED SYSTEMS.
- R.T.A. STRIP MAY BE FIELD FABRICATED OUT OF EVERGUARD® FREEDOM™ MEMBRANE.
- COMMON FASTENER ANCHORING THE OVERLAP OF THE TWO STRIPS IN THE CORNER.
- FOR INSULATION THICKNESS GREATER THAN 8" (203 mm), A HARD BOARD IS REQUIRED ON MECHANICAL SYSTEMS ONLY.

GAF <small>www.gaf.com 1 Corner Drive Parsippany, NJ 07054</small>	EverGuard <small>PARAPET WALL & CURB SERIES</small>	DRAWING # 326B	SCALE N.T.S.	REVISION DATE 02-20-16
R.T.A. STRIP - OUTSIDE CORNER REINFORCEMENT DETAIL			TPO ONLY	
THIS DETAIL APPLIES TO: Adhered Systems Self-Adhered Systems Ballasted Systems Non-Fleece				

GAF <small>www.gaf.com 1 Corner Drive Parsippany, NJ 07054</small>	EverGuard <small>PARAPET WALL & CURB SERIES</small>	DRAWING # 326A	SCALE N.T.S.	REVISION DATE 02-11-16
R.T.A. STRIP - INSIDE CORNER REINFORCEMENT DETAIL			TPO ONLY	
THIS DETAIL APPLIES TO: Adhered Systems (Smooth Membrane Only) Self-Adhered Systems				

ROOFING DETAILS

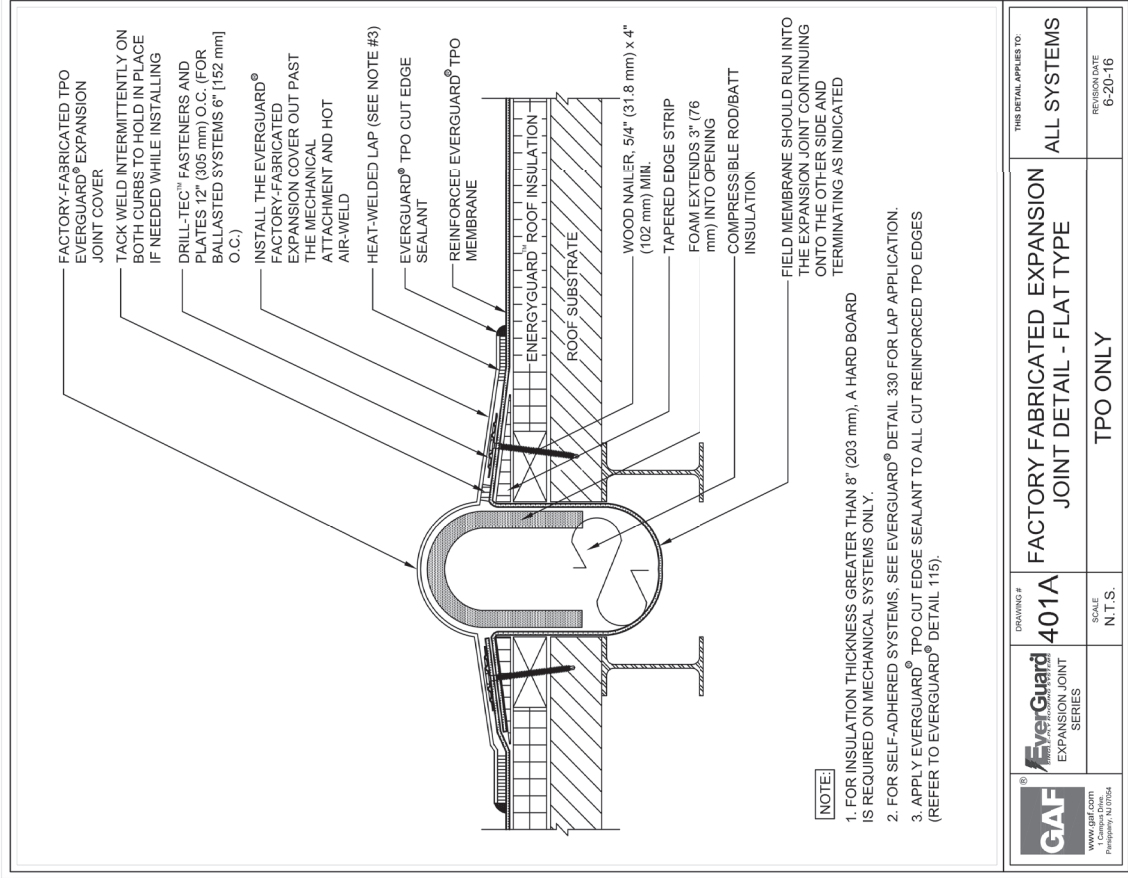
NOTE:

1. R.T.A. STRIP MAY BE FIELD FABRICATED OUT OF EVERGUARD® FREEDOM™ MEMBRANE. REMOVE FILM BEFORE INSTALLING BASE SHEET.
2. THIS DETAIL IS NOT TO BE USED FOR EVERGUARD® PVC MEMBRANES OR MECHANICALLY ATTACHED SYSTEMS.
3. IF EVERGUARD® FREEDOM TPO IS USED, BONDING ADHESIVE NOT NEEDED AND WALL MUST BE PRIMED WITH TPO PRIMER.
4. IF EVERGUARD® FREEDOM™ MEMBRANE IS USED, BONDING ADHESIVE IS NOT NEEDED AND WALL MUST BE PRIMED.
5. APPLY EVERGUARD® TPO CUT EDGE SEALANT TO ALL CUT REINFORCED TPO EDGES (REFER TO EVERGUARD® DETAIL 115).

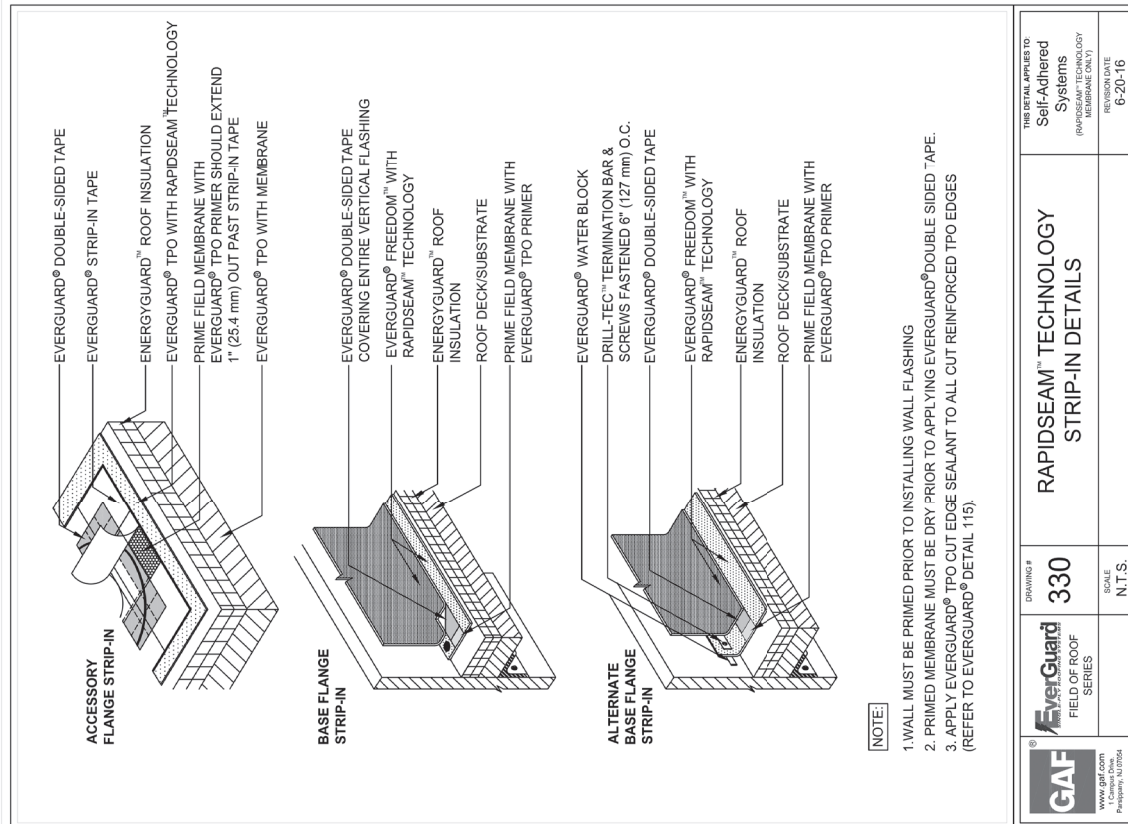
NOTE:

1. R.T.A. STRIP MAY BE FIELD FABRICATED OUT OF EVERGUARD® FREEDOM™ TPO MEMBRANE. REMOVE FILM BEFORE INSTALLING BASE SHEET.
2. FOR INSULATION THICKNESS GREATER THAN 8\"/>

ROOFING DETAILS



 www.gaf.com Parsippany, NJ 07054	 EXPANSION JOINT SERIES	DRAWING # 401A	THIS DETAIL APPLIES TO ALL SYSTEMS	REVISION DATE 6-20-16
	SCALE N.T.S.	TPO ONLY	FACTORY FABRICATED EXPANSION JOINT DETAIL - FLAT TYPE	REVISION DATE 6-20-16



 www.gaf.com Parsippany, NJ 07054	 FIELD OF ROOF SERIES	DRAWING # 330	THIS DETAIL APPLIES TO Self-Adhered Systems (REGULAR TECHNOLOGY MEMBRANE ONLY)	REVISION DATE 6-20-16
	SCALE N.T.S.	RAPIDSEAM™ TECHNOLOGY STRIP-IN DETAILS	FACTORY FABRICATED EXPANSION JOINT DETAIL - FLAT TYPE	REVISION DATE 6-20-16

ROOFING DETAILS

NOTE:

1. FOR INSULATION THICKNESS GREATER THAN 8" (203 mm), A HARD BOARD IS REQUIRED ON MECHANICAL SYSTEMS ONLY.
2. BEND EVERGUARD® COATED METAL TO FORM A SEALANT BOX AS SHOWN. STRIP-IN VERTICAL SEAM WHERE BOX IS JOINED TOGETHER.
3. ALLOW 2" (52 mm) CLEARANCE AROUND THE PROJECTION. IF MULTIPLE PROJECTIONS, ALLOW 1" (25.4 mm) BETWEEN PROJECTION AND BOX.
4. INSIDE SURFACE OF EVERGUARD® COATED METAL SEALANT BOX (BARE METAL SIDE) MUST BE CLEAN AND DRY BEFORE SEALANT IS APPLIED.
5. EXISTING PROJECTION MUST BE CLEANED AND FREE OF ANY INSULATING MATERIALS.
6. 25 YEAR GUARANTEES AND ABOVE MUST USE EXTREME ACCESSORIES
7. APPLY EVERGUARD® TPO CUT EDGE SEALANT TO ALL CUT REINFORCED TPO EDGES (REFER TO EVERGUARD® DETAIL 115).

THIS DETAIL APPLIES TO:
ALL SYSTEMS

COATED METAL SEALANT BOX PENETRATION FLASHING

DRAWING # 509
SCALE N.T.S.

EverGuard
ROOF PENETRATION SERIES

GAF
www.gaf.com
Atlanta, GA 30341
Parsippany, NJ 07054

NOTE:

1. FOR INSULATION THICKNESS GREATER THAN 8" (203 mm), A HARD BOARD IS REQUIRED ON MECHANICAL SYSTEMS ONLY.
2. FOR SELF-ADHERED RAPIDSEAM™ TECHNOLOGY SYSTEMS, SEE EVERGUARD® DETAIL 330 FOR LAP APPLICATION
3. IF EVERGUARD® FREEDOM™ MEMBRANE IS USED, BONDING ADHESIVE IS NOT NEEDED AND WALL MUST BE PRIMED.
4. APPLY EVERGUARD® TPO CUT EDGE SEALANT TO ALL CUT REINFORCED TPO EDGES (REFER TO EVERGUARD® DETAIL 115).

THIS DETAIL APPLIES TO:
ALL SYSTEMS

TERMINATION AT R.T.U. WITH WELDED LAP DETAIL

DRAWING # 503A
SCALE N.T.S.

EverGuard
ROOF PENETRATION SERIES

GAF
www.gaf.com
Atlanta, GA 30341
Parsippany, NJ 07054

ROOFING DETAILS

NOTE:

1. MINIMUM SLOPE IS 2:12.
2. FOR INSULATION THICKNESS GREATER THAN 8" (203 mm), A HARD BOARD IS REQUIRED ON MECHANICAL SYSTEMS ONLY.
3. ADD BALLAST PER SPECIFICATION FOR BALLASTED SYSTEMS.
4. FOR SELF-ADHERED SYSTEMS, SEE EVERGUARD® DETAIL 330 FOR LAP APPLICATION.
5. APPLY EVERGUARD® TPO CUT EDGE SEALANT TO ALL CUT REINFORCED TPO EDGES (REFER TO EVERGUARD® DETAIL 115).

 www.gaf.com 1 Commerce Drive Atlanta, GA 30344	 SPECIAL CONSTRUCTION SERIES	DRAWING # 601	THIS DETAIL APPLIES TO ALL SYSTEMS	REVISION DATE 6-22-16
	SCALE N.T.S.	STEEP SLOPE TIE-IN DETAIL		

NOTE:

1. FOR INSULATION THICKNESS GREATER THAN 8" (203 mm), A HARD BOARD IS REQUIRED ON MECHANICAL SYSTEMS ONLY.
2. APPLY EVERGUARD® TPO CUT EDGE SEALANT TO ALL CUT REINFORCED TPO EDGES (REFER TO EVERGUARD® DETAIL 115).

 www.gaf.com 1 Commerce Drive Atlanta, GA 30344	 ROOF PENETRATION SERIES	DRAWING # 512	THIS DETAIL APPLIES TO ALL SYSTEMS	REVISION DATE 0-27-16
	SCALE N.T.S.	CONCEALED WOOD EQUIPMENT SUPPORT DETAIL		

ROOFING DETAILS

Labels in diagram:

- EVERGUARD® COVER TAPE
- GALVANIZED METAL DRIP EDGE (REFER TO MANUFACTURER INSTRUCTIONS.)
- GALV. ANGULAR SHANK ROOFING NAILS 4" O.C. STAGGERED OR DRILL-TEC® SCREWS 12" O.C.
- PRIME FIELD MEMBRANE WITH EVERGUARD® TPO LOW VOC PRIMER.
- RAPIDSEAM™ MEMBRANE
- ENERGYGUARD™ ROOF INSULATION
- ROOF DECK/SUBSTRATE
- WOOD NAILER, 5/4" X 4" MIN SECURED TO SUBSTRATE
- SHEET METAL GUTTER

NOTE:

1. BE SURE TO CLEAN METAL AND MEMBRANE WITH EVERGUARD® TPO SEAM CLEANER BEFORE PRIMING.
2. APPLY FLEXSEAL™ CAULK GRADE SEALANT TO ALL EVERGUARD® STRIP-IN TAPE EDGES.
3. MEMBRANE MUST BE PRIMED AND DRY PRIOR TO APPLYING EVERGUARD® DOUBLE SIDED TAPE.
4. HANGERS MUST TERMINATE INTO FASCIA, NOT INTO ROOF SURFACE

 www.gaf.com Phosphoric Acid Free	 ROOF EDGE SERIES	DRAWING #	711	SCALE	N.T.S.
		THIS DETAIL APPLIES TO RapidSeam™ Systems		REVISION DATE 7-14-16	
GUTTER EDGE DETAIL			TPO ONLY		

FOR JOBS UP TO 50 SQUARES ONLY

Labels in diagram:

- EVERGUARD® DOUBLE SIDED TAPE PLACED OVER PRIMED AREA
- REINFORCED EVERGUARD® TPO MEMBRANE
- PRIME 6" MEMBRANE EDGE AND BATTEN BAR WITH EVERGUARD TPO LOW VOC PRIMER. ALLOW TO DRY FULLY BEFORE APPLYING TAPE
- DRILL-TEC™ BATTEN BAR CENTERED OVER RED PRINTED LINE AS SHOWN AND FASTENED 6" O.C.
- EDGE OF MEMBRANE
- BLACK LINE

NOTE:

1. APPLY TOPCOAT® FLEXSEAL™ CAULK GRADE TO ALL CUT EVERGUARD® MEMBRANE EDGES.
2. MEMBRANE MUST BE PRIMED AND DRY PRIOR TO APPLYING EVERGUARD® DOUBLE SIDED TAPE.

 www.gaf.com Phosphoric Acid Free	 FIELD OF ROOF SERIES	DRAWING #	702	SCALE	N.T.S.
		THIS DETAIL APPLIES TO Taped Seam Systems		REVISION DATE 5-1-15	
MEMBRANE EDGE DETAIL					

ROOFING DETAILS

[NOTE]

1. ALLOW 2" (52 mm) CLEARANCE AROUND THE PROJECTION. IF MULTIPLE PROJECTIONS, ALLOW 1" (25.4 mm) BETWEEN PROJECTION AND BOX.
2. THE EXISTING PROJECTION MUST BE CLEAN OF ALL DEBRIS BEFORE INSTALLATION.
3. EVERGUARD® POURABLE SEALANT POCKET MUST BE PRIMED WITH EVERGUARD® TPO PRIMER.
4. APPLY FLEXSEAL™ CAULK GRADE SEALANT TO ALL EVERGUARD® STRIP-IN TAPE EDGES.
5. MEMBRANE MUST BE PRIMED AND DRY PRIOR TO APPLYING EVERGUARD® DOUBLE SIDED TAPE.
6. IF PENETRATION POCKET IS TO BE CUT CLEAN, PRIME ADD EVERGUARD® DOUBLE SIDED TAPE THEN STRIP-IN WITH EVERGUARD® STRIP-IN TAPE.

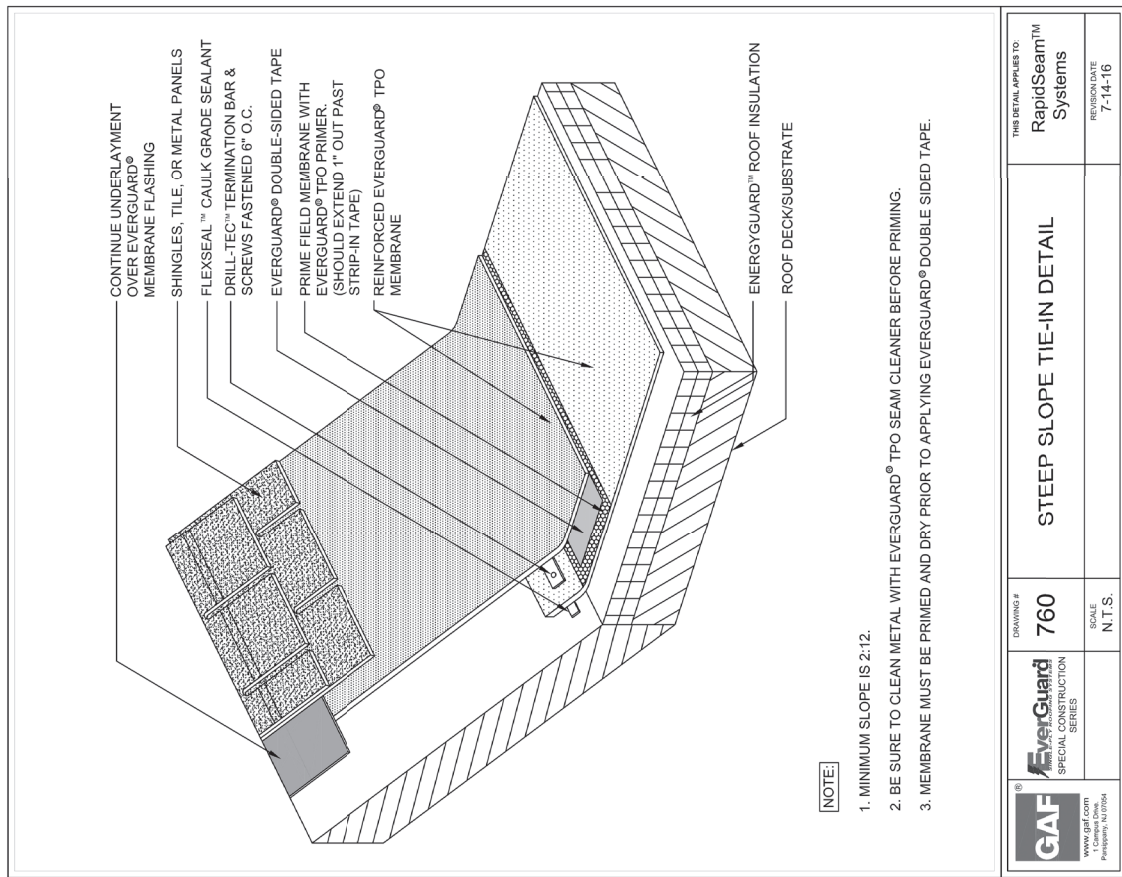
 www.gaf.com Parsippany, NJ 07054	 PARAPET WALL & CURB SERIES	DRAWING #	755	THIS DETAIL APPLIES TO	RapidSeam™ Systems
	 ROOF PENETRATION SERIES	SCALE	N.T.S.	 755	 POURABLE SEALER POCKET DETAIL
		REVISION DATE		7-14-16	

[NOTE]

1. APPLY FLEXSEAL™ CAULK GRADE SEALANT TO ALL EVERGUARD® STRIP-IN TAPE EDGES AND ALL CUT REINFORCED TPO EDGE.
2. MEMBRANE MUST BE PRIMED AND DRY PRIOR TO APPLYING EVERGUARD® DOUBLE SIDED TAPE.

 www.gaf.com Parsippany, NJ 07054	 PARAPET WALL & CURB SERIES	DRAWING #	739	THIS DETAIL APPLIES TO	RapidSeam™ Systems
	 OUTSIDE CORNER REINFORCEMENT - UNIVERSAL CORNER DETAIL	SCALE	N.T.S.	 739	 OUTSIDE CORNER REINFORCEMENT - UNIVERSAL CORNER DETAIL
		REVISION DATE		7-14-16	

ROOFING DETAILS



 www.gaf.com Parsippany, NJ 07054	 SPECIAL CONSTRUCTION SERIES	DRAWING # 760	THIS DETAIL APPLIES TO RapidSeam™ Systems
		SCALE N.T.S.	REVISION DATE 7-14-16
STEEP SLOPE TIE-IN DETAIL			

NOTES

NOTES



*Quality You Can
Trust...From
North America's
Largest Roofing
Manufacturer!™*