GAF

We protect what matters most™

EverGuard® SA TPO Self-Adhered Membrane Roofing Systems

Overview & General Requirements Manual

EverGuard® SA TPO Self Adhered Membrane Roofing System Manual

WELCOME

This manual contains the latest information relating to the application of GAF's commercial roofing products. It has been prepared as a general guide to assist architects, engineers, roofing contractors, and owners in the use of GAF's product offerings. You can find further information at www.gaf.com, or contact GAF at (877-423-7663).

ABOUT GAF

With 130+ years in the industry, GAF is the leading roofing manufacturer in North America. As a member of the Standard Industries family of companies, we are also part of the largest roofing and waterproofing business in the world.

Our communities help give our work meaning and the products we manufacture help protect what matters most. The shingles help to shelter the families living in the homes in our towns. The TPO helps protect what is under that hospital's roof. In addition to quality products, we make sure they are installed by quality craftsmen and women. The full GAF portfolio of solutions is supported by an extensive national network of factory-certified contractors.

GAF continues to be the leader in quality and offers comprehensive warranty protection on its products and systems. Our success is driven by a commitment to empowering our people to deliver advanced quality and purposeful innovation and the desire to protect what matters most.
For more information about GAF, visit us at www.gaf.com.

SERVICES

- Our GAF Technical Sales Support Services representatives can provide information about specifications, application, code approvals, and product information. The GAF Technical Sales Support Services number is 1-877-423-7663.
- Architectural Information Services (AIS) is a specification service that provides a general specification for the approved GAF roofing system you identify, including product descriptions, application methods, and detailed drawings based on the information you provided. The phone number for AIS is 800-522-9224
- Our Tapered Design Group (TDG) provides 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 1-877-423-7663.
- Our CARE (Center for the Advancement of Roofing Excellence) program trains industry professionals in proper roofing techniques through professional, educational programs geared specifically to the roofing industry - given by experts in the roofing industry.
- Visit GAF on the web at www.gaf.com for extensive product information, specifications, and technical literature.

DISCLAIMERS

GAF manufactures and sells roofing materials and does NOT practice architecture or engineering or provide professional design services. 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 a substitute for good application practices.

- Under no circumstances does GAF have any liability for costs or expenses arising out of or associated with the pre-existing 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.

GENERAL

Roof guarantees are available for purchase for all roofing system specifications published in this Manual, provided that (i) the roofing system is installed by a contractor certified with GAF at the appropriate certification level, (ii) the roofing system is installed in accordance with the terms and conditions set forth in this Manual, and (iii) all other standard requirements for guarantee issuance are met. Contact GAF for more information.

All guaranteed roofing systems must be flashed in accordance with published GAF flashing requirements and details. 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 determine, in its sole discretion, whether a roofing guarantee will be issued to cover any proposed or completed roof. The issuance of a guarantee and/or its effectiveness is contingent upon payment of GAF's guarantee fee and payment in full to roofing contractors and materials suppliers.

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.

For further information on guarantee requirements and for approval of modifications to published specifications, consult with GAF at 877-423-7663.

GAF is not responsible for consequential damages under any circumstances. Building owners may make reasonable and customary temporary repairs at their own expense to minimize damage to the building or its contents in an emergency.

A GAF guarantee may be canceled subsequently by GAF for violation of its terms and conditions.

Certain GAF guarantees may be eligible for GAF WellRoof® guarantee extension. Additional requirements apply. Consult with GAF at 877-423-7663 for eligibility requirements.

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 issued for a particular project.

References to GAF certified contractors only identify a contractor eligible to apply for a GAF roofing guarantee and is not intended to convey any other meaning. Contractors enrolled in GAF certification programs are not employees or agents of GAF, and GAF does not control or otherwise supervise these independent businesses. Contractors may receive benefits, such as loyalty rewards points and discounts on marketing tools from GAF for participating in the program and offering GAF enhanced warranties, which require the use of a minimum amount of GAF products. Services provided by Contractors enrolled in GAF certification programs are subject to the Contractor Terms of Use, available at gaf.com.

GAF will issue a roofing system guarantee only for roofs applied by a GAF certified contractor that meet GAF's requirements for guarantee issuance. The responsibility for proper application of the roof lies with the GAF certified contractor alone. It is the responsibility of the building owner and its designated representatives to enforce compliance with contractual requirements, 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 purchased, 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 when GAF arrives onsite, GAF reserves the right to charge for such visit.

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 sole use only and do not constitute a waiver, modification, or expansion 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 our requirements or standard good roofing practices, such conditions may be brought to the attention of the roofing contractor. GAF, in its sole discretion, has the right to require corrective action as it deems necessary to conform to standard requirements for the issuance of the GAF roofing system guarantee.

SPECIAL CONDITIONS

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

GAF will not issue a roofing system guarantee for the following without design justification submitted to GAF for approval consideration from the Field Services Director:

- Over any surface or deck not covered in this manual
- Over a cold/freezer storage building, unless GAF's cold storage specifications and details are incorporated
- 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 or control joints
- 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 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, without properly designed mechanical ventilation systems.
- When roofing over an existing roof system that contains moisture
- On plywood/OSB decks not conforming to APA requirements
- On roofs containing sprayed-in-place polyurethane foam
- Any unusual condition not specifically approved by GAF
- On any high-temperature condition that allows the roof membrane temperature to exceed 160°F (71°C).
- On any other installations that deviate from GAF's specifications.

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® SA TPO Self Adhered Membrane Roofing Systems when installed by an eligible GAF certified contractor. Please call 877-423-7663 for additional information and specific guarantee requirements.

EverGuard® Roofing System Guarantees	Length of Coverage
Diamond Pledge™ NDL Roof Guarantee	Up to 20 years
System Pledge™ Roof Guarantee	Up to 20 years
Weather Stopper® Integrated System Limited Warranty	Up to 20 years
WellRoof® Guarantee Extension* • Up to 25% longer guarantee term for eligible systems only; additional requirements apply.	Up to a 5-year extension

* When certain requirements are met, GAF will extend its Diamond Pledge™ Guarantee by up to 25% for a maximum of 25 years. Please call 877-423-7663 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.

Note: Refer to the EverGuard® SA TPO SELF ADHERED MEMBRANE **SYSTEM GUARANTEE REQUIREMENTS** on next page for maximum guarantee lengths and additional requirements.

SYSTEM GUARANTEE REQUIREMENTS

The following is a summary of the requirements for the installation of an EverGuard® SA TPO Self-Adhered Membrane Roofing System in order for the system to be eligible to receive an EverGuard® Diamond Pledge™ NDL roof guarantee. The selection of membrane type, thickness, and attachment is the responsibility of the architect, engineer, owner, or roof consultant.

EVERGUARD® DIAMOND PLEDGE™ NDL ROOF GUARANTEE REQUIREMENTS			
Attachment Method	**Maximum Guarantee Length**	**EverGuard® SA TPO Membrane**	**Insulation Requirements**
Self Adhered	20 Years	60 mils	As required by Insulation Attachment Table(s)

[1]May be one layer when using a minimum 1/4:12 tapered polyiso insulation system from GAF over concrete, gypsum or cementitious wood fiber (cwf) decks.

[2]Approved Cover Boards:

1. *EnergyGuard™ HD Polyiso*
2. *EnergyGuard™ HD Plus Polyiso*
3. *EnergyGuard™ NH HD Polyiso*
4. *EnergyGuard™ NH HD Plus Polyiso*
5. *SECUROCK® Roof Board*
5. *DensDeck® Prime Roof Board*
6. *DEXcell FA Glass Mat Roof Board*
7. *DEXcell Glass Mat Roof Board*
8 *DEXcell FA VSH Glass Mat Roof Board*

Additional Requirements For Extended-Length (25 - Years) EverGuard® Diamond Pledge™ NDL Roof Guarantees	
Building Height Limitations	Buildings greater than 100’ (30.5 m) in height must have a minimum 3’ (1 m) parapet wall to be eligible for an extended-length guarantees.
Construction Type	Extended-length guarantees are available only for new construction or a complete tear-off to the deck. Extended-length guarantees are not eligible for re-cover applications.
Air/Vapor Retarders	An air/vapor retarder is required where large wall openings greater than 10% of a total wall area can be open during a wind storm, including opening due to storm damage.damage. An air/vapor retarder is required on all 10’ (3 m) wide or greater membranes with side laps mechanical attachment that exceed 6 in. (152 mm) o.c.
WellRoof™ Guarantee Extension	Certain projects may be eligible for a GAF WellRoof® extension of up to 25% of the original guarantee term; additional requirements apply (including annual maintenance by a GAF Certified Maintenance Professional (CMP)). Maximum guarantee length, including WellRoof® Guarantee Extension, is 35 years.
Roof Flashings	For extended-length guarantees, separate counter flashing or cap flashing is required; exposed termination bars are not acceptable.
Flashing Accessories	For extended-length guarantees, regardless of the membrane type, EverGuard Extreme® pre-formed flashing accessories are required. When EverGuard Extreme® pre-formed flashing accessories are not available, unreinforced EverGuard Extreme® membrane must be used.
Roof Edges	EverGuard Extreme® Cover Tape HW, EverGuard Extreme® TPO Coated Metal in conjunction with EverGuard Extreme® Flashing Strip or any of the other EverGuard® pre-fabricated extruded aluminum fascia systems are required.

ATTACHMENT TABLES

NEW CONSTRUCTION OR TEAR OFF							
Deck	Insulation/Substrate				Insulation/Substrate Attachment		
	ISO	Gypsum Board[1]	EPS/ XPS[2]	None[3]	Mech. Fast.	Adhesive[4]	Hot
Steel	YES	YES	YES	NO	YES		
Wood	YES	YES	YES	YES	YES	YES	YES[5]
Structural Concrete & Gypsum	YES	YES	YES		YES	YES	YES
Lightweight Insulating Concrete	YES	YES	YES	YES	YES	YES	YES
Cementitious Wood Fiber	YES	YES	YES	YES	YES	YES	YES[1]

1. *For faced boards, a glass mat facer is required for self adhered membranes.*
2. *Cover board required with EPS/XPS, unless StormSafe® Anchor Sheet is used.*
3. *Requires the installation of mechanically attached StormSafe® Anchor Sheet over the deck.*
4. *Includes Olybond 500® and LRF-M.*
5. *Insulation can be installed in hot asphalt only when mopping to mechanically attached base sheet*

RE-COVER						
Existing Roofing System Type	Insulation/Substrate			Insulation/Substrate Attachment		
	ISO	Gypsum Board[1]	EPS/ XPS[2]	Mech Fast.	Adhesive[3]	Hot
Smooth BUR/MB	YES	YES	YES	YES	YES	YES
Single-Ply Membrane	YES	YES	YES	YES		
Granule-Surfaced BUR/MB	YES	YES	YES	YES	YES	YES
Gravel-Surfaced BUR/MB	YES	YES	YES	YES	YES	YES
Standing Seam Metal[4]	YES	YES		YES		

1. *For faced boards, a glass mat facer is required for self adhered membranes.*
2. *Cover board required with EPS/XPS, unless using StormSafe® Anchor Sheet.*
3. *Includes OlyBond 500®, and LRF-M.*
4. *XPS is the only material allowed as flute fill, with a cover board required.*

TABLE 1 - INSULATION FASTENER & PLATE (TABLE 1 OF 3)

For insulation attachment, use Table 1 to determine the proper fastener and plate and Tables 2 & 3 to determine the number of fasteners per board.

Deck Type	Drill-Tec™ Fastener Type	Drill-Tec™ Plate Type	Penetration (min.)
Steel[1] (Min. 22 gauge)	#12	3 in. (76 mm) Steel	3/4 in. (19 mm) through the deck
	HD #14		
Wood (Plywood, OSB and Plank)	#12	3 in. (76 mm) Steel	3/4 in. (19 mm) through the deck (plywood or OSB) and 1 in. (25 mm) thread into the deck (plank)
	HD #14		
	XHD #15		
Structural Concrete (Min. 2,500 psi)	HD #14	3 in. (76 mm) Steel	1 in. (25 mm) thread into the deck
	CD-10		1 in. (25 mm) shank into the deck
Gypsum Concrete and Cementitious Wood Fiber (Tectum)	Polymer GypTec™	3 in. (76 mm) GypTec™	1 1/2 in. (38 mm) thread into the deck
	LD (Lite Deck)	3 in. (76 mm) LD (Lite Deck)	

[1] 24-26 gauge decks require a GAF Field Services Manager's or Director's approval. Refer to GAF's A Guide to Metal Roof Retrofit in Commercial Low-slope Roof Assemblies for installations over existing metal roofs on gaf.com.

TABLE 2 - INSULATION ATTACHMENT (TABLE 2 OF 3)

STANDARD ATTACHMENT FOR APPROVED STEEL, CONCRETE,WOOD, GYPSUM & CEMENTITIOUS WOOD FIBER DECKS

For insulation attachment, use Table 1 to determine the proper fastener and plate and Tables 2 & 3 to determine the number of fasteners per board.

Insulation Type	Board Size	Thickness	Standard Attachment Fasteners per Board		
			Field	Perimeter	Corner
EnergyGuard™ Polyiso	4’ x 4’ (1.2 m x 1.2 m)	0.5 in. - 1.4 in. (13 - 35 mm)	8	12	16
	4’ x 4’ (1.2 m x 1.2 m)	1.5 in. - 1.9 in. (38 - 48 mm)	5	8	10
	4’ x 4’ (1.2 m x 1.2 m)	2 in. (51 mm) minimum	4	6	8
	4’ x 8’ (1.2 m x 2.4 m)	0.5 in. - 1.4 in. (12 - 35 mm)	16	24	32
	4’ x 8’ (1.2 m x 2.4 m)	1.5 in. - 1.9 in. (38 - 48 mm)	10	15	20
	4’ x 8’ (1.2 m x 2.4 m)	2 in. (51 mm) minimum	8	12	16
EnergyGuard™ HD Polyiso	4’ x 8’ (1.2 m x 2.4 m)	1/2 in. (12 mm) minimum	8	12	16
EnergyGuard™ Barrier Polyiso	4’ x 8’ (1.2 m x 2.4 m)	1/2 in. (13 mm) minimum	8	12	16
USG SECUROCK® Brand Gypsum-Fiber Roof Board	4’ x 8’ (1.2 m x 2.4 m)	1/4 in. (6 mm) minimum	8	12	16
	4’ x 8’ (1.2 m x 2.4 m)	5/8 in. (15 mm) minimum	6	9	12
DensDeck® Prime Roof Board	4’ x 8’ (1.2 m x 2.4 m)	1/4 in. (6 mm) minimum	8	12	16
DEXcell Glass Mat Roof Board	4’ x 8’ (1.2 m x 2.4 m)	1/4 in. (6 mm) minimum	8	12	16
	4’ x 8’ (1.2 m x 2.4 m)	1/2 in. (13 mm) minimum	8	12	16
	4’ x 8’ (1.2 m x 2.4 m)	5/8 in. (15 mm) minimum	6	9	12
DEXcell FA Glass Mat Roof Board	4’ x 4’ (1.2 m x 1.2 m)	1/4 in. (6 mm) minimum	5	8	10
	4’ x 4’ (1.2 m x 1.2 m)	1/2 in. (13 mm) minimum	4	6	8
	4’ x 4’ (1.2 m x 1.2 m)	5/8 in. (15 mm) minimum	4	6	8
	4’ x 8’ (1.2 m x 2.4 m)	1/4 in. (6 mm) minimum	10	15	20
	4’ x 8’ (1.2 m x 2.4 m)	1/2 in. (13 mm) minimum	8	12	16
	4’ x 8’ (1.2 m x 2.4 m)	5/8 in. (15 mm) minimum	6	9	12
DEXcell FA VSH Glass Mat Roof Board	4’ x 4’ (1.2 m x 1.2 m)	5/8 in. (15 mm) minimum	4	6	8
	4’ x 8’ (1.2 m x 2.4 m)	5/8 in. (15 mm) minimum	6	9	12

TABLE 3 - INSULATION ATTACHMENT (TABLE 3 OF 3)

90 PSF UPLIFT RESISTANCE FOR APPROVED STEEL & CONCRETE DECKS

For insulation attachment, use Table 1 to determine the proper fastener and plate and Tables 2 & 3 to determine the number of fasteners per board.

Insulation Type	Board Size	Thickness	Attachment Fasteners/Board (For 90 psf Uplift Resistance)		
			Field	Perimeter	Corner
EnergyGuard™ Polyiso	4' x 4' (1.2 m x 1.2 m)	1.5 in. - 1.9 in. (38 - 48 mm)	8	12	16
	4' x 4' (1.2 m x 1.2 m)	2 in. (51 mm) minimum	4	6	8
	4' x 8' (1.2 m x 2.4 m)	1.5 in. - 1.9 in. (38 - 48 mm)	16	24	32
	4' x 8' (1.2 m x 2.4 m)	2 in. (51 mm) minimum	8	12	16
EnergyGuard™ HD Polyiso	4' x 8' (1.2 m x 2.4 m)	1/2 in. (13 mm) minimum	16	24	32
EnergyGuard™ Barrier Polyiso	4' x 8' (1.2 m x 2.4 m)	1/2 in. (13 mm) minimum	16	24	32
USG SECUROCK® Brand Gypsum-Fiber Roof Board	4' x 8' (1.2 m x 2.4 m)	1/4 in. (6 mm) minimum	10	15	20
	4' x 8' (1.2 m x 2.4 m)	5/8 in. (15 mm) minimum	6	9	12
DensDeck® Prime Roof Board	4' x 8' (1.2 m x 2.4 m)	1/4 in. (6 mm) minimum	10	15	20
	4' x 8' (1.2 m x 2.4 m)	1/2 in. (13 mm) minimum	8	12	16
DEXcell Glass Mat Roof Board	4' x 8' (1.2 m x 2.4 m)	1/4 in. (6 mm) minimum	10	15	20
	4' x 8' (1.2 m x 2.4 m)	1/2 in. (13 mm) minimum	8	12	16
	4' x 8' (1.2 m x 2.4 m)	5/8 in. (15 mm) minimum	6	9	12
DEXcell FA Glass Mat Roof Board	4' x 4' (1.2 m x 1.2 m)	1/4 in. (6 mm) minimum	5	8	10
	4' x 4' (1.2 m x 1.2 m)	1/2 in. (13 mm) minimum	4	6	8
	4' x 4' (1.2 m x 1.2 m)	5/8 in. (15 mm) minimum	4	6	8
	4' x 8' (1.2 m x 2.4 m)	1/4 in. (6 mm) minimum	10	15	20
	4' x 8' (1.2 m x 2.4 m)	1/2 in. (13 mm) minimum	8	12	16
	4' x 8' (1.2 m x 2.4 m)	5/8 in. (15 mm) minimum	6	9	12
DEXcell FA VSH Glass Mat Roof Board	4' x 4' (1.2 m x 1.2 m)	5/8 in. (15 mm) minimum	4	6	8
	4' x 8' (1.2 m x 2.4 m)	5/8 in. (15 mm) minimum	6	9	12

TABLE - GAF ROOF SYSTEM IDENTIFICATION

The following chart is used to determine the appropriate GAF system specification identification.

EVERGUARD® SA TPO SELF ADHERED SYSTEM SPECIFICATION IDENTIFICATION				
MEMBRANE TYPE	MEMBRANE ATTACHMENT	CONSTRUCTION TYPE	INSULATION	MEMBRANE THICKNESS
T= TPO	SA = SELF- ADHERED	N = NEW R = RECOVER T =TEAR-OFF	I = INSULATED N = NON-INSULATED	60 = 60 MIL
T	SA	N	I	60

TABLE - LOW-RISE FOAM (LRF) ADHESIVE SECUREMENT

Asphaltic Base Sheet		
Unmodified Fiberglass / Asphalt Sand / Smooth Surface Base Sheet	Yes[1]	
SBS Modified Asphalt Sand / Smooth Surface Base Sheets	Yes[1]	
APP Modified Asphalt Sand / Smooth Surface Base Sheets	Yes[1]	
Approved Insulations (May be adhered to subsequent layers or decks listed above)		
Polyisocyanurate (flat / tapered)	Yes[1]	Max. 4’ x 4’ (1.2 m x 1.2 m) boards[4]
High-Density Polyiso Cover Board	Yes[1]	Max. 4’ x 4’ (1.2 m x 1.2 m) boards[4]
High-Density Wood Fiber	Yes[1]	
DensDeck® Prime	Yes[1]	
SECUROCK® Gypsum-Fiber Roof Board	Yes[1]	
DEXcell FA Glass Mat Roof Board	Yes[1]	
DEXcell FA VSH Glass Mat Roof Board	Yes[1]	
Perlite Insulation	Yes[1]	¾ in. (18 mm) minimum
Extruded Polystyrene (XPS)	Yes[1]	Cover board required
Expanded Polystyrene (EPS)	Yes[1]	Cover board required
Direct Re-cover		
Existing Asphaltic Built-Up Roofs (Gravel must be removed)		
Smooth Surface Built-Up Roof (with no coating)	Yes[1]	
Smooth Surface Built-Up Roof (with new asphalt glaze coat)	Yes[1]	
Smooth Surface Built-Up Roof (with any type of coating)	Yes[1]	Excludes silicone coatings
Gravel-Surfaced Built-Up Roof (over existing insulation)	Yes[1]	Excludes silicone coatings

Mineral-Surfaced Built-Up Roof	Yes[1]	
Existing SBS Modified Asphaltic Roofs		
Smooth SBS Ply – Sheet (with no granules or coating)	Yes[1]	
Smooth SBS Ply – Sheet (with new asphalt glaze coat)	Yes[1]	
SBS Modified Bitumen Roofs (with any type of coating)	Yes[1]	Excludes silicone coatings
Mineral-Surfaced SBS Modified Bitumen Roofs	Yes[1]	
Existing APP Modified Asphaltic Roofs		
Smooth APP Ply – Sheet (with no granules or coating)	Yes[1]	
APP Modified Bitumen Roofs (with any type of coating)	Yes[1]	Excludes silicone coatings
Mineral-Surfaced APP Modified Bitumen Roofs	Yes[1]	
Existing Coal Tar Built-Up Roof		
Gravel-Surfaced Coal Tar Pitch Roof	Yes[1]	• Loose gravel removed & new insulation. • 1 in. polyiso min. required for TPO
Existing Single-Ply Roof [4]		**Spatter pattern only**
EPDM Roof	Yes[1,2]	Requires Supplemental Fastening[3]
TPO Roof	No[3]	
PVC Roof	No[3]	
Insulation (after removal of existing single-ply roof)	Yes[1,3]	Must be an approved insulation that is secured and not wet or damaged.[4]

1. *An adhesion test is required to ensure substrate and adhesion quality. Refer to Appendix A in the back of this manual for adhesion testing guidelines.*
2. *See Preparation of Roofing Area – Re-Cover Applications on page 24 for further requirements.*
3. *The use of low-rise foam adhesives directly over an existing single-ply membrane is not acceptable by GAF. The use of LRF Adhesive M, OlyBond500® Canister and TPO LRF Adhesive M Low Temp can be utilized to attach new insulation/cover board to existing adhered polyiso insulation that has had its facer removed during the removal of an adhered single-ply roof system.*
4. *4' x 8' (1.2 m x 2.4 m) polyiso boards may be installed using LRF if the following requirements are followed:*
    - *6 in. o.c. bead spacing only*
    - *Insulation boards must be flat, dry, and clean.*
    - *Lay insulation boards in place and walk-in to ensure complete adhesion. Once the board is set in place, apply adequate weight to the boards until the adhesive is cured to ensure proper securement between the insulation and substrate.*
    - *Does not qualify for enhanced wind coverage.*
    - *Not approved for use with any roofing system that requires the support of 3rd party testing (e.g. FM.). If 3rd party testing is utilized to support the wind uplift resistance of a roofing system, maximum 4'x4' boards are required.*

Note: *Refer to the Low-Rise Foam Insulation Adhesive Coverage Rates Table on page 20 for further information.*

TABLE - PERIMETER SECUREMENT ATTACHMENT

<table>
<tr><th colspan="4">Minimum Requirements for EverGuard® Diamond Pledge™ NDL Roof Guarantees</th></tr>
<tr><th>Building Width</th><th>Building Height</th><th>Minimum Area Width</th><th>Minimum Bead Spacing</th></tr>
<tr><td rowspan="3"><200’ (61 m)</td><td>0-34’ (0-10 m)</td><td>4’ (1.2 m)</td><td>6 in. (152 mm)</td></tr>
<tr><td>35’-100’ (10-30 m)</td><td>8’ (2.4 m)</td><td>6 in. (152 mm)</td></tr>
<tr><td>>100’ (30 m)</td><td colspan="2" rowspan="2">Formula: Perimeter area width is throughout the perimeter and corner region. The width of this region is defined as the least of the following two measurements: 0.1 x Building Width or 0.4 x Building Height
Note: The minimum width is 4’ (1.2 m)</td></tr>
<tr><td>≥200’ (61 m)</td><td>any height</td></tr>
<tr><td colspan="4">General Comments/Requirements
1. When installing insulation/cover boards, if a portion of a board extends into another zone, it must defer to the zone of the greater fastening/securement pattern.
2. Based on ASCE 7-05 (2009 IBC) and ASCE 7-10 (2012 & 2015 IBC), the perimeter and corner dimensions for buildings less that 60 ft. in height would be equal to the smaller of the following:
○ 0.1 times the building width, or
○ 0.4 times the building eave height
3. Based on the ASCE 7-16 (2018 IBC), the perimeter and corner dimensions for buildings less than 60 ft. in height are as follows:
○ Perimeter: width dimension is equal to 0.6 times the building eave height
○ Corners: length dimension is equal to 0.6 times the building eave height and the width dimension is equal to 0.2 times the building eave height
4. For buildings greater than 60 ft. in height:
○ Perimeter: 10% of the least horizontal dimension
○ Corners: Length of the corner is 2 times 10% of the least horizontal dimension and the width is 10% of the least horizontal dimension</td></tr>
</table>

PRODUCTS

Membranes		
Product	**Description**	**Size(s)**
EverGuard® SA	Self-adhered single-ply roofing membrane	60 mil

Flashing Membranes		
Product	**Description**	**Size(s)**
EverGuard® SA	Self-adhered single-ply roofing membrane	60 mil
EverGuard® TPO	Single-ply roofing membrane	60, 80 mil
EverGuard® TPO Fleece-back	Single-ply roofing membrane with polyester fleece	45, 60, 80 mil

Insulation	
Product	**Thickness & Slopes**
EnergyGuard™ Polyiso Insulation	1.0 in. - 4.6 in. (25.4 mm - 116 mm)
EnergyGuard™ Tapered Polyiso Insulation	Slopes: 1/8:12 ,1/4:12 , 1/2:12
EnergyGuard™ Ultra Polyiso Insulation	0.5 in. - 4.6 in. (12.7 mm - 116 mm)
EnergyGuard™ Tapered Ultra Polyiso Insulation	Slopes: 1/8:12 ,1/4:12 , 1/2:12
EnergyGuard™ NH Polyiso Insulation	1.0 in. - 4.6 in. (25.4 mm - 116 mm)]
EnergyGuard™ NH Tapered Polyiso Insulation	Slopes: 1/8:12 ,1/4:12 , 1/2:12
EnergyGuard™ NH Ultra Polyiso Insulation	0.5 in. - 4.6 in. (12.7 mm - 116 mm)
EnergyGuard™ NH Ultra Tapered Polyiso Insulation	Slopes: 1/8:12 ,1/4:12 , 1/2:12
[Other sizes available upon request]	

Cover Boards	
Product	**Thickness**
EnergyGuard™ HD Polyiso Insulation	1/2 in. (12.7 mm)
EnergyGuard™ NH HD Polyiso Insulation	1/2 in. (12.7 mm)
EnergyGuard™ HD PLUS Polyiso Insulation	1/2 in. (12.7 mm)
EnergyGuard™ NH HD PLUS Polyiso Insulation	1/2 in. (12.7 mm)
USG SECUROCK® Brand Gypsum-Fiber Roof Board	1/4 in. (6.35 mm), 3/8 in. (9.53 mm), 1/2 in. (12.7 mm), 5/8 in. (15.9 mm)
DensDeck® Prime Roof Board	1/4 in. (6.35 mm), 1/2 in. (12.7 mm), 5/8 in. (15.9 mm)
DEXcell Glass Mat Roof Board	1/4 in. (6.35 mm), 1/2 in. (12.7 mm), 5/8 in. (15.9 mm)
DEXcell FA Glass Mat Roof Board	1/4 in. (6.35 mm), 1/2 in. (12.7 mm), 5/8 in. (15.9 mm)
DEXcell FA VSH Glass Mat Roof Board	5/8 in. (15.9 mm)

Air/Vapor Retarders	
Product	**Roll Size**
GAF SA Vapor Retarder	502.5 gross sq. ft. (46.68 m^2)
GAF SA Vapor Retarder XL	603.8 gross sq. ft. (56.1 m^2)

Fire Barrier	
Product	**Size(s)**
GAF FireOut™ Fire Barrier Coating	5 gal (18.93 L) pail 55 gal (208 L) drum

Accessories	
Product	**Size(s)**
EverGuard® TPO Coated Metal	4 ft x 10 ft (1.21 m x 3.05 m)
EverGuard® TPO Cover Tape	6 in. (152 mm) or 10 in. (254) width
EverGuard® TPO Heat-Weldable Cover Tape	6 in. (152 mm) width
EverGuard® TPO Detailing Membrane	24 in. x 50 ft. (610 mm x 15.24 m)
EverGuard® TPO Flashing Membrane	8 in. (203 mm) width
EverGuard® TPO Pourable Sealer Pocket	12 in. x 15 ¼ in. x 4 in. (305 mm x 387 mm x 102 mm)
EverGuard® TPO RTA Strip	6 in. (152 mm) width
EverGuard® TPO Split Pipe Boot	1 in. x 2 in. (25.4 mm x 51 mm) 3 in. x 5 in. (76 mm x 127 mm) 6 in. x 8 in. (152 mm x 203 mm)
EverGuard® TPO Square Tube Wrap	4 in. x 4 in. (102 mm x 102 mm) 4 in. x 6 in. (102 mm x 152 mm) 6 in. x 6 in. (152 mm x 152 mm)
EverGuard® TPO Corner Curb Wrap	Height: 12 in. Flange: 6 in. Lengths: 13.5 in. (343 mm), 19.5 in. (495 mm), 25.5 in. (648 mm), 31.5 in. (800 mm)
EverGuard® TPO Scupper	4 in. x 6 in. x 12 in. (102 mm x 152 mm x 305 mm) 8 in. x 10 in. x 12 in. (203 mm x 254 mm x 305 mm)
EverGuard® TPO Fluted Corner	8 in. (203 mm) diameter
EverGuard® TPO Universal Corner	3 in. x 3 in. (76 mm x 76 mm) with 6 in. (152 mm) flange
EverGuard® TPO Vent Boot	1 in. - 6 in. (25.4 mm - 152 mm) diameter
EverGuard® TPO Vent	8 in. (203 mm)
EverGuard® TPO T-Top Vent	4 in. (102 mm) or 6 in. (152 mm)
EverGuard® TPO Walkway Roll	34.25 in. x 50 in. (870 mm x 15.2 m)

Fasteners	
Product	**Size(s)**
Drill-Tec™ #12 Fastener	1 ⅝ in. (41.3 mm), 2 ¼ in. (57.1 mm), 3 in. (76 mm), 4 in. (102 mm), 5 in. (127 mm), 6 in. (152 mm), 7 in. (178 mm), 8 in. (203 mm)
Drill-Tec™ #14 Fastener	1 ¼ in. (32 mm), 1 ¾ in. in. (45 mm), 2 in. (51 mm), 3 in. (76 mm), 4 in. (102 mm), 5 in. (127 mm), 6 in. (152 mm), 7 in. (178 mm), 8 in. (203 mm), 9 in. (227 mm), 10 in. (254 mm), 11 in. (279 mm), 12 in. (305 mm), 14 in. (357 mm), 16 in. (406 mm), 18 in. (457 mm), 20 in. (508 mm), 22 in. (559 mm), 24 in. (609 mm)
Drill-Tec™ #14 HD Fastener	1 ¼ in. (32 mm), & 1 ¾ in. in. (45 mm), 2 in. (51 mm), to 12 in. (305 mm), [at 1” increments] 14 in. (357 mm), to 24 in. (609 mm) [at 2” increments]
Drill-Tec™ XHD #15 Fastener	2 in. (51 mm), 3 in. (76 mm), 4 in. (102 mm), 5 in. (127 mm), 6 in. (152 mm), 7 in. (178 mm), 8 in. (203 mm), 9 in. (227 mm), 10 in. (254 mm), 11 in. (279 mm), 12 in. (305 mm), 14 in. (357 mm), 16 in. (406 mm), 18 in. (457 mm), 20 in. (508 mm), 22 in. (559 mm)
Drill-Tec™ CD-10 Fastener	2 in. (51 mm), 2 ½ in. (64 mm), 3 in. (76 mm), 3 ½ in. (89 mm), 4 in. (102 mm), 4 ½ in. (114 mm), 5 in. (127 mm), 5 ½ in. (140 mm), 6 in. (152 mm), 7 in. (178 mm), 8 in. (203 mm), 9 in. (227 mm), 10 in. (254 mm), 11 in. (279 mm), 12 in. (305 mm)
Drill-Tec™ Polymer GypTec® Fastener	Range from 2 ½ in. (64 mm) to 12 in. (305 mm) [with ½” increments]
Drill-Tec™ LD (Lite Deck) Fastener	2 ⅝ in. (66.7 mm), 3 in. (76 mm), 4 in. (102 mm), 5 in. (127 mm), 6 in. (152 mm), 7 in. (178 mm), 8 in. (203 mm), 9 in. (227 mm), 10 in. (254 mm), 12 in. (305 mm)

Plates		
Product	**Size**	**Usage**
Drill-Tec™ Steel Wall Plate	2 in. (51 mm) Galvalume® steel plate	For membrane attachment to base/wall, around penetrations, and angle changes
Drill-Tec™ Barbed XHD Plate	2 ⅜ in. (60.3 mm) Galvalume® steel plate	For membrane attachment to substrate
Drill-Tec™ Barbed SXHD Plate	2 ¾ in. (69.9 mm) Galvalume® steel plate	For membrane attachment to substrate
Drill-Tec™ Double-Barbed XHD Plate	2 in. (51 mm) Galvalume® steel plate	For membrane attachment to substrate
Drill-Tec™ DF Steel Insulation Plate	3 in. (76 mm) Galvalume® steel plate	For membrane attachment to substrate
Drill-Tec™ DF Barbed Seam Plate	2 ⅜ in. (60.3 mm) Galvalume® steel plate ue	For insulation attachment to substrate

Plates		
Product	**Size**	**Usage**
Drill-Tec™ GypTec® Plate	2 in. (51 mm) Galvalume® steel plate	For attachment to gypsum and Tectum decks
Drill-Tec™ LD (Lite Deck) Plate	3 in. (76 mm) Galvalume® steel plate	For insulation attachment to gypsum, Tectum, and lightweight concrete decks
Drill-Tec™ Barbed Seam Plate	2.4 in. (60.3 mm) Galvalume® steel plate	For membrane attachment to substrate
Drill-Tec™ Scoop Seam Plate	2.4 in. (60.3 mm) Galvalume® steel plate	For membrane attachment to substrate
Drill-Tec™ Flat Steel Plate	3 in. (76 mm) Galvalume® steel plate	For insulation attachment to the substrate
Drill-Tec™ Recessed Steel Plate	3 in. (76 mm) Galvalume® steel plate	For insulation attachment to the substrate
Drill-Tec™ Ribbed Steel Plate	3 in. (76 mm) Galvalume® steel plate	For insulation attachment to the substrate
Drill-Tec™ Plastic Locking Plate	3 in. (76 mm) plastic plate	For insulation attachment to substrate

Primers & Cleaners	
Product	**Description**
EverGuard® Low VOC TPO Primer	Low VOC solvent based primer
EverGuard® TPO Primer	Solvent based primer
EverGuard® TPO Seam Cleaner	Solvent based seam cleaner
EverGuard® TPO CleanWeld Conditioner	Low VOC solvent based cleaner

Sealant	
Product	**Description**
EverGuard® One-Part Pourable Sealant (urethane based)	One-part moisture cure, self-leveling
FlexSeal™ Caulk Grade Sealant	Solvent based, trowel grade synthetic elastomeric sealant
EverGuard® Water-Block	One part butyl based high viscosity sealant
EverGuard® TPO Cut Edge Sealant	Solvent based sealant

EverGuard® Membrane Adhesive Coverage Rates Table[3]					
Adhesive Type[1]	**Container**	**Minimum Application Temperature**	**Application[2]**	**Installed Coverage Per Container**	**Installed Membrane Per Gallon (Liter/ Canister)**
EverGuard® 1121 TPO Bonding Adhesive	5 Gallon (55.74 L) Pail	40°F (4.4°C)	For smooth membrane - Apply adhesive equally to both the substrate and underside of membrane	300 sq. ft. (27.87 sq. m)	50-70 sq. ft. (1.23 - 1.75 sq. m)
EverGuard® Low VOC TPO Bonding Adhesive	5 Gallon (55.74 L) Pail	40°F (4.4°C)	For smooth membrane - Apply adhesive equally to both the substrate and underside of membrane	600 sq. ft. (55.74 sq. m)	100-120 sq. ft. (2.45 – 2.94 sq. m)
EverGuard® TPO 3 Square Low VOC Bonding Adhesive	5 Gallon (55.74 L) Pail	40°F (4.4°C)	For smooth membrane - Apply adhesive equally to both the substrate and underside of membrane	300 sq. ft. (27.87 sq. m)	50-70 sq. ft. (1.23 - 1.75 sq. m)
EverGuard® WB 181 Bonding Adhesive	5 Gallon (55.74 L) Pail	40°F (4.4°C)	For smooth membrane - Apply adhesive equally to both the substrate and underside of membrane	600 sq. ft. (55.74 sq. m)	100-120 sq. ft. (2.45 – 2.94 sq. m)
	5 Gallon (55.74 L) Pail	40°F (4.4°C)	For fleece-back membrane - Apply to the roof substrate surface ONLY	600 sq. ft. (55.74 sq. m)	100-120 sq. ft. (2.45 – 2.94 sq. m)
EverGuard® TPO Quick Spray Adhesive (includes LV50)	Canister	20º F (-6.7º C)	For smooth membrane - Apply adhesive equally to both the substrate and the underside of the membrane	600 sq. ft. (55.74 sq. m)	1,000 sq. ft. per canister (93 sq. m)

[1] It is critical that the proper adhesive be used with each membrane type to prevent failure. Substitution of adhesives for different products and use of non-GAF branded adhesives is discouraged. Performance/adhesion failures due to adhesive substitutions will not be covered by GAF warranties and guarantees.

[2] Refer to the specific adhesive product label for detailed application rates and instructions or contact GAF at 877-423-7663.

Note:*This Table is not a substitute for adhesion testing and verification that the adhesive selected is appropriate for the substrate being used.*

Low-Rise Foam Insulation Adhesive Coverage Rates Table					
Adhesive Type[1]	**Container**	**Minimum Application Temperature**	**Application**	**Application Type[3] and Rate[5]**	**Installed Coverage Per Container[2]**
OlyBond500® Equipment-Free Canister	Canister	40°F (4.4°C)	Insulation/Cover board - Apply to the board or roof substrate	.75 in.-1 in. (19-25 mm) foam bead - 12 in. (305 mm) o.c. spacing	3500 sq. ft. (35 sqs)
OlyBond500® Insulation Adhesive	Cartridge	40°F (4.4°C)	Insulation/Cover board - Apply to the board or roof substrate	.75 in.-1 in. (19-25 mm) wet bead - 12 in. (305 mm) o.c. spacing	400-600 sq. ft. (4-6 sqs)
	Bag-In-A-Box	40°F (4.4°C)	Insulation/Cover board - Apply to the board or roof substrate	.75 in.-1 in. (19-25 mm) wet bead - 12 in. (305 mm) o.c. spacing	1700-2000 sq. ft. (17-20 sqs)
	15 Gallon (56.78 L) Drum	40°F (4.4°C)	Insulation/Cover board - Apply to the board or roof substrate	.75 in.-1 in. (19-25 mm) wet bead - 12 in. (305 mm) o.c. spacing	6,000 - 7,000 sq. ft. (60-70 sqs)
LRF M Adhesive	Cartridge	40°F (4.4°C)	Insulation/Cover board - Apply to the board or roof substrate	1 in. (25 mm) wet bead - 12 in. (305 mm) o.c. spacing	400-600 sq. ft. (4-6 sqs)
	Bag-In-A-Box	40°F (4.4°C)	Insulation/Cover board - Apply to the board or roof substrate	1 in. (25 mm) wet bead - 12 in. (305 mm) o.c. spacing	1800-2000 sq. ft. (18-20 sqs)
	15 Gallon (56.78 L) Drum	40°F (4.4°C)	Insulation/Cover board - Apply to the board or roof substrate	1 in. (25 mm) wet bead - 12 in. (305 mm) o.c. spacing	6,000 - 7,000 sq. ft. (60-70 sqs)
LRF M Adhesive Low Temp[4]	Cartridge	25º F (-3.8º C)	Insulation/Cover board - Apply to the board or roof substrate	1 in. (25 mm) wet bead - 12 in. (305 mm) o.c. spacing	400-600 sq. ft. (4-6 sqs)

[1] Substitution of adhesives for different products and use of non-GAF branded adhesives is discouraged. Performance/adhesion failures due to adhesive substitutions will not be covered by GAF warranties and guarantees.
[2] Coverage may vary depending on the porosity of the roof substrate surface or if spacing is reduced.
[3] Refer to the Low-Rise Foam Perimeter Securement Table within this Manual for further perimeter bead spacing requirements.
[4] TPO LRF Adhesive M Low Temp cannot be used for adhering fleece-back PVC membranes.
[5] Application spacing may be less for specific uplift resistance performance. Refer to listed system requirements from the applicable testing agency.

APPLICATION GUIDELINES

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. Dispose of used or expired adhesives, sealants, and other products in accordance with applicable federal, state and local regulations.
C. Resolve any potential application issues, as well as any conditions that may be detrimental to installation and performance of the roof system, 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 a GAF representative.
D. The following are common items of discussion at a pre-job conference:
    a. Roof deck conditions.
    b. Flashing and expansion joint details.
    c. Insurance underwriters or building code requirements.
    d. Unusual project conditions.
    e. Protection of the roof, building, building occupants, and contents during and after application.
    f. Application techniques.
    g. Coordination and scheduling of other trades that will be working on the project.
    h. 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.
    i. Scheduling of material shipments, material storage, and rooftop loading.
    j. Submittals of materials, drawings, and project documents.

Delivery, Storage, and Protection

A. Products are to be delivered to sites in original containers with seals unbroken and labeled with manufacturers' product brand names.
B. Store materials in a weather-protected environment, clear of the ground and moisture.
C. Protect all adhesives, coatings, and sealants/caulks from freezing. Frozen material must be discarded and replaced. After use, properly seal all liquid material containers.
D. Storage of roofing materials.
    a. All material must be raised above ground or stored on pallets at roof level and covered with a tarpaulin or other waterproof and in.breathable in. material.
    b. Insulation products should be properly stored and secured to avoid weather and wind damage.
    c. Insulation factory-installed plastic shipping shrouds and are not designed for rooftop storage. Use in.breathable in. type covers, such as waterproof tarpaulins, to protect from weather and moisture. To reduce the possibility of condensation during job site storage, remove the plastic shipping shroud or cut the plastic shroud to allow for venting.
    d. Do not remove any protective tarpaulins until immediately before material will be installed. Extreme heat or cold conditions may require special storage requirements.
    e. Cover and protect materials at the end of each day's work.
    f. Do not expose release film on EverGuard® SA TPO Membrane to long periods of direct sunlight.
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.

Environmental Requirements & Restrictions

A. Do not apply roofing materials during inclement or threatening weather.
B. Be aware that high or gusting winds make the installation of some materials more difficult.
C. 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.
CAUTION: Various system components will have different application temperature ranges. Refer to Adhesive Charts and membrane section below for specific ranges

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 **Safety Considerations and Warnings** section 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 protection such as 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).

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

APPLICATION / INSTALLATION

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.
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.
E. Refer to GAF Roof Guarantee Program on page 5for specific requirements for extended-length guarantees.

Preparation of Roofing Substrate

F. 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.
G. Deck preparation is the sole responsibility of the building owner or roofing contractor. All defects in the roof deck or substrate must be corrected by the responsible parties before new roofing work commences.
H. Verify that the deck surface is dry, sound, clean and smooth, free of depressions, waves, or projections.
I. For tear-offs, remove all existing roofing materials to the roof decking, including flashings, metal edgings, drain leads, pipe boots, and pitch pockets, and clean substrate surfaces of all asphalt and adhesive contaminants.
J. Confirm quality and condition of roof decking by visual inspection and by fastener pull-out testing by an individual trained by the roof fastener manufacturer. GAF recommends these test results to be kept on file as part of the acceptability of the substrate surface for a EverGuard® Diamond Pledge™ NDL Roof Guarantee. Although submission of results to GAF is not required in all circumstances, GAF reserves the right to request a copy of the results at its discretion. See Appendix A
K. Secure all loose decking. Remove and replace all deteriorated decking.
L. Remove abandoned equipment and equipment supports.
M. Confirm that height of equipment supports will allow the installation of minimum 8 in. (203 mm) flashing heights.
N. Refer to the Air/Vapor Retarder section on page 25 for air/vapor retarder requirements.

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.
B. Clean substrate surfaces of all asphalt and adhesive contaminants, which may compromise the installation of the new roof assembly.
C. Remove abandoned equipment and equipment supports.
D. Confirm that the height of equipment supports will allow the installation of full-height flashings.
E. EverGuard® SA TPO Membrane is not compatible with asphalt-based products. In addition, EverGuard® SA TPO Membrane must be divorced from all asphalt-based flashings.

Preparation of Roofing Area – Re-Cover Applications

A. Remove all surfacing and debris from the roof surface.
B. Remove blisters and ridges from the roof membrane.
C. When re-covering over an existing single-ply roof, that roof must be first cut into maximum 10’ x 10’ (3 m x 3 m) areas first, before the application of the new slip sheet and/or membrane.
    a. Installation over an existing mechanically attached membrane is only acceptable if all existing fasteners are flush and do not cause ridging/tenting at the existing membrane.
D. Remove all existing flashings, including metal edgings, drain leads, pipe boots, and pitch pockets, and clean substrate surfaces of all asphalt and adhesive contaminants.
E. The existing roof surface must be free of visible moisture, such as ponding water, ice, or snow.
F. 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.
G. Confirm quality and condition of roof decking by visual inspection if possible, and by fastener pull-out testing. Remove and replace all deteriorated decking.
H. Test cuts
    a. Take test cuts to verify the existing roof construction and condition. Generally three test cuts should be made for roofs under 100 squares (929 m^2) and one test cut per 100 squares (929 m^2) above the minimum amount.
    b. Test cuts must be representative of the roofing system(s).
I. Remove abandoned equipment and equipment supports.
J. Raise equipment supports to allow the installation of minimum 8 in. (203 mm) flashing heights.
K. Re-cover installations over coal tar pitch roofs are not recommended. However, if the designer of record chooses to re-cover over an existing coal tar pitch roof, GAF requires the following:
    a. Existing loose gravel must be broomed or vacuumed (do not spud).
    b. If high spots remain, a thicker insulation board must be used to provide a smooth substrate for the EverGuard® SA TPO Self Adhered Membrane.
    c. A minimum 1 in. (25 mm) re-cover board is required for TPO applications.
    d. Do not use EPS or XPS re-cover boards over coal tar pitch roofs.
L. Surface preparation over Coal Tar Pitch (CTP)
    a. CTP must be cleaned mechanically (not by hand) with vacuuming, or power brooming equipment.
    b. When using LRF Adhesive M or OlyBond500®, an adhesion test must be completed.
M. Surface preparation over smooth-surface BUR
    a. All asphaltic surfaces must be clean, dry, and primed with Matrix™ 307 Premium Asphalt Primer when insulation is being installed in hot asphalt.

Wood Nailer Installation

A. General
    a. GAF requires that 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.
    b. GAF does not warrant or guarantee the attachment of the wood nailers, nor the performance of the wood nailers or any leaks that may be caused by wood nailer installation.
    c. Use untreated wood blocking and nailers in all GAF roof systems unless required otherwise by code or insurance carrier.
    d. If pressure treated wood is required, use fasteners and separators as recommended by the specifier, code official, or insurance carrier.
    e. GAF does not recommend the use of ACQ or CA treated lumber and assumes no responsibility for corrosion problems resulting from such use.

Gypsum Fire Barrier Board Installation

A. General

a. Gypsum fire barrier boards must typically be installed when required by the design professional or code authority to address code or approval requirements. For EverGuard® SA TPO Self Adhered Membrane Roofing Systems, SECUROCK® Gypsum-Fiber Roof Board, DensDeck® Prime Roof Boards or DEXcell boards must be used.

B. Placement
   a. Butt gypsum boards together with a 1/4 in. (6.3 mm) maximum space between adjoining boards. Fit gypsum boards around penetrations and perimeter with a 1/4 in. (6.3 mm) maximum space between board and penetration.
   b. Install gypsum 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.
   c. Gypsum boards installed over steel decking must have boards placed parallel to deck flutes with edges over the flute surface for bearing support.
   d. 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.
   e. Remove and replace gypsum boards that become wet or damaged prior to the installation of the TPO membrane..
   f. Install no more gypsum board than can be properly covered with roofing membrane by the end of each day.
C. Securement
   a. Refer to Insulation & Re-cover Board Installation on page 27 for gypsum board securement options

Air/Vapor Retarder Installation

A. General
   a. Air/Vapor retarder components must typically be installed when required by the design professional to address internal building air pressure or humidity conditions.
B. Air/Vapor Retarder Application – Loose-Applied
   a. Install the air/vapor retarder components loose-applied to the deck or fire-barrier board so that wrinkles and buckles are not formed.
   b. Overlap air/vapor retarder components per applicable installation recommendations of the manufacturer. If minimum 6 mil polyethylene is used, overlap a minimum of 6 in. (152 mm).
   c. Seal perimeter and penetration areas with foam sealant.
   d. Seal all perimeter nailers with adhered roof membrane placed over the nailer and covering the exterior face of the nailer by 1 in. (25 mm).
   e. Install insulation boards over the air/vapor retarder and mechanically attach the boards to the deck.
C. Air/Vapor Retarder Application – Adhered
   a. Apply compatible adhesive to the structural deck or fire barrier board per air/vapor retarder manufacturers' recommendations.
   b. Install the air/vapor retarder components loose applied 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.
   c. Overlap air/vapor retarder components a minimum of 6 in. (152 mm) for side and end laps. Adhere laps together with compatible adhesive.
   d. Seal perimeter and penetration areas with foam sealant.
   e. 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.
D. Application – Self Adhered
   a. GAF SA Vapor Retarder and SA Primer can be applied at temperatures as low as 25°F (-3.9°C) with rising temperatures as long as it has been stored in a heated area to ensure that the GAF SA

Vapor Retarder and GAF SA Primer is between 50°F - 90°F (10°C – 32.2°C) at time of installation.

b. GAF SA Primer is not required for metal decks. Metal decks must be clean, dry, and free from oil or other contaminants that can interfere with adhesion of the GAF SA Vapor Retarder. Other acceptable substrates (plywood, gypsum, or concrete) must be primed prior to application.
c. GAF SA Primer must be mixed thoroughly prior to application.
    i. Apply when surface temperature is between 32°F - 110° F (0°C - 43.3°C).
    ii. Apply GAF SA Primer using brush, roller, or sprayer at approximately 100 - 142 sq. ft. per gallon (2.4 - 3.4 m^2 /L).
d. Roll out the GAF SA Vapor Retarder over clean, dry deck and allow to relax. For metal decks, the width of the membrane is designed for proper alignment of the long edge with the flutes as it is installed over the roof deck
e. Once the membrane is in place, while holding the membrane tight, peel off the silicone release film by pulling diagonally from the underside of the sheet.
f. Install subsequent rolls of membrane in the same way, taking care to overlap the longitudinal side laps a minimum of 3 in. (76 mm) and end laps a minimum of 6 in. (152 mm).
g. For metal decks, install a 6 in. x 42 in. (152 mm x 1.07m) metal plate at the end of the roll to support the membrane end lap between the metal flutes, ensuring a complete end lap seal. Overlap end laps a minimum of 6 in. (152 mm).
h. Once installed, pressure must be applied over the whole surface using a weighted roller to ensure adequate adhesion to the substrate.
i. Seal perimeter and penetration areas with closed-cell foam sealant.The GAF SA Vapor Retarder must be tied into the building's air/vapor retarder system as appropriate with compatible SBS asphaltic materials.
j. All T-joints and 90 degree transitions must be sealed with Matrix™ 201 SBS Flashing Cement. If fishmouths or other openings are created at overlap, they must be repaired and sealed with Matrix™ 201 SBS Flashing Cement. All wet and damaged materials or leaks through the GAF SA Vapor Retarder must be repaired before installing the finished roof.

Insulation & Re-cover Board Installation

A. General
    a. Cover/Re-cover boards of the following types listed below are acceptable for use in roofing systems guaranteed by GAF. Board size can be 4' x 4' or 4' x 8' (1.21 m x 1.21 m or 1.21 m x 2.4 m) panels for mechanical attachment and 4' x 4' or 4' x 8' (1.21 m x 1.21 m or 1.21 m x 2.4 m) for adhered attachment and tapered systems, except for fanfold re-cover board, which comes in 2' (610 mm) x 4' (1.21 m) sections with a 50' (15.2 m) total length.
    b. Install insulation board and re-cover board as required in accordance with the Insulation Design Tables in this Manual.
    c. The use of an overlay board is required for all membrane applications adhered in hot asphalt over polystyrene insulations. The overlay board must either have all joints taped prior to installation of the roofing membrane, or a layer of red rosin sheathing paper must be installed between the insulation and the coverboard. Roof tape, if required over insulation joints, shall be laid evenly, smoothly, and embedded in a uniform coating of hot steep asphalt with 4 in. (102 mm) end laps. Care must be taken to ensure smooth application of tape, and full embedment of the tape in the asphalt.
        i. Application of the asphalt and tape may be made by either "back mopping". the tape and pressing the tape into place, or by using a taping machine (small felt layer), which will apply asphalt to the tape in a continuous operation.
B. Placement
    a. Butt insulation boards together with a ¼ in. (6.3 mm) maximum space between adjoining boards. Fit insulation boards around penetrations and perimeter with a ¼ in. (6.3 mm) size maximum space

between board and penetration. Do not kick insulation boards into place.

b. 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.
c. Insulation boards installed in multiple layers must have the joints between boards staggered in all directions a minimum of 6 in. (152 mm) between layers.
d. Insulation boards installed over steel decking must have boards placed to parallel deck flutes with edges over flute surface for bearing support.
e. Install tapered insulation to provide a sump area with a minimum area of 36 in. x 36 in. (914 mm x 914 mm) where applicable.
f. 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.
g. Remove and replace insulation boards that become wet or damaged after installation.
h. Install no more insulation than can be properly covered with roofing membrane by the end of each day.
i. EPS, XPS or polyiso insulation may be used to fill in flutes of steel decking when used in conjunction with a cover board.

C. Securement

a. Mechanical Attachment
    i. Use appropriate number, type, and length of Drill-Tec™ fasteners for structural deck type. See Insulation Attachment Tables within this Manual.
    ii. Drill-Tec™“flat” plates (without the countersunk fastener holes protruding from the bottom of the plates) are required when plates are installed over hard surfaces such as EnergyGuard™ HD Polyiso Insulation(s), DensDeck®, SECUROCK® or other hard cover boards to allow the plates to rest flush on the surface.
    iii. Pre-drilling is required for concrete decks, and may be required for gypsum concrete and cementitious wood fiber decks.
    iv. Install fastener so as to firmly fix the plate to the insulation surface without over-driving.
    v. Additional fasteners must be installed in corner/perimeter roof areas for all EverGuard® systems. Refer to the Perimeter Securement Table on page 13 within this Manual to determine the width of the perimeter area.
b. Low-Rise Foam Adhesive
    i. For 4’ x 4’ (1.2 m x 1.2 m) polyisocyanurate board
        1. Ribbon-adhere insulation with GAF low-rise foam adhesive in ribbons spaced 12 in. (305 mm) o.c. maximum for the field of the roof, and 6 in. (152 mm) o.c. maximum for perimeters and corners. To determine the width of the perimeter, refer to the Perimeter Securement Table on page 13.
    ii. For 4’ x 8’ (1.2 m x 2.4 m) polyisocyanurate board
        1. Ribbon-adhere insulation with GAF low-rise foam adhesive in ribbons spaced 6 in. (152 mm) o.c. maximum for the field of the roof, and 6 in. (152 mm) o.c. maximum for perimeters and corners. To determine the width of the perimeter, refer to the Perimeter Securement Table on page 13.

        NOTE: 4’ x 8’ (1.2 m x 2.4 m) insulation boards do not qualify for enhanced wind coverage.

        NOTE: 4’ x 8’ (1.2 m x 2.4 m) insulation boards are not approved for use with any roofing system that requires the support of 3rd party testing (e.g. FM.).
    iii. For bead width requirements, installation temperatures and further details, refer to GAF’s Low-Rise Foam (LRF) Insulation Adhesive Coverage Rate Table on page 20.

iv. Walk in the insulation boards after installation to ensure complete adhesion. Once the board is set in place, apply adequate weight to the boards until the adhesive is cured to ensure proper securement of the insulation to the substrate.

c. Crickets and Saddles
   i. When installing crickets, saddles, or cut tapered insulation panels, it may be advantageous to use an approved low rise foam adhesive in lieu of mechanical attachment. See Insulation & Re-cover Board Installation Section C Foam Adhesive for more information.

EverGuard® SA TPO Self Adhered Membrane Installation

A. General
   a. EverGuard® SA TPO Self Adhered Membrane can be installed down to an ambient air temperature of 20 degrees and rising.
      Note: Reference the Adhesives Charts (list chart names) within the manual for minimum temperature requirements.

B. Membrane Placement for Hot-Air Welding of Seams
   a. Starting at the low point of the roof, roll out and position the EverGuard® SA TPO Self Adhered 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.
   b. Position the first sheet for either a parapet wall or metal edge condition.
   c. Best practice is to install the EverGuard® SA TPO Self Adhered Membrane so that the side laps run across the roof slope lapped toward drainage points.
   d. Unroll the EverGuard® SA TPO Self Adhered Membrane roll and fold the membrane in half longitudinally, exposing the split in the release liner.
   e. Peel the upper half of the release liner from the adhesive film back of the EverGuard® SA TPO Self Adhered Membrane and lay to the side of the panel. Do not cut the release liner.
   f. Roll the EverGuard® SA TPO Self Adhered 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.
   g. Apply pressure to the EverGuard® SA TPO Self Adhered Membrane using a weighted roller. Roll the remaining installed 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.
   h. Install the other side of the sheet by folding the EverGuard® SA TPO Self Adhered 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.
   i. Apply pressure to the membrane using a lawn roller as specified above. Roll the remaining installed EverGuard® SA TPO Self Adhered 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.
   j. Position the next sheet to overlap the installed first course EverGuard® SA TPO Self Adhered Membrane a minimum of 3 in. (76 mm) while ensuring the laps are installed shingle-fashion to prevent backwater laps.

C. EverGuard® SA TPO Self Adhered Membrane Surface Preparation for Seaming
   a. Proper preparation of the area to be heat-welded is critical to forming a good, long-lasting seam. Heat-welding uses the thermoplastic nature of the material to melt two pieces of material together, fusing it into a single piece. In order to properly fuse these two discrete pieces together, the materials must be clean and dry; if not clean and dry, contaminants will interfere with the weld and, generally, the result is a poor or false weld.

b. Satisfactory heat welding requires that the membrane be clean of dirt and contaminants, and free from dew, rain, and other sources of moisture.
c. Factory-fresh membrane typically will not require cleaning prior to welding, provided that welding is performed immediately after placement of the membrane. Mem- brane that has been exposed for a longer period of time will require additional cleaning methods, depending on the type of contamination present.
    i. Any material rolled out and put into place needs to be welded the same day, including welding of any detail work.
    ii. Membrane that has been exposed overnight or for more than 12 hours or has otherwise become contaminated, will require cleaning.

D. Seam Cleaning
a. **Light Contamination:** Membrane that has been exposed for a few days or less to air-borne debris, foot traffic, or dew or light precipitation can usually be cleaned with a cloth moistened with EverGuard® TPO Seam Cleaner or EverGuard® CleanWeld™ Conditioner (low VOC) for TPO membranes. Be sure to wait for cleaner to dry/flash-off prior to welding.
b. **Dirt-Encrusted 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. Rinse area thoroughly with clean water and allow to dry. This must be followed by cleaning with a cloth moistened with EverGuard® TPO Seam Cleaner or EverGuard® CleanWeld™ Conditioner (low VOC) for TPO. Be sure to wait for cleaner to dry/flash-off prior to welding.
c. **Weather or Oxidized Contamination**: Membrane that is weathered/oxidized will require the use of a low-residue cleaner such as Formula 409® and a mildly abrasive scrubbing pad to remove the weathered/oxidized top surface layer.This must be followed by cleaning with a cloth moistened with EverGuard® TPO Seam Cleaner or EverGuard® CleanWeld™ Conditioner (low VOC) for TPO. Be sure to wait for cleaner to dry/flash-off prior to welding.
d. **Chemical Based Contamination:** Membrane that is contaminated with bonding adhesive, asphalt, flashing cement, grease and oil, and most other contaminants usually cannot be cleaned sufficiently to allow an adequate heat weld to the membrane surface. Removal and replacement of the membrane is required in these situations.

E. Heat Welding Equipment
a. Successful hot air welding requires the use of specialized, properly maintained and adjusted equipment operated by experienced personnel familiar with hot air welding techniques. Achieving consistent welds is a function of ensuring that the roofing membrane surface is clean and prepared for heat welding, conducting test welds to determine proper equipment settings, and evaluating weld quality after welding has been completed.
b. Welding equipment consists of three main components: power supply, hot air welder (either automatic or hand-held), and extension cords.The newest automatic welding equipment provides improved control of speed, temperature, pressure, and membrane.The use of the latest model of automatic welder is highly recommended. Older models may not achieve consistent welds. Follow the equipment manufacturer's recommendations regarding correct equipment operation and adjustment.
    i. Current generation automatic hot-air welder (recommended)
        1. Minimum Power Supply: 220 volts, 30 amps, 10,000 watt continuous
    ii. Current generation hand-held hot-air welder (recommended)
        1. Minimum Power Supply: 110 volts, 15 amps, 2500 watt continuous
c. Commercial Grade 10,000-watt voltage-controlled generator (minimum)
    i. THD (Total Harmonic Distortion) rating should be six (6) or less for quality welds
    ii. 240v & 120v Outlets
    iii. GFCI Line Cords
    iv. Volt Meters

d. Extension Cords
    i. Automatic Welders - #10 wire with a standard plug configuration. Maximum 100’ (30.5 m) in length.
    ii. Hand-Held Welders - #12 wire with a standard plug configuration. Maximum 100’ (30.5 m) in length.
    iii. For longer lengths, consult an electrician for line voltage drop. Heavier-gauge extension cords are likely to be required.

e. Stable power supply, adequate wattage and consistent voltage is critical to obtaining consistent hot air welds and to prevent damage to the welder. The use of a contractor-supplied portable generator is recommended. House-supplied power is acceptable for hand welders only. Do not connect to a power source that is:
    1. Used for other equipment that cycles on and off.
    2. Is subject to momentary disruptions or power surges.
    3. Incapable of providing sufficient power.
        a. THD (Total Harmonic Distortion)greater than six (6) may lead to fluctuations which may impact welding.

    ii. Silicone Hand Roller (used in conjunction with hand-held welders)
        1. Ensure that the roller is in good condition. Rollers with rounded edges should be replaced.

Note: Outdated welding equipment and inadequate or fluctuating electrical power are the most common causes of poor seam welds.

F. Equipment Settings

a. Setting up the hot air robotic welder properly is key to having a properly installed roof and performing test welds is one of the most important steps to ensure that you are obtaining a properly welded roof. Making appropriate adjustments before you begin the final welding process assures that the correct combinations are achieved.

b. Test welds should be performed at the beginning of every work period.
    i. Just before welding in the morning,
    ii. Upon returning from lunch in the afternoon, and
    iii. When there’s been a significant change in weather (e.g., air temperature, wind speed, cloud cover, etc.).

c. 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. This is called a film tearing bond. in. A deficient weld fails by separating between the two layers of the membrane.

d. 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. For initial automatic air welder settings, use the formula below:
    i. Speed Formula: Start at (ambient temp/10) + 2 = FPM (Feet Per Minute)
    ii. Example: 70/10 + 2 = 9 FPM

Note: This formula serves as an initial starting point. Adjustments may need to be made accordingly from there. New equipment may run faster and hotter. Remember, settings required for a good weld will change based on equipment type, weather conditions and membrane thickness.

Cautions and Warnings

a. Any attempt to run a robotic welder at a speed greater than 16' (5 m) per minute may result in defective seam welds.
b. 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.
c. Robotic welders running too fast may not allow the operator to monitor the 1.5 in. (38 mm) minimum weld and ensure that critical T-joint areas have been correctly creased.
d. The operator must keep in mind the relationship between ambient temperature and robotic welding speed in order to achieve an acceptable weld.
e. Increasing the speed of the robotic welder can also compromise the appearance of a non-bonded system.

G. Adjoining the Butt-Ends with Hot Air-Welding of Seams
a. Install the new sheet tightly against the previously installed sheet.
b. For non-selvage butt-end seaming of EverGuard® SA TPO Self Adhered Membrane, position an 8 in. (203 mm) EverGuard® TPO Flashing Strip evenly over the seam extending at least 2 in. (52 mm) onto the adjacent sheets.
c. Using a hand-held heat gun and silicone roller, weld the 8 in. (203 mm) EverGuard® TPO Flashing Strip into place using the two-pass welding method.
d. Finish the detail by applying EverGuard® TPO Cut Edge Sealant to all edges to complete the detail.

H. Test Welds
a. Take 2 pieces of “bag fresh” EverGuard® SA TPO Self Adhered Membrane approximately 18 in. (457 mm) along the selvage edge.
b. Set your automatic welder’s speed and heat. For full size welders, such as the BAK LarOn, GAF suggests starting at the following settings:
i. Temperature between 600˚F (315˚C) and 1,148˚F (620˚C). Speed 10-16 feet (3.05-4.88 m) per minute. New equipment may run faster and hotter.
ii. For an initial setting, use the formula below as a general guideline:

Speed Formula: Start at (ambient temp/10) + 2 = FPM (Feet Per Minute)
Example Scenario: Start out by setting the speed at 10 FPM and the temperature at 600°F (315˚C) and do a test weld. Bump temperature up 100°F (38˚C) to 700°F (371˚C) keeping
same 10 FPM. Perform another test weld. Continue doing this in 100°F (38˚C) increments keeping speed the same until machine is maxed out [typically 1,148˚F (620˚C)] and find the
weld window. Set up the machine in the middle of the weld window.

Note: Remember, settings required for a good weld will change based on equipment type, weather conditions and membrane thickness.

c. Weld the 18 in. (457 mm) pieces together and then allow the membrane to cool for at least 10 minutes. Cut 1 in. (25 mm) wide strips across the welded material.The welds are tested by application of stress causing the seam to peel apart.
d. An acceptable weld will fail by exposing the scrim reinforcement.This is called a film tearing bond or FTB in.. The film tearing bond will be between 1 in. (25 mm) and 1.5 in. (38 mm) wide.
e. A partial weld will fail by partially separating between the two layers of the membrane.
f. An unacceptable weld will fail by separating between the two layers of the membrane.This is also known as a cold weld or false weld.
g. During cooler temperatures, it is even more critical to perform test welds in the morning, after any extended break such as lunch, or after significant change in weather (e.g., air temperature, wind speed, cloud cover, etc.).
h. Hand welding during colder temperatures also needs to be adjusted.
i. Perform test welds on the membrane you will be using that day.
ii. Do not use scrap material to create test welds.

iii. Perform daily quality control including probing and checking seams at the end of the day.

I. Adjustments to the Hot Air Robotic Welder Settings
   a. Many factors will affect the settings, including overcast skies and lower air temperatures. This will generally require a slower speed and lower heat settings. The slower speed and heat provides the additional heat energy to compensate for heat-draining conditions.
   b. The correct speed and temperature settings for automatic welders are determined by preparing test welds at various speed and heat settings.
   c. Only make one change at a time and avoid changing heat and speed together.
   d. If you are welding at 1,148˚F (620˚C) and do not get a good weld, do not automatically adjust the speed because the temperature may be too high. Lowering the temperature or increasing speed may be a necessary adjustment.
   e. If the weld is greater than 1.5 in. (38 mm), you may have the temperature too high and this could lead to a failed weld over time.
   f. Having too much weight on the automatic hot-air welder combined with too high of a speed setting can potentially cause wrinkles in the weld area.

J. Automatic Hot Air Welding of Field Seams
   a. Successful automatic welding is primarily a function of proper machine adjustment and ensuring a consistent power supply.
   b. Membrane MUST be cleaned and free from all dirt and debris prior to hot air welding of seams.
   c. Verify correct power supply voltage with a voltmeter.
   d. Determine proper welder speed and temperature settings by performing the test weld procedure.
   e. Mark all locations where automatic welding starts and stops to identify locations of possible weld discontinuities.These areas should be carefully probed and repaired as required.
   f. The weld must provide a maximum film-tearing bond of 1.5 in. (38 mm) and a minimum 1 in. (25 mm) film-tearing bond.
   g. Membrane laps must be heat-welded together. All welds must be continuous, without voids or partial welds. Welds must be free of burns or scorch marks.
   h. All reinforced membrane TPO field seams should be made using an automatic hot air welder.
   i. Attend to all T-joints by carefully pressing each joint down by silicone roller edge, seam probe, or other hard-edged tool immediately after the T-joint has emerged from the automatic welder.
      i. 60 mil EverGuard® SA TPO Self Adhered Membrane T-joints require the installation of a heat-welded membrane cover patch.
   j. Cut edges of reinforced TPO membrane should be sealed with EverGuard® TPO Cut Edge Sealant.

K. Hand-Welding of Seams
   a. Successful hand welding is a skill that involves individual technique, normally developed and refined over time. Operator should be proficient in different nozzle configurations. Correct selection of welder temperature and nozzle width can have an effect on the quality of the hand weld.
   b. Membrane MUST be cleaned and free from all dirt and debris prior to hand-welding.
   c. Tack welding is not permitted in the field welding of seams.
   d. The membrane must be heat-welded together using the “two-pass method.”. Weld from the interior on the first pass (or pre-weld) and finish the weld with the second pass.
   e. The welding nozzle is introduced between the two layers of membrane, and the silicone roller is rolled back and forth perpendicular to the nozzle mouth to press the membrane together and accomplish the weld. The roller should remain flat to ensure proper compression.
   f. All welds must be continuous, without voids or partial welds. Welds must be free of burns or scorch marks.
   g. The ability to achieve satisfactory welds with the hot air welder being held in either hand facilitates welding at various angles and in various situations.
   h. The weld must provide a maximum film-tearing bond of 1.5 in. (38 mm) and a minimum 1 in. (25 mm) film-tearing bond.

i. Depending on the type of welding being performed (i.e., reinforced to reinforced membrane, reinforced to unreinforced membrane) the temperature setting will vary, as will the width of the welding nozzle.
    i. Welding Seams, Prefabricated Flashings and Repair Patches – Use the highest temperature setting that can safely be used taking into account the experience and comfort level of the installer.
    ii. Welding Field-Fabricated Pipe and Corner Flashings – Use the highest temperature setting that can safely be used taking into account the experience and comfort level of the installer

L. Seam Probing
   a. Seam probing is the physical inspection of a hot air weld area by running a suitable blunt probe along the length of a seam with horizontal pressure applied into the bottom edge of the weld. Seam probing checks the integrity of the leading edge of the weld to help ensure a water-tight roofing system and is critical to locating small skips in a welded lap. Seam probing is NOT a replacement for conducting test welds.
   b. All hot air welded seams should be physically probed daily with a blunt or dull cotter key puller hand tool (sharp points or edges must be filed down).
   c. Allow the seam to cool down at least 30 minutes or to ambient temperature before probing.
      i. Premature probing can damage seams because the welds may still be warm.
   d. Mark & repair all voids, open welds or cold-welds routinely throughout the day but no later than the end of each workday using a hand-welder.
   e. To make a minor repair on a seam, use a EverGuard® T-Joint Cover Patch, or EverGuard® Detailing Membrane, or the same material type being used for the field sheet.
   f. If repairs are needed for an entire open seam, use reinforced membrane a minimum of 4 in. (102 mm) wide. Finish the detail by heat-welding EverGuard® T-Joint Cover Patches at each corner. Any damage caused to the field sheet (not in the seams) must be patched with reinforced membrane.
   g. After completion of probing and possible repairs, cut edges of reinforced TPO membrane should be sealed with EverGuard® TPO Cut Edge Sealant.

M. Seam Samples
   a. Seam samples shall be taken by the applicator a minimum of twice a day; morning and afternoon and pulled apart to verify a minimum 1.5 in. film tearing bond. The samples to be dated and saved for evaluation by a GAF Field Services Representative. Each seam sample test cut shall be patched by the installer immediately after. Inadequate film tearing bond may require that the seam be stripped in with like material.

Flashing Installation - EverGuard® SA TPO Self Adhered Membrane

Refer to the construction details available at www.gaf.com, which depict flashing requirements for typically encountered conditions. Install flashing materials as shown in the construction details.

A. General
   a. EverGuard® SA TPO Self Adhered Membrane can be installed down to an ambient air temperature of 20 degrees and rising.
      Note: Reference the Adhesives Charts (list chart names) within the manual for minimum temperature requirements.
   b. The thickness of the flashing membrane must be the same as the thickness of the EverGuard® SA TPO Self Adhered Membrane.
   c. When using EverGuard® SA TPO Self Adhered Membrane, 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.

d. The membrane flashing shall be carefully positioned prior to application to avoid wrinkles and buckles.
e. All laps in must be heat-welded in accordance with heat-welding guidelines or have a heat-welded cover strip.
f. Porous substrates may require application of EverGuard® TPO Primer or a separation board.
g. For 20-year system guarantees, a separate counterflashing is required; exposed termination bars are not acceptable.
h. All vertical butt-ends of flashings must be stripped in.
i. All EverGuard® TPO SA flashings MUST be rolled-in to complete the flashing detail.

B. T-Joint Cover Patches
a. T-joint cover patches are to be a minimum 4 in. (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 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 membrane 60 mil and thicker.

Flashing Installation

Refer to the construction details available at www.gaf.com, which depict flashing requirements for typically encountered conditions. Install flashing materials as shown in the construction details.

A. General
a. Flash all perimeter, curb, and penetration conditions with EverGuard® coated metal, membrane flashing, and flashing accessories as appropriate to the site condition.
b. All EverGuard® coated metal and membrane flashing corners must be reinforced with pre-formed corners or non-reinforced membrane.
c. All flashing membranes and accessories are to be heat-welded using a hand welder. See section on Hand Welding.
d. Cut edges of reinforced TPO membrane should be sealed with EverGuard® TPO Cut Edge Sealant.
e. When using bonding adhesive, be sure to use adhesive specific to membrane and ambient weather conditions.
f. Maximum flashing height without intermediate fastening:
i. 30 in. (762 mm) – Loose-Applied
ii. 66 in. (1.7 m) – Adhered

Note: EverGuard® TPO Quick Spray Adhesive and EverGuard® TPO Quick Spray LV50 can be applied to walls without any height limitations. Supplemental fastening is not required. The wall flashing must be separate from the roof membrane. The roof membrane cannot extend continuously from the field of the roof up the wall. The roof membrane must be mechanically attached along the base of the wall(s) and the wall flashing must be mechanically attached at the top of the wall(s).

g. Minimum flashing height is 8 in. (203 mm).
h. The maximum distance from the wall that horizontal mechanical attachment should be installed is 6 in. (152 mm). When you must go past 6 in. (152 mm), move the attachment to the vertical substrate.
i. EverGuard® membrane flashings should be of the same type and thickness as the roofing membrane.
j. For TPO membranes installed over granulated modified bitumen flashings, a polymat separator sheet must be installed for loose-applied flashings. In adhered applications, a barrier board must be installed.
k. When using EverGuard® TPO adhesives, use any of the following substrates: polyisocyanurate insulation (w/o foil facer); high density fiberboard; approved gypsum board; cured structural

concrete (with no curing and sealing compound present); untreated OSB; untreated CDX plywood; poured or plank gypsum and dry, sound masonry (with no curing and sealing compound present).

l. Fire-treated plywood/wood used as a parapet wall substrate is only acceptable if covered with an approved gypsum board for adhered EverGuard® flashing membranes.
m. EverGuard® Corner Curb Wraps consist of a pre-formed combination corner and flashing pieces that are 12 in. (305 mm) in height and can be ordered in various lengths.These flashings may be loose applied or adhered in place. For adhered flashing applications, apply adhesive to both the underside of the substrate and the flashing membrane to adhere the membrane.
n. For existing vertical flashings up to 24 in. (610 mm), the EverGuard® SA TPO Self Adhered Membrane release liner must be kept in place for dry-hung vertical flashings.
o. EverGuard® SA TPO Self Adhered Membrane may be used up to 54 in. (1.4 m) in height over appropriate substrates primed with EverGuard® TPO Primer.

B. Adhered EverGuard® Smooth Reinforced Membrane Flashing
   a. The type and thickness of the flashing membrane must be the same as the thickness and type of the roofing membrane.
   b. For application rates and temperatures, refer to the EverGuard® Membrane Adhesive Coverage Rates Table within this Manual.
   c. Coverage may vary depending on the porosity of the substrate surface.
   d. Carefully position the membrane flashing prior to application to avoid wrinkles and buckles.
   e. Solvent-based adhesive must be allowed to dry until tacky to the touch before mating the membrane. Water-based adhesive must be allowed to dry completely. Typically, the sheet must be installed within one hour of applying the water-based adhesive. However, this may vary depending on ambient conditions including temperature, relative humidity, sunlight, etc.
   f. Heat-weld all EverGuard® reinforced membrane seams in accordance with heat-welding guidelines.
      i. Prevent seam contamination by keeping the adhesive application a few inches back from the seam area.
   g. Only use the adhesive you are working with to prime the wall substrate.
   h. For extended-length guarantees, a counter flashing must be used. Exposed termination bars are not acceptable.

C. Loose-Laid EverGuard® Smooth or Fleece-back Reinforced Membrane Flashing
   a. Carefully position the EverGuard® smooth or fleece-back reinforced flashing membrane prior to application to avoid wrinkles and buckles.
   b. Heat-weld all EverGuard® reinforced membrane seams in accordance with heat-welding guidelines.
   c. For selvage edge laps of EverGuard® TPO membranes, overlap the roof membrane a minimum of 3 in. (76 mm) and heat weld the laps
   d. For extended-length guarantees, a counter flashing must be used. Exposed termination bars are not acceptable.

D. Non-Reinforced Membrane Flashing
   a. Non-reinforced membrane must be used as a field-fabricated penetration/reinforcement flashing only where pre-formed corners and pipe boots cannot be properly installed.
   b. Penetration flashing constructed of non-reinforced membrane is 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.
   c. The non-reinforced vertical membrane flashing may be adhered to the penetration surface. Refer to Adhered Reinforced Membrane Flashing - Smooth Surface section on page 36 for application instructions.
   d. All round and square pipe type flashings require EverGuard® FlexSeal™ Caulk-Grade Sealant or EverGuard® Water-Block between the penetration and the membrane. Add and tighten stainless steel band and seal top of membrane with EverGuard® FlexSeal™ Caulk-Grade Sealant.
   e. T-joint Patches

i. T-joint patches are to be a minimum 4 in. (102 mm) in size and made of non-reinforced material. They must be completely hot-air welded over the T-joint at the intersection of the three pieces of reinforced membrane. During installation, care must be taken to “crease-in” the unsupported membrane at the three step-off locations.
ii. Pre-fabricated or field-fabricated non-reinforced mem- branes that match the membrane being used in the field of the roof are acceptable for T-joints.
iii. T-joint patches are required on 60 mil TPO.

C. EverGuard® Coated Metal Flashings
a. EverGuard® coated metal flashing allows much of the metal-work used in typical roofing applications to benefit from the security of heat-welded membrane seaming, with a corresponding reduction in required metalwork maintenance.
b. EverGuard® coated metal must be formed in accordance with construction details. Where required, EverGuard® coated metal should be designed for wind resistance in accordance with the applicable building code and tested for capacity in accordance with ANSI/ SPRI/FM 4435/ES-1, Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.
c. EverGuard® coated metal sections used for roof edging, base flashing, and coping must be butted together with a 1/4 in. (6 mm) gap to allow for expansion and contraction. Heat weld a 6 in. (152 mm) wide non-reinforced membrane strip to both sides of the joint. A 2 in. (51 mm) wide aluminum tape can be installed over the joint as a bond-breaker, to prevent welding in this area.
i. EverGuard® coated metal used for sealant pans and scupper inserts, and 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 in. (152 mm) membranes.
ii. EverGuard® coated metal base flashings must be provided with min. 4 in. (102 mm) wide flanges fastened to wood nailers. EverGuard® coated metal base flashings must be formed with a 1 in. (25 mm) cant.
iii. Provide a 1/2 in. (13 mm) hem for all exposed metal edges to provide corrosion protection and edge reinforcement for improved durability.
iv. EverGuard® coated metal flashings should be 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.
v. When installing EverGuard® 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.

D. Roof Edge
a. Metal roof edging should be designed for wind resistance in accordance with the applicable building code and tested for capacity in accordance with ANSI/SPRI/ FM 4435/ES-1,“Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.”.
b. To install a EverGuard® coated metal at the roof edge, install a continuous metal hook strip to secure the lower fascia edge. Secure the continuous hook strip to the building a maximum of 4 in. (102 mm) o.c.
c. Install EverGuard® coated metal drip edge with minimum 3 in. (76 mm) wide flange nailed 4 in. (102 mm) o.c. or Drill-Tec™ fasteners 12 in. (305 mm) o.c. into wood nailers.
d. Flash EverGuard® coated metal drip edge with heat welded 8 in. (203 mm) TPO reinforced flashing strip.
e. Alternatively, flash roof edges with a two-piece snap-on fascia system, adhering roof membrane to metal cant with bonding adhesive and face-nailing the membrane 8 in. (203 mm) o.c. prior to installing the snap-on fascia.
f. Metal edging may be flashed using EverGuard® TPO Cover Tape after priming both the metal and the TPO membrane.

i. EverGuard® TPO Cover Tape is a 6 in. (152 mm) wide, non-reinforced TPO membrane backed with a butyl tape adhesive. Clean the entire surface to be covered, both metal and roof membrane, with soap and water, and dry entire area. Wipe area to be primed with a damp wipe of EverGuard® TPO Cleaner.

ii. 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 in. (152 mm) past the intersection in all directions.

iii. For EverGuard® TPO Cover Tape Heat Weld.This is a hybrid cover tape consisting of 6 in. (152 mm) of .045 reinforced TPO membrane with 3 in. (76 mm) butyl tape on half of the back surface. Refer to f (above) and follow procedures for the butyl tape preparation and installation. Then heat weld the cover tape to the field membrane with a 2 in. (51 mm) hand welder or automatic heat welder, to all membrane-to-membrane surfaces.

Note: Any overlap ends must be stripped in with flashing detail membrane and welded completely to finish the detail. EverGuard® TPO Cut Edge Sealant must be installed on all edges of the HW Flashing Strip.

g. Flash roof edge scuppers with a scupper insert of EverGuard® coated metal or an EverGuard® pre-fabricated coated metal scupper that is mechanically attached to the roof edge and integrated as part of the metal edging. Refer to Scupper section on page 40 for more information on scuppers.

E. Parapet and Building Walls

a. Flash wall with either adhered membrane flashings, metal flashings, or loose-applied flashings.

b. Secure membrane flashing at the top horizontal edge with a termination bar. Apply FlexSeal™ Caulk-Grade Sealant between the wall surface and membrane flashing underneath all termination bars. Exposed termination bars must be mechanically fastened 6 in. (152 mm) o.c.

i. If counter flashing is installed over the termination bar, the termination bar should be fastened 12 in. (305 mm) o.c.. Termination bar can be sealed with FlexSeal™ Caulk-Grade Sealant or EverGuard® Water-Block.

c. Roof membrane must be mechanically attached along the base of walls that are flashed with membrane flashing. Attach with fasteners and plates/termination bar. Use a fastener spacing in accordance with in-lap attachment requirements, with a maximum 12 in. (305 mm) o.c. spacing.

d. Metal counter flashings with adhered or loose-applied membrane wall flashings are required on 20-year guarantees or longer. (They are not required for guarantees of less than 20 years.) All termination bars, either exposed or covered, must be sealed with FlexSeal™ Caulk-Grade Sealant or EverGuard® Water-Block.

e. Flash wall scuppers with a scupper insert of EverGuard® coated metal that is mechanically attached to the wall and integrated as part of the wall flashing. Refer to the Scupper section for other detail options.

f. Metal cap flashings should be designed for wind resistance in accordance with the applicable building code and tested for capacity in accordance with ANSI/SPRI/FM 4435/ES-1,“Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.”.

g. Maximum flashing height without intermediate fastening:

i. 30 in. (762 mm) – Loose-Applied

ii. 66 in. (1.7 m) – Adhered

Note: EverGuard® TPO Quick Spray Adhesive and EverGuard® TPO Quick Spray LV50 can be applied to walls without any height limitations. Supplemental fastening is not required.The wall flashing must be separate from the roof membrane.The roof membrane cannot extend continuously from the field of the roof up the wall.The roof membrane must be mechanically attached along the base of the wall(s) and the wall flashing must be mechanically attached at the top of the wall(s).

h. Metal cap flashings must have continuous cleats or be face-fastened 12 in. (305 mm) o.c. on both

the inside and outside of the walls.

i. Use fire-treated plywood/wood for parapet walls only if covered with an approved gypsum board for (fully) adhered or EverGuard® SA TPO Self Adhered Membrane.

j. For existing granule-surfaced modified bitumen flashings up to 24 in. (610 mm), the EverGuard® SA TPO Self Adhered Membrane release liner must be kept in place for dry-hung flashings. For EverGuard® SA TPO Self Adhered Membrane applications, a barrier board must also be installed.

F. Round and Square Tube Penetrations

a. Four options are available for penetration flashings: stepped pipe boots; split pipe boots; square tube wraps; and field fabrication with unsupported membrane and target.

b. 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 Water-Block Sealant.

c. Roof membrane must be mechanically attached at the base of each penetration with screws and plates a maximum of 12 in. (305 mm) o.c., with a minimum of four fasteners per penetration.

G. Irregularly Shaped Penetrations

a. Metal Sealant Pans/Pre-formed TPO Accessories

i. Flash irregularly shaped penetrations with flanged sealant pans formed of EverGuard® coated metal, secured to the deck through the roof membrane with fasteners 6 in. (152 mm) o.c., a minimum of two per side.

ii. Strip in metal flanges with 8 in. (203 mm) wide membrane flashing strips and vertical pop riveted seams with 4 in. (102 mm) unsupported membrane.

iii. Surface should be clean, dry, and free of any loose materials. Remove all previously applied caulk, mastic, cement, and other contaminants from penetrations with a cleaner. All roof deck voids should be filled with FlexSeal™ Sealant.

iv. Prime all surfaces of pre-formed TPO accessories with EverGuard® TPO Primer. Allow primer to dry prior to applying EverGuard® OnePart Pourable Sealant. Fill the EverGuard® Pourable Sealer Pocket with EverGuard® One- Part Pourable Sealant to the top of the pocket, ensuring that all voids are filled.

v. Installation of pre-formed TPO sealant pans requires field membrane securement around the penetration. A minimum of four (4) system-appropriate fasteners 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 in. (51 mm) weld of the TPO sealant pan flange. Properly heat weld the flange of TPO sealant pan to the field/target membrane.

vi. If the sealant pan is cut to install around the penetration, the cut must be stripped in with a minimum 4 in. (102 mm) wide non-reinforced membrane. The non-reinforced strip-in membrane must extend a minimum of 2 in. (51 mm) beyond the outside edge of the sealant pan flange and be fully welded.

vii. EverGuard® TPO reinforced targets may be sealed with EverGuard® TPO Cut Edge Sealant.

b. MajorSeal™ Liquid Flashing is only to be used when MajorSeal™ TPO flashing accessories and standard details cannot be used. You must contact your GAF Field Services Area Manager to assess suitability prior to use.

c. MajorSeal™ Liquid Flashing is not suitable for areas around drains or scuppers, or areas that pond water.

i. MajorSeal™ Liquid Flashing is eligible for a 20-year maximum guarantee and is not eligible for extended-length guarantee coverage.

H. Curbs

There are several options for flashing curbs:

a. Use EverGuard® SA TPO Self Adhered Membrane after priming the curb substrate with EverGuard® TPO Primer.
b. Use EverGuard® TPO reinforced membrane with adhesive applied to the membrane and substrate or loose-applied up to 30 in. (762 mm) in height
c. Secure membrane flashing at the top edge with a termination bar, flat stock, or counter flashing. Apply FlexSeal™ Caulk-Grade Sealant or EverGuard® Water-Block between the curb surface and membrane flashing. Exposed termination bars must be mechanically fastened 6 in. (152 mm) o.c.; termination bars that are counter flashed must be fastened 12 in. (305 mm) o.c. If wood is present at the top of the curb, install ring shank nails 12 in. (305 mm) o.c. after wrapping the membrane to the inside of the curb. This can be used in lieu of the termination bar if nailed on the top or preferably, the inside of the curb.
d. The roofing membrane must be mechanically attached along the base of curbs and ducts that are flashed with membrane flashing with fasteners and plates/termination bar at 12 in. (305 mm) o.c. and then covered with the base flashing.
e. Secure curb flashing at the top horizontal edge with a termination bar. Apply FlexSeal™ Caulk-Grade Sealant between the wall surface and membrane flashing underneath all termination bars. Exposed termination bars must be mechanically fastened 6 in. (152 mm) o.c.
    i. If counter flashing is installed over termination bars, the termination bar should be fastened 12 in. (305 mm) o.c..Termination bar can be sealed with FlexSeal™ Caulk-Grade Sealant or EverGuard® Water-Block.

I. Expansion Joint Covers
a. Install expansion joint covers at all flat type and raised curb-type expansion joints.There are currently three types of expansion joints approved for EverGuard® Systems.
b. The roofing membrane must be mechanically attached along the base of raised curb expansion joints with fasteners and plates a minimum of 12 in. (305 mm) o.c.
c. Expansion joint bellows must be one and a half times the width of the expansion joint opening to allow for proper expansion/contraction.
d. Metal fastening strip on prefabricated expansion joints must be set in FlexSeal™ Caulk-Grade Sealant or EverGuard® Water-Block and secured with EverGuard® Drill-Tec™ fasteners and neoprene washers fastened 6 in. (152 mm) o.c.

J. Roof Drains
a. Roof drains must be fitted with compression clamping rings and strainer baskets. Both traditional cast iron and aluminum drains, as well as retrofit-type cast aluminum and molded plastic drains, are acceptable.
b. Roof drains must be provided with a min. 36 in. x 36 in. (914 mm x 914 mm) sumped area if possible. Slope of tapered insulation within the sumped area must not exceed 4:12.
c. Extend the roofing membrane over the drain opening. Locate the drain and cut a hole in the roofing membrane directly over the drain opening, as large as the diameter of the drain pipe. Provide a 1/2 in. (13 mm) membrane flap extending past the drain flange into the drain opening. Punch holes through the roofing membrane at drain bolt locations.
d. For cast iron and aluminum compression clamp style drains, the roofing membrane must be set in a full bed of FlexSeal™ Caulk-Grade Sealant or EverGuard® Water-Block on the drain flange prior to securing with the compression clamping ring.
e. 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 9 in. (229 mm) larger than the sump area must be installed. The membrane flashing must be heat welded to the roof membrane. Alternatively, if the seam does not run under the clamping ring, it can be covered with a 6 in. (152 mm) wide reinforced membrane strip heat welded to the membrane.
f. Tighten the drain compression clamping ring in place.
g. All drains must be provided with a strainer basket.

h. Roof drains must be open and functioning.

K. Retrofit Drain Inserts
   a. Drain inserts must only be used in the event the original drain is damaged and cannot be repaired without complete replacement of the drain. Drain inserts will reduce water flow. Consult the design professional to ensure adequate drainage is maintained.
   b. Clean the drain lines a minimum of 24 in. (610 mm) where the drain insert is to be installed. Failure to clear this section of drain line can prevent the sealing of the drain and degrade the performance of the drain seal.
   c. All drains must be provided with a drain sump of 36 in. (914 mm) x 36 in. (914 mm) minimum dimension, if possible. Fasteners must be installed 12 in. (305 mm) o.c. or a minimum of 4 per penetration.
   d. The drain insert is installed on top of the roofing membrane and is secured to the roof deck with Drill-Tec™ fasteners with a minimum of 4 fasteners per penetration.
   e. A separate reinforced membrane drain flashing sheet is heat welded to the roofing membrane.The drain flashing sheet is heat welded to a compatible drain flange.
   f. Install the drain clamping ring if applicable.
   g. All drains must be provided with a strainer basket.
   h. Roof drains must be open and functioning.

L. Scuppers
   a. EverGuard® coated metal roof edge scuppers must be provided with a min. 4 in. (102 mm) wide flange nailed to wood nailers, with hemmed edges and secured with continuous clips in accordance with the gravel stop assembly.
   b. EverGuard® coated metal wall scuppers must be provided with 4 in. (102 mm) wide flanges, with additional corner pieces pop-riveted to the flanges to create a continuous flange. All flange corners must be rounded.
   c. Install wall scuppers over the roof and flashing membrane and secure to the roof deck/wall with Drill-Tec™ fasteners 6 in. (152 mm) o.c., a minimum of 2 fasteners per side.
   d. All corners must be reinforced with EverGuard® TPO Universal Corners or field fabricated from EverGuard® non-reinforced materials.
   e. Strip in scupper with flashing membrane target sheet.
   f. Alternatively, a wall scupper box may be field flashed using non-reinforced flashing membrane heat welded to membrane on the wall face and roof deck. Be sure that all corners are reinforced with universal corners or non-reinforced EverGuard® material. Fully adhere to the scupper box and terminate on the outside wall face with a termination bar and FlexSeal™ Caulk-Grade Sealant or EverGuard® Water-Block.
   g. EverGuard® TPO has prefabricated scuppers in standard and custom sizes available. Consult your Territory Manager or local distributor for details.
   h. Scuppers may be set in a bed of FlexSeal™ Caulk-Grade Sealant or EverGuard® Water-Block for additional resistance to movement.

M. Heater Stacks
   a. The temperature of any heater stack that comes into contact with the EverGuard® membrane or flashing should not exceed 160°F (71°C) for EverGuard® TPO membrane, or 190°F (88°C) for Everguard Extreme® TPO.
   b. Field-fabricated two-piece membrane flashings of EverGuard® non-reinforced flashing are typically installed at heater stacks. EverGuard® TPO have cone type prefabricated pipe flashing that may work in these applications.
   c. Heat 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.
   d. Mechanically attach the roof membrane to the structural deck with Drill-Tec™ fasteners and plates around the penetration base prior to flashing installation. Minimum of 4 fasteners per penetration.

e. All stack flashings must be secured at their top edge by a stainless-steel clamping band over FlexSeal™ Caulk-Grade Sealant or EverGuard® Water-Block. Seal the detail with FlexSeal™ Caulk-Grade Sealant.
f. Field-fabricated membrane flashings may be adhered to the flashing sleeve with EverGuard® adhesives. Be sure to use the correct bonding adhesive with the membrane being installed.

N. Wood Support Blocking
a. Wood support blocking, typically 4 in. (102 mm) x 4 in. (102 mm), is usually installed under light-duty or temporary roof-mounted equipment, such as electrical conduit, gas lines, and condensation and drain lines.
b. Install wood support blocking over a protective layer of EverGuard® TPO Walkway Rolls. Set wood blocking in FlexSeal™ Caulk-Grade Sealant.
c. If using pre-fabricated pipe stands with rubber-like bases, no slip sheet is required on TPO membranes.

O. Satellite Dish Support Bases
a. Install non-penetrating satellite dish support bases over a protective layer of TPO membrane.

P. Lightning Suppression System
a. Secure lightning suppression cable to the roof surface by means of 2 in. (51 mm) wide EverGuard® TPO flashing membrane strips that are heat welded to the roof membrane.
b. Secure lightning rod to reinforced EverGuard® membrane patch that is heat welded in place. Securement should not penetrate the roof membrane.

Traffic Protection

A. Walkway rolls or pads should be installed at all roof access locations, including ladders, hatchways, stairs, and doors. Install walkway rolls or pads at other designated locations, including roof-mounted equipment work locations and areas of repeated rooftop traffic.
B. Walkway rolls or pads must be spaced 6 in. (152 mm) to allow for drainage. Edges of walkway rolls or pads must be placed 6 in. (152 mm) from any seam.
C. Heat-weld walkway rolls or pads to the roof membrane surface continuously around the walkway roll or pad perimeter.

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 in. (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.

Field Quality Control

A. Field quality control should be performed in accordance with NRCA's Quality Control and Quality-assurance Guidelines for the Application of Membrane Roof Systems.
B. 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.
C. 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.
D. 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.

Cleaning

A. In areas of the roof where bonding adhesive, bituminous markings and other contaminants from finished surfaces can not be removed by standard GAF cleaning procedures, repairs may be necessary.
B. To repair a contaminated area, cut out and remove any sheet membrane where contaminants cannot be removed.
C. Repair sheet damage by cleaning the area with an all-purpose cleaner and then rinse off soapy residue.
D. Reactivate the membrane using EverGuard® TPO Seam Cleaner or EverGuard® CleanWeld™ Conditioner for TPO membrane. See Seam Cleaning page 29.
E. Complete the repair by installing a patch of like material to specific system requirements

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 , followed by heat-welding a membrane repair patch of sufficient size to extend a minimum of 2 in. (51 mm) beyond the damaged area.
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.

APPENDIX A

ADHESION TEST GUIDELINES

PURPOSE

- Testing is required to ensure foam adhesive will bond insulation to a given substrate.
- GAF requires roofing contractors (or a qualified third party) to conduct an adhesion test prior to registering a EverGuard® Diamond Pledge™ NDL Roof Guarantee.

GUIDELINES

- Do not use adhesive to install roofing materials on any roof deck or other substrate that shows signs of deterioration or loss of integrity.
- GAF recommends that contractors keep test results on file, to be submitted to GAF upon request. Submission of results to GAF is not required in the ordinary course; however, GAF may request them on a job-to-job basis. Failure to perform the required testing or to be able to produce the test results may delay or prevent the issuance of an EverGuard®Diamond Pledge™ NDL Roof Guarantee.
- GAF may, at its sole discretion, require additional testing prior to the job start or prior to issuance of an EverGuard® Diamond Pledge™ NDL Roof Guarantee in accordance with ANSI/SPRI IA-1 2015 Standard Field Test Procedure for Determining the Mechanical Uplift Resistance of Insulation Adhesives over Various Substrates.

PROCEDURES

ACCEPTABLE ADHESION TEST METHODS ARE OUTLINED BELOW:

1. GAF Preferred Test Method: “Shovel Test” Materials:
   - GAF approved insulation adhesive(s)
   - Square edge shovel or similar
   - Minimum 12 in. x 12 in. (305 mm x 305 mm) piece(s) of minimum 1 ½ in. (38 mm) EnergyGuard™ polyiso roof insulation or minimum 15/32 in. (25 mm) plywood

Frequency:

ANSI/SPRI IA-1 2021 - Standard Field Test Procedure for Verifying the Suitability of Roof Substrates and Adhesives

- Perform a minimum of 4 pull tests for the first 50,000 square feet (4,650 square meters), and 2 additional pull tests for each additional 50,000 square feet (4,650 square meters) or portion thereof on each project.
- Test locations shall be selected in the corner and perimeter areas if conditions can not be replicated in the field of the roof. The tests shall not be performed in close proximity to one another to provide a representation of the entire roof area.

Directions:

- Install low-rise foam adhesive on roof deck or roof substrate in accordance with GAF or other GAF approved manufacturer’s requirements.
- Place a minimum 12 in. x 12 in. (305 mm x 305 mm) piece of polyiso roof insulation or plywood in the foam adhesive (ribbons or spatter pattern) over the roof deck or roof substrate that is being tested. One or more ribbons are required.
- Allow adhesive to cure for a minimum of 1 hour.
- Pull up on the adhered board by placing a shovel under the corner or end of the board.The direction of the adhesive ribbon(s) should not affect adhesion results. Make sure that the shovel* is placed squarely under the board.

  **If the existing substrate is insulation, GAF requires that a piece of plywood be placed under the bottom of the shovel in order to not crush the underlying insulation. Failure to do so can lead to inaccurate test results.*

- Gently push down on shovel until the bond between the board and substrate is broken
- Examine the board and substrate to determine the location of the bond failure.
- Failure should be within the adhesive or board.
- If the foam adhesive has separated from the substrate, foam adhesive should not be used to bond the new roof to this substrate.
- When testing adhesion to a deck, if the failure occurs in the deck, the deck is not suitable for using foam adhesive to bond the roof to the deck.

Record mode of failure and place in project file.

- Photographs
- Date, time & air temperature

FASTENER PULL TEST GUIDELINES

1. 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.
   - ANSI SPRI FX-1 2021 - Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners
     - Perform a minimum of 10 pullouts for up to 50,000 ft^2 (4,650 m^2), and 5 additional pullouts for each additional 50,000 ft^2 (4,650 m^2) or portion thereof on each project. Perform the pullouts in various areas of the roof, including corners, perimeter, and field, to provide a representative sampling of roof area. 50% of the tests shall be performed in the corners and perimeter areas.

OTHER ACCEPTABLE TEST METHODS:

1. ANSI/SPRI IA-1 2015 Standard Field Test Procedure for Determining the Mechanical Uplift Resistance of Insulation Adhesives over Various Substrates.