



We
protect
what
matters
most™

EverGuard® TPO/PVC Retrofit Roofing Systems Over Metal Roofs

***A Guide to Metal Roof Retrofit in
Commercial Low-slope Roof Assemblies***

Updated November 2025
(supersedes December 2020)

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WELCOME

Thank you for consulting the EverGuard® TPO/PVC Retrofit Roofing Systems Over Metal Roofs. You can find further information at www.gaf.com, or contact GAF Design Services at 877-423-7663 or DesignServices@gaf.com.

This Guide serves as a supplement to the following Roofing Systems Overview & General Requirements Manuals:

- [EverGuard® TPO/PVC MECHANICALLY ATTACHED](#)
- [EverGuard® TPO/PVC INDUCTION-WELDED ATTACHMENT](#)
- [EverGuard® TPO/PVC ADHERED](#)
- [EverGuard® TPO SELF-ADHERED](#)

About GAF

Founded in 1886, GAF has grown to become North America's largest manufacturer of commercial and residential roofing. Professional roofing contractors have long relied on the rugged, dependable performance that a GAF roof can offer. We are the leading roofing manufacturer in North America, with plants strategically located across the U.S. A member of the Standard Industries family of companies, GAF is part of the largest roofing and waterproofing business in the world. We protect what matters most™.

Disclaimers

This Guide contains the latest information relating to the application of GAF's retrofit roofing systems over metal roofs and is based on our years of experience in the commercial roofing field. It has been prepared as a general guide to assist design professionals, roofing contractors and building owners in the use of our roofing systems.

GAF manufactures and sells roofing materials and does not practice architecture or engineering. GAF is not responsible for the performance of its products when damage to its products is caused by such things as improper building design, or construction flaws.

The design responsibility remains with the design professionals, roofing contractor, building owner. These guidelines should not be construed as being all-inclusive, nor should they be considered as a substitute for good application practices.

Under no circumstances does GAF have any liability for expenses arising out of or associated with the pre-existing presence of asbestos-containing materials or any other allegedly hazardous substances or materials in or on the roof to which the new GAF roofing materials are being applied.

Information contained in this Guide 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 Guide supersedes any prior GAF document(s) on this topic. Please always check www.gaf.com to make sure you have the most up to date information.

GUARANTEE GUIDELINES

GAF offers roof guarantees for a fee for all roofing system specifications published in this Guide when installed by contractors certified with GAF at the appropriate certification level in accordance with the terms and conditions set forth in this Guide, and provided that the procedures for obtaining a guarantee are followed.

All roofing systems for which a guarantee is requested must be installed according to 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 [Design Services](#) or [Guarantee Services](#) before installation.

GAF will determine, in its sole discretion, whether a roofing guarantee will be issued to cover any proposed or completed roof. Additionally, 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.

Contact [GAF Guarantee Services](#) for further information on guarantee procedures and [GAF Design Services](#) for approval of modifications to published specifications.

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.

Guarantee Durations

GAF offers a selection of roof guarantees to meet the needs of most building owners. The following guarantees are available for use with selected EverGuard® TPO/PVC retrofit roofing systems over metal roofs when installed by a contractor certified with GAF at the appropriate certification level that meets GAF's requirements for guarantee issuance. GAF EverGuard® roof membranes must be used in roofing systems to be guaranteed by GAF. The maximum guarantee duration for any metal retrofit system is 20 years.

NOTE: The installation guidelines and details presented in this Guide are the minimum requirements to obtain a GAF guarantee. These parameters may not provide a roofing assembly capable of resisting wind uplift resistance loads as required by building code. It is up to the designer of record to determine if the roof design meets applicable building codes.

EverGuard® TPO Guarantee Durations			
Attachment Method	Maximum Guarantee Duration	EverGuard® TPO	EverGuard Extreme® TPO
		Minimum Thickness	
Mechanically Attached	15 years	45 mil	50 mil
	20 years	60 mil	50 mil
Induction-Welded	20 years	45 mil	50 mil
Adhered ¹	20 years	45 mil	50 mil
Self-Adhered	20 years	60 mil	N/A

EverGuard® PVC and PVC KEE Guarantee Durations			
Attachment Method	Maximum Guarantee Duration	EverGuard® PVC	EverGuard® PVC KEE
		Minimum Thickness	
Mechanically Attached	15 years	50 mil	50 mil
	20 years	60 mil	50 mil
Induction-Welded	15 years	50 mil	50 mil
	20 years	60 mil	50 mil
Adhered ¹	15 years	50 mil	50 mil
	20 years	60 mil	50 mil

¹ Fleece-back membrane roofing systems are an option but are not addressed in this Guide. Contact [Design Services](#) for more information.

ROOF DESIGN

Careful consideration of the topics in this section will provide a fundamentally sound basis for design and selection of EverGuard® TPO/PVC single-ply roofing systems.

Recover

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

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

Existing Metal Roof System As The Substrate

It is the responsibility of the design professionals, roofing contractors or building owners to determine the fitness of an existing metal panel roof system that will be serving as a substrate for a specific roofing system installation. Additionally, GAF is not responsible for moisture-related problems associated with any deck or substrate materials.

Fire Resistance

Exterior Fire Resistance: Resistance by the roofing system to fire applied to the exterior roof surface is important. Typically, a UL Class A, B or C rating is required by building code.

Interior Fire Resistance: Depending on the building's use and occupancy, and construction type, resistance to fire from within the building will be required. This is normally expressed in the form of hourly ratings, and usually requires the use of a tested roof assembly.

Refer to current EverGuard® listings in the appropriate UL directory or FM Approval Listings to verify roof assembly requirements for specific fire ratings.

Thermal Barrier Requirements: The International Building Code has requirements when foam plastic insulation (e.g., polyiso) is used in a roof assembly. A thermal barrier is required to separate the foam plastic insulation from the interior of a building except when a roof assembly passes one of the following tests:

- FM 4450, "Approval Standard for Class 1 Insulated Steel Decks Roofs"
- NFPA 276, "Standard Method of Fire Test for Determining the Heat Release Rate of Roofing Assemblies with Combustible Above-Deck Roofing Components"
- UL 1256, "Standard for Fire Test of Roof Deck Constructions"

Wind Resistance

Roofing systems should be capable of resisting the forces generated by the maximum anticipated wind speed for a specific building. The tested uplift-resistance (capacity) of a roof assembly should be greater than the design wind loads that will occur on a building's roof assembly. This is expressed as:

Design uplift-resistance capacity > Design wind load

Design wind loads are mathematical predictions of anticipated maximum wind loads that apply to a specific building (taking into account configuration, height and size, exposure classification and enclosure classification) and location. The widely recognized consensus standard for determining design wind loads is ASCE 7, "Minimum Design Loads and Associated Criteria for Buildings and Other Structures" and it is referenced in the International Building Code.

Wind Load Testing: The following standards are commonly used to determine the wind uplift resistance capacity for roofing systems:

- ASTM E1592, "Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference." ASTM E1592 covers the evaluation of the structural performance of sheet metal panels and anchor-to-panel attachments.
- FM 4474, "American National Standard for Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures." FM 4474 evaluates simulated wind uplift resistance of complete roof assemblies by using static pressure differentials.
- UL 580, "Standard for Tests for Uplift Resistance of Roof Assemblies." UL 580 evaluates the roofing system and the roof deck attachment to the supports.
- UL 1897, "Standard for Uplift Tests for Roof Covering Systems." UL 1897 evaluates a roof covering system's method of attachment, including all components, by using differential air pressures.

It is important to note that some components of a roof deck system are not evaluated by these test methods. For example, secondary supports such as beams, purlins and joists, and the connections from secondary supports to the main structural system, are not evaluated.

Roofing Systems Attachment Comparison

There are some key design differences to consider when a TPO or PVC membrane is mechanically attached and induction-welded versus adhered and self-adhered over existing metal roofs.

Mechanically Attached & Induction-Welded Retrofit Roofing Systems (Recommended Attachment Option): When installing TPO/PVC over metal panels, GAF recommends mechanically attaching to existing purlins to ensure a proper wind-uplift load path, see Figure 1. For conventional mechanically attached and induction-welded roofing systems, they may be fastened into every purlin (e.g., every 5 feet [1.52 m]) or fastened into every other purlin (e.g., every 10 feet [3.05 m]). However, it should be noted that fastening into every other purlin may significantly change the wind uplift resistance load path. See Figure 1.

If possible, examine the underside of existing metal panel roof system to confirm the existence of supplemental purlins at corner, perimeter and/or ridge areas. If supplemental purlins exist, the roof membrane should be mechanically attached to these purlins per the fastening patterns applicable for the roof zone.

NOTE: *It is imperative that the attachment capacity of the purlins to the secondary structure is greater than the attachment capacity of the metal panels to the purlins.*

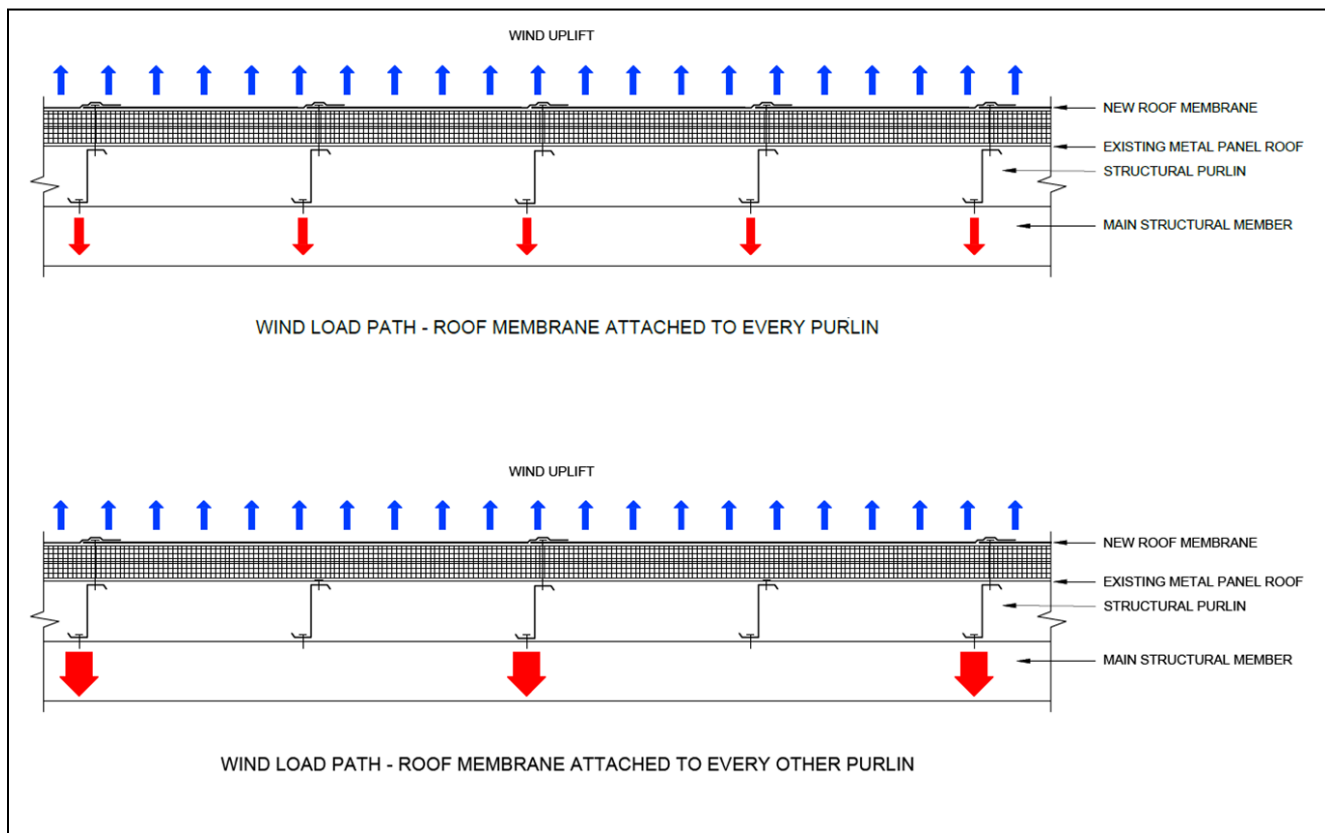


Figure 1: Illustrations of Wind Load Paths

Adhered & Self-Adhered Retrofit Roofing Systems: With adhered retrofit roofing systems, insulation boards are mechanically fastened through the pans of metal roof panels. The primary concern with this type of installation is the significant differences with the physical properties of metal roof panels and steel decks, such as:

- Varying yield strength of steel
- Metal thickness: typically 26 ga. or thicker for steel decks vs. 24 ga. or thinner for metal roof panels
- Geometry differences: steel decks have deep, closely spaced ribs relative to metal roof panels

Given the inherent differences, metal panel roof systems should not be treated as structurally equivalent to a traditional steel deck.

In addition, obtaining wind load capacity ratings for these retrofit systems is very challenging, because there are countless metal panel roof products and installation configurations. It would require a specific metal panel roof product with its specific attachment method, to be tested with a specific roof covering type with its specific attachment method.

NOTE: Accordingly, this supports why the preferred method for installing TPO/PVC in metal retrofit assemblies is to utilize mechanical securement into the structural purlins.

Corner and Perimeter Zones

Wind uplift pressures are higher in corner and perimeter zones which require additional fasteners in those areas. Accordingly, see below for the applicable fastening guides that may be used to obtain a GAF guarantee:

Mechanically Attached & Induction-Welded Retrofit Roofing Systems: The following details are applicable:

- [Detail 108A: Purlin Fastening Zones – Induction-Welded Attachment](#)
- [Detail 108B: Purlin Fastening Zones – Mechanically Attached Assembly](#)
- [Detail 108C: Every Other Purlin Fastening Zones – Mechanically Attached Assembly](#)

NOTE: Additional purlins may need to be installed in corners and perimeters to provide appropriate attachment locations for fasteners in order to achieve desired wind uplift resistance.

Adhered & Self-Adhered Retrofit Roofing Systems: The following details are applicable:

- [Detail 816: 4' x 8' Roof Board Fastening Pattern – \(16\) Fasteners Per Board](#)
- [Detail 824: 4' x 8' Roof Board Fastening Pattern – \(24\) Fasteners Per Board](#)

Contact [Design Services](#) for perimeter and corner zone calculations.

Additional Structural Design Considerations

There are other structural design considerations when installing a TPO/PVC metal retrofit roofing system over existing metal roof panels on a metal building, such as:

- **Dead Load:** Additional dead load may come from two sources:
 - Added weight of the new roof, and
 - Added loads during winter from a lack of melted snow due to reduced heat loss from the insulation upgrade in the retrofit roof system.

Additionally, if the building is located in a jurisdiction that adopted the 2012, 2015, 2018, 2021, and 2024 editions of the International Existing Building Code (IEBC) and any one of the two conditions listed below occur due to reroofing, then the affected structural elements carrying the increased loads must be altered, strengthened or replaced with heavier members to meet International Building Code (IBC) design criteria:

1. The metal roof retrofit caused an increase in design dead, live or snow load (drift effects) of more than 5% of the original design; or
 2. The second layer of roof covering weighs more than 3 pounds per square foot.
- **Drag Load:** Drag load is a load that runs parallel to a sloped roof surface. With low-slope roof systems (i.e., 2:12 or less), the effect of drag load typically is insignificant. However, drag loads can pull metal roof panels down the slope of a roof. Factors that contribute to drag load are the weight of the roof system itself, and the additional weight of snow and ice. Drag load increases as roof slope increases. With a single-ply membrane retrofit system, drag loads are resisted by:
 - Attachment of the metal roofing panels to the structural purlins; Drag loads may be large enough to cause structural purlins to “roll.”
 - Lateral loading on the membrane fasteners. The greater the insulation depth, the greater the bending load on the fasteners.
 - **Purlin Continuity:** The most common purlin types are “Z” and “C” shaped sections. In many metal buildings, purlins are continuous over rigid steel frames or rafters, which serve as structural supports for the purlins.

Purlins are commonly lapped at the supports to achieve continuity. With “Z” purlins, purlins are typically lapped by nesting one inside another, see Figure 2. However with “C” purlins, purlins often are connected back-to-back for continuity, see Figure 3, and under these circumstances, a straight row of fasteners will not be achievable.

Where the “C” purlins are installed back-to-back, GAF recommends appropriate measures be taken, so that adjustment is made in the fastening pattern to ensure the attachment of the roofing system engages into the structural purlins.

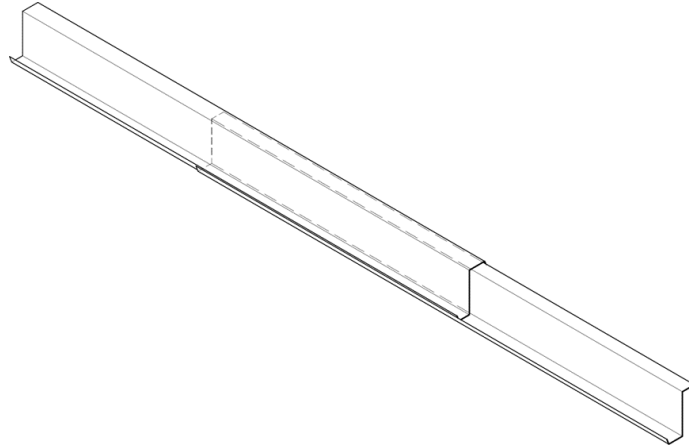


Figure 2: “Z” purlins lapped by nesting

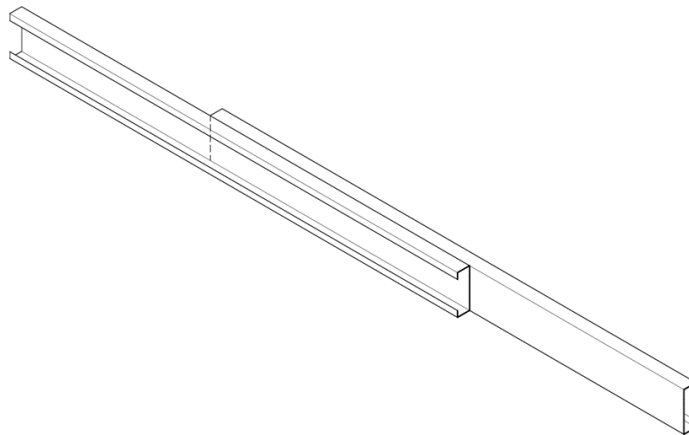


Figure 3: “C” purlins lapped back-to-back

- **Lateral Bracing:** Lateral Bracing is used to mitigate the effects of stress on structural members and is critical in resisting wind loads. In metal buildings, purlins should be braced to guard against bending, rotation or deformation.

Special attention should be paid to metal panel roofing systems with exposed fasteners, a.k.a. through-fastened metal roofs. With these types of applications, the metal panels are often relied upon to provide the diaphragm action to stiffen the building and brace the purlins. This may not be adequate for a metal roof retrofit. GAF recommends a licensed design professional be retained to evaluate the needs for the specific project.

GAF recommends purlins be braced when installing a single-ply roofing system over an existing metal panel roof system. See Figure 4 for examples of bracing.

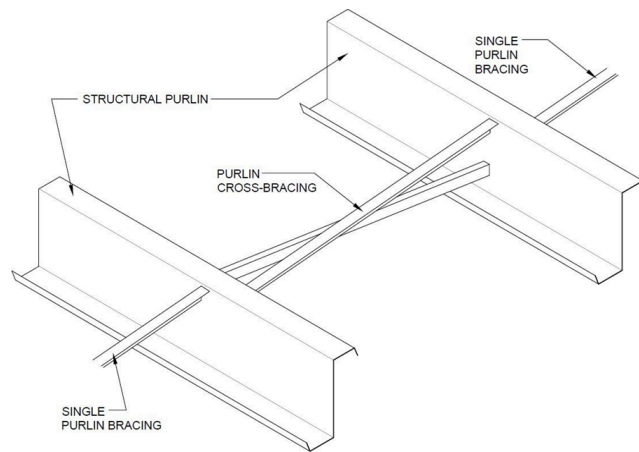


Figure 4: Examples of purlin bracing

Drainage Concerns

On metal panel roofing systems, water drains between the seams of metal roof panels. Since the water is confined to individual panel sections, this results in a uniform load on the structural system. Metal buildings are typically designed for balanced loading; therefore, equal loading across the purlins is critical. When a single-ply membrane is installed over a metal panel roof system, the water flow pattern is changed, because water is no longer confined by the panel seams.

Certain conditions can lead to ponded water, which may produce uneven loading of the structure. The following may contribute or exacerbate uneven loading situations due to ponding:

- Clogged gutters or scuppers, especially buildings with parapets or built-in (internal) gutters
- Surge of water as a result of a mechanically-attached single-ply membrane billowing from high winds
- Damaged or overloaded purlins
- Deflection in metal roof panels

Energy Code Requirements

In addition to the topics discussed in this section, the International Energy Conservation Code (IECC) has the following roofing-related (a.k.a., building envelope) requirements that may be applicable:

- Minimum thermal (above deck) roof insulation
- Solar reflectivity and thermal emissivity
- Air leakage

The IECC requirements vary by the edition adopted by the authority having jurisdiction and will also depend on other factors, such as the building type, occupancy, and location. GAF recommends consultation with a design professional to determine specific energy and building code requirements for the project.

ATTACHMENT TABLES

MECHANICALLY ATTACHED SYSTEMS¹

Maximum roof slope: 2:12

Maximum building height: 40 feet (12.2 m)

Standard wind speed coverage under GAF guarantees is 55 mph. See guarantee for coverage and restrictions.

Maximum enhanced wind speed coverage available: up to 72 mph, on eligible projects only; advanced written approval from GAF required.

Max. Purlin & Fastener Row Spacing	Purlin Type ²	Min. Pull-Out Value ³ (lbs/fastener)	Max. Fastener Spacing ¹		
			Field ⁴ Zones of Roof	Perimeter ⁴ Zones of Roof	Corner ⁴ Zones of Roof
Up to 5 ft. (60") [every purlin]	Min. 16 ga.	800	12" o.c.	6" o.c.	6" o.c.
	Min. 14 ga.	1000	18" o.c.	12" o.c.	12" o.c.
Up to 10 ft. (120") [every other purlin]	Min. 16 ga.	800	6" o.c.	12" o.c.*	6" o.c.*
	Min. 14 ga.	1000	6" o.c.	12" o.c.*	6" o.c.*

**Install fasteners into every purlin in perimeter and corner zones*

General Comments/Requirements

1. The values in the table are the minimum requirements to obtain a GAF guarantee and may not meet code required wind uplift pressures. Contact [Design Services](#) to obtain fastening patterns that meet wind uplift requirements.
2. The attachment capacity of the purlins to the secondary structure must be greater than the attachment capacity of the metal panels to the purlins, especially when an "every other purlin" attachment method is used.
3. Fastener pull-out testing is required. Results must be submitted to GAF for review and approval prior to job start.
4. Refer to Detail 108B for attachment information for every purlin roofing systems and Detail 108C for every other purlin roofing systems.

Fastener Pullout Testing

Fastener pull-out testing in accordance with ANSI/SPRI FX-1 Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners is recommended. Minimum 1" (25 mm) fastener embedment is required. Fastener pullout tests shall be conducted on the purlins with approved fasteners.

INDUCTION-WELDED SYSTEMS¹

Maximum roof slope: 2:12

Maximum building height: 40 feet (12.2 m)

Standard wind speed coverage under GAF guarantees is 55 mph. See guarantee for coverage and restrictions.

Maximum enhanced wind speed coverage available: up to 72 mph, on eligible projects only; advanced written approval from GAF required.

Max. Purlin & Fastener Row Spacing	Purlin Type ^{3,4}	Min. Pull-Out Value ⁵ (lbs/fastener)	Max. Fastener Spacing ¹		
			Field ⁶ Zones of Roof	Perimeter ⁶ Zones of Roof	Corner ⁶ Zones of Roof
Up to 5 ft. (60") [every purlin]	Min. 16 ga.	800	24" o.c. ²	12" o.c.	12" o.c.
	Min. 14 ga.	1000	24" o.c. ²	12" o.c.	12" o.c.
Up to 10 ft. (120") [every other purlin]	Min. 16 ga.	800	12" o.c.	12" o.c.*	12" o.c.*
	Min. 14 ga.	1000	12" o.c.	12" o.c.*	12" o.c.*

**Install fasteners into every purlin in perimeter and corner zones*

General Comments/Requirements

1. The values in the table are the minimum requirements to obtain a GAF guarantee and may not meet code required wind uplift pressures. Contact [Design Services](#) to obtain fastening patterns that meet wind uplift requirements.
2. Fasteners in the field zone must be offset by 12" o.c.
3. Membrane must be attached to the induction-welded plates that are installed directly into structural purlins with appropriate Drill-Tec™ Purlin Fastener.
4. The attachment capacity of the purlins to the secondary structure must be greater than the attachment capacity of the metal panels to the purlins, especially when an "every other purlin" attachment method is used.
5. Fastener pull-out testing is required. Results must be submitted to GAF for review and approval prior to job start.
6. Refer to Detail 108A for attachment information for induction-welded roofing system, including how to achieve offset in fastening pattern.

Fastener Pullout Testing

Fastener pull-out testing in accordance with ANSI/SPRI FX-1 Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners is recommended. Minimum 1" (25 mm) fastener embedment is required. Fastener pullout tests shall be conducted on the purlins with approved fasteners.

ADHERED & SELF-ADHERED SYSTEMS^{1,6,7}

Maximum roof slope: 2:12

Maximum building height: 40 feet (12.2 m)

Maximum purlin spacing: 5 feet (1.52 m)

Maximum design wind uplift pressure: 22.5 psf

Standard wind speed coverage under GAF guarantees is 55 mph. See guarantee for coverage and restrictions.

Drill-Tec™ Fastener	Drill-Tec™ Plate	Min. Pull-Out Value ^{2,3,4} (lbs/fastener)	Insulation Securement ^{1,6,7} (4' x 8' boards)		
			Field ⁵ Zones of Roof	Perimeter ⁵ Zones of Roof	Corner ⁵ Zones of Roof
#15 XHD	3" Flat	250	16	16	24
		300	16	16	16

General Comments/Requirements

1. The values in the table are the minimum requirements to obtain a GAF guarantee and may not meet code required wind uplift pressures. Contact [Design Services](#) to obtain fastening patterns that meet wind uplift requirements.
2. The attachment capacity of the metal panels to the purlins must be greater than the attachment capacity of the roof membrane to the metal panels.
3. Minimum 24–26 gauge metal roof panel thickness.
4. Fastener pull-out testing is required. Results must be submitted to GAF for review and approval prior to job start.
5. Refer to Details 816 and 824 for insulation board fastening patterns.
6. Wind uplift pressure calculations must be performed and submitted to GAF Design Services.
7. Adhered and self-adhered roof membrane systems have not been tested. Therefore, confirmation and verification of wind uplift resistance capacity may not be achieved.

Fastener Pullout Testing

Fastener pull-out testing in accordance with ANSI/SPRI FX-1 Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners is recommended. Minimum 3/4" (19 mm) fastener embedment is required. Fastener pullout tests shall be conducted on the metal panels with approved fasteners.

SPECIFICATION PLATES

TPO SYSTEMS SPECIFICATION PLATE				
T	MA	R	I	60
MEMBRANE TYPE	MEMBRANE ATTACHMENT	CONSTRUCTION TYPE	INSULATION	MEMBRANE
T = TPO	MA = Mechanically Attached IW = Induction-Welded FA = Adhered SA = Self-Adhered	R = Recover	I = Insulation	45 = 45 mil Smooth 60 = 60 mil Smooth 80 = 80 mil Smooth 50EX = 50 mil Extreme TPO 60EX = 60 mil Extreme TPO 70EX = 70 mil Extreme TPO 80EX = 80 mil Extreme TPO 60 = 60 mil Self-Adhered 80 = 80 mil Self-Adhered

PVC SYSTEMS SPECIFICATION PLATE				
P	MA	R	I	60
MEMBRANE TYPE	MEMBRANE ATTACHMENT	CONSTRUCTION TYPE	INSULATION	MEMBRANE
P = PVC	MA = Mechanically Attached IW = Induction-Welded FA = Adhered	R = Recover	I = Insulation	50 = 50 mil Smooth 60 = 60 mil Smooth 80 = 80 mil Smooth 50KEE = 50 mil KEE Smooth 60KEE = 60 mil KEE Smooth 80KEE = 80 mil KEE Smooth

DESIGN CONSIDERATIONS & APPLICATION GUIDELINES

The following are additional guidelines for roofing professionals on projects involving metal roof retrofit assemblies.

Substrate Surface Preparation & Site Conditions

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.

1. Substrate preparation is the sole responsibility of the building owner or roofing contractor.
2. Confirm the adequacy of the new roofing system to provide positive slope to drains.
3. Obtain verification that the building structure can accommodate the added weight of the new roofing system.
4. When staging materials on the roof during application, ensure the existing metal roof and structure are not temporarily overloaded by the weight of construction materials. Rolls of membrane, especially the 12 ft. (3.05 m) wide rolls, are exceptionally heavy.
5. Remove all existing roofing materials to the roof decking, including flashings, metal edgings, drain leads, pipe boots, and pitch pockets. If the wall/ curb flashings are in good condition and tightly adhered to the substrate, new TPO or PVC flashing materials may be installed over existing flashings to a height of 24" (610 mm) without adhesives.
6. Clean substrate surfaces of all adhesive contaminants.
7. Verify that the deck surface is dry, sound, clean and smooth, and free of depressions, waves, or projections.
8. Confirm quality and condition of the existing metal panel roof and structural purlins by visual inspection and fastener pull-out testing.
9. All defects in the existing metal panel roof system must be corrected by the responsible parties before new roofing work commences.
10. Secure all loose decking. Remove and replace all deteriorated decking.
11. Remove abandoned equipment and equipment supports.

12. Confirm that height of equipment supports will allow the installation of minimum 8in. (203 mm) flashing heights.
13. The existing metal panel roof system must be free of visible moisture, such as ponding water, ice, or snow.
14. Protect building surfaces against damage and contamination from roofing work.
15. Where work must continue over completed roof areas, protect the finished roofing system from damage.

Fasteners & Plates

Membrane Securement	Drill-Tec™ Fasteners ⁴	Drill-Tec™ Plates ⁵
Mechanically Fastened ^{1,2,3}	Purlin Fastener (#3 square or hex head)	2" Double Barbed XHD Plate
		2 3/8" Barbed XHD Plate
		2 3/8" Double Barbed XHD Plate
		2 3/8" Eye Hook® AccuSeam® Plate
Induction-Welded ^{1,2,3}	Purlin Fastener (#3 square or hex head)	RhinoBond® XHD Plate ⁶
		IW Plate ⁶
Adhered	#15 XHD Fastener	3" Flat Plate ¹

General Comments/Requirements

1. Drill-Tec™ 3" "flat" plates (without the countersunk screw holes protruding from the bottom of the plates) are required when plates are installed over hard surfaces such as DensDeck®, SECUROCK®, EnergyGuard™ HD Polyiso or other hard cover boards to allow the plates to rest flush on the surface.
2. Drill-Tec™ #15 Fasteners and 3" plates can be used for supplemental insulation attachment.
3. Installation tip: Square insulation plates, such as AccuTrac® plates, may be helpful in distinguishing them from round induction-weld plates.
4. Use fasteners that are suitable for the purlin type, and ensure that purlins are of the required condition to ensure reliable installation and performance.
5. Special care should be taken when fastening plates, so as not to overdrive or underdrive the fasteners. Overdriving the fasteners will result in a deformation or "cupping" of the plate and will result in an uneven or inadequate bond to the membrane when welded. Under-driving the fastener will result in a loose plate with insufficient clamping force and a protruding fastener head that could cause damage to the membrane during welding and through normal roof traffic.
6. The special coating on the plates allows for EverGuard® membrane to be welded to each plate using the magnetic induction welding tool. Drill-Tec™ RhinoBond® Plates are different in type and color: TPO plates are a yellow/green, while the PVC plates are black in color. Drill-Tec™ IW Plates are stamped to identify TPO or PVC. The appropriate plate must be used with the appropriate membrane type.

Insulation & Flute Filler

EnergyGuard™ Polyiso, EnergyGuard™ Ultra Polyiso Flute, or approved EPS/XPS flute fill must be of the same size and inserted in the existing metal standing seam roof panel to provide a level substrate for installation of the approved cover board or insulation boards.

Note: For guaranteed roofing systems, all insulation must be supplied by GAF.

1. For mechanically attached and induction-welded purlin attachment metal retrofit systems, use 5 fasteners per 4 ft. x 8 ft. (1.22 m x 2.44 m) board, with one fastener placed in each corner and one placed in the center.
2. For adhered metal retrofit systems without a cover board, a minimum 1.5" (38.1 mm) flat polyisocyanurate insulation must be used.
3. For adhered metal retrofit systems with a cover board, a minimum ½" (12.7 mm) of the following options must be used.
 - a. EnergyGuard™ HD Polyiso Cover Board
 - b. Georgia Pacific DensDeck® Prime
 - c. Georgia Pacific DensDeck® StormX™ Prime
 - d. USG Securerock® Brand Gypsum-Fiber Roof Board
 - e. National Gypsum Dexcell FA™ Glass Mat Roof Board
 - f. National Gypsum Dexcell FA VSH™ Glass Mat Roof Board

Wood Nailer Installation

1. Wood nailers must be installed to match the insulation heights on **all** perimeter edge and insulation pipe conditions.
2. Standing seam metal roof panels require two layers of wood nailers. The first layer of wood nailers shall be installed between the seams of the metal roof panels and attached directly to the structural purlins. A minimum of two fasteners are required between each standing seam. The second layer of wood nailers shall be attached to the first layer.
3. Corrugated metal roof panels must be sealed under the wood nailers to eliminate air and moisture infiltration.
4. Refer to the appropriate [EverGuard® TPO/PVC Roofing Systems Overview & General Requirements Manual](#) for additional requirements.

Membrane Installation

Mechanically Attached Roofing System into Purlins

1. Roll out membrane and remove any wrinkles or buckles from the sheet.
2. Overlap the end and side laps a minimum of 3 in. (76 mm) if fastening through the membrane sheet. If fastening in the seams, overlap side laps a minimum of 6 in. (152 mm).
3. Mechanically fasten roof membrane into the purlins using the appropriate purlin fasteners. Fasteners must be installed to achieve the proper embedment depth into the purlins.
4. Install fasteners vertically to the deck thru the plates, without lean or tilt. Plates should be drawn down tightly to the membrane surface. Do not overdrive or underdrive fasteners. Properly installed fasteners will not allow the plate to move (underdriving), and will not cause wrinkling of the membrane (overdriving).
5. Depending on sheet orientation and placement of the fasteners into the purlins, fasteners may be located in the seams of the membrane or in the field of the sheet. Fasteners not located in the seams should be covered by an 8" (203 mm) wide flashing strip hot air welded to the membrane.
6. Refer to construction details at www.gaf.com for visual depiction of flashing requirements.
7. Refer to the [EverGuard® TPO/PVC MECHANICALLY ATTACHED Roofing Systems Overview & General Requirements Manual](#) for additional requirements.

Induction-Welded Roofing System into Purlins

1. Install the appropriate purlin fasteners and induction-weld plates into the purlins prior to installing the membrane. Fasteners must be installed to achieve the proper embedment depth into the purlins.
2. Install fasteners vertically to the deck thru the plates, without lean or tilt. Plates should be drawn down tightly to the membrane surface. Do not overdrive or underdrive fasteners. Properly installed fasteners will not allow the plate to move (underdriving), and will not cause wrinkling of the membrane (overdriving).
3. Roll out membrane and remove any wrinkles or buckles from the sheet. Overlap the end and side laps a minimum of 3 in. (76 mm).
4. Maintain a 2 in. (51 mm) separation between the induction-welded fastening plates and membrane seams, as the plates prevent a consistent welded seam.
5. Induction weld the induction-welded plates to prevent sheet movement prior to seam welding to adjacent sheets.
6. Place the induction-weld tool over the coated plate and push the button. Wait about 5 seconds for the beep.
7. Clamp with a special magnetic clamp and repeat.
8. Since fastening patterns are different in the field, perimeter and corner areas, treat each as a separate zone and weld each zone separately. This helps ensure that all plates are welded as you move from zone to zone.
9. Heat-weld all EverGuard® reinforced membrane seams in accordance with heat-welding guidelines.
10. Refer to the [EverGuard® TPO/PVC INDUCTION-WELDED Roofing Systems Overview & General Requirements Manual](#) for additional requirements.

Adhered Roofing System over Metal Retrofit

1. Roll out membrane and remove any wrinkles or buckles from the sheet. Overlap the end and side laps a minimum of 3 in. (76 mm).

Bonding Adhesive – Smooth Reinforced Membrane

1. When using EverGuard® TPO and PVC bonding adhesives with smooth reinforced membranes, use any of the following substrates: polyisocyanurate insulation (without foil facer) or gypsum board.
2. For best results use a 3/8" (9.5 mm) solvent-resistant nap roller, brush, or squeegee. When using a roller, avoid taking the roller head out of the bucket, dropping it in one place, and beginning to roll.
3. Instead, remove the roller filled with adhesive and drop the roller on three areas to be glued, and then connect the adhesive drop areas. This will avoid an excess amount of adhesive in one place, and it will flash off faster and more uniformly. Prevent seam contamination by keeping the adhesive application a few inches back from the seam area.
4. Apply adhesive equally to both the substrate and underside of membrane.
5. For application rates and temperatures, refer to the [EverGuard® TPO/PVC ADHERED Roofing System Overview & General Requirements Manual](#).
6. Solvent-based adhesive must be allowed to dry until tacky to the touch before mating membrane.
7. Bond the membrane to the substrate and apply pressure by means of a roller or push broom to ensure complete bonding. Avoid trapping air between the membrane and the substrate.

Spray Bonding Adhesive – Smooth Reinforced Membrane

1. EverGuard® TPO Quick Spray Adhesive and Everguard® TPO Quick Spray LV 50 adhesive is for use with smooth reinforced membranes over any of the following substrates: polyisocyanurate insulation (without foil facer) or gypsum board.
2. Spraying the adhesive will require additional materials and equipment: The required gun tip is Unijet 11002.
3. For application rates and temperatures, refer to the [EverGuard® TPO/PVC ADHERED Roofing System Overview & General Requirements Manual](#).

4. Application of spray bonding adhesive:
 - a. Remove the EverGuard® Quick Spray Hose And Gun Kit. Before initial use, rotate the gun thumbwheel closed so that the trigger can't be pulled. Securely attach the gun to the hose and the hose to the canister. Fully open canister valve. Do not close until the canister is empty. A small adjustable wrench may be needed.
 - b. When not spraying, leave the tank and safety on with the line charged. When spraying is resumed, use EverGuard® TPO Quick Spray Adhesive Hose & Gun Cleaner on a clean rag to clean the nozzle tip.
 - c. Spray only on an approved substrate that is clean, dry and free of foreign matter.
 - d. Spraying from 8 to 12 inches (203 to 305 mm) away, apply adhesive uniformly to both the substrate and membrane without overlap. Keep the gun perpendicular to the surface.
 - e. Spray pattern should be approximately 8 to 12 inches (203 to 305 mm) wide when using the recommended Unijet 11002 gun tip.
 - f. Prevent seam contamination by keeping the adhesive application a few inches back from the weldable seam area.
 - g. Allow adhesive to partially dry (approximately 2-5 minutes). Adhesive should feel tacky before bonding the membrane to substrate.
 5. Bond the membrane to the substrate and apply pressure by means of a roller and push broom to ensure complete bonding. Avoid trapping air between the membrane and the substrate.
 6. In order to maintain the gun and hose once finished, lock the trigger and leave the canister valve OPEN. Keep the spray gun thumbwheel CLOSED when not in use. (Maximum 3 days) Keep canisters covered when not in use. To use adhesive after storage, clean with EverGuard® TPO Quick Spray Adhesive Hose & Gun Cleaner.
 7. To dispose of an empty tank, turn on the valve at the tank with the nozzle pointing away from you. Let all vapors evacuate the tank. On top of the tank is a recessed round metal plug. With the tank empty, knock out the plug and dispose of the empty tank.
2. Heat-weld all EverGuard® reinforced membrane seams in accordance with heat-welding guidelines.
 3. Refer to the [EverGuard® TPO/PVC ADHERED Roofing Systems Overview & General Requirements Manual](#) for additional requirements.

Self-Adhered Roofing System over Metal Retrofit

1. Roll out membrane and remove any wrinkles or buckles from the sheet. Overlap the end and side laps a minimum of 3 in. (76 mm).
2. Fold membrane in half longitudinally, exposing the split in the release liner. Peel the upper half of the release liner from the adhesive film back of membrane and lay to the side of the panel. Do not cut the release liner.
3. Roll 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. Broom in the sheet.
4. Apply pressure to the 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.
5. Install the other side of the sheet by folding the 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.
6. Apply pressure to the membrane using a weighted roller as specified above. Roll the remaining installed 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.
7. Position the next sheet to overlap the installed first course membrane a minimum of 3 in. (76 mm) while ensuring the laps are installed shingle-fashion to prevent backwater laps.
8. Heat-weld all EverGuard® reinforced membrane seams in accordance with heat-welding guidelines.
 - a. For selvage edge laps of EverGuard® SA TPO Self Adhered Membrane, overlap the roof membrane a minimum of 3 in. (76 mm) and heat weld the laps.
 - b. Non-selvage edge laps or end laps of EverGuard® SA TPO Self Adhered Membrane are made by butting adjacent sheets, and welding an 8 in. (203 mm) wide flashing strip cut out of smooth TPO membrane of the same thickness as the field sheet.
9. Refer to the [EverGuard® TPO/PVC SELF-ADHERED Roofing Systems Overview & General Requirements Manual](#) for additional requirements.