



**Attachment Guide
and Supplemental Increased Wind Speed
Warranty Attachment Guide**

March 2023

NOTE: The contents of this guide are considered accurate at the time of posting. All information contained within should be validated for accuracy as it relates to specific project conditions or requirements. Specific codes, uplifts or other factors may result in changes to the information contained within this document. Validate all specific conditions with a Holcim Regional Technical Coordinator prior to its use.

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Introduction

The purpose of this guide is to reinforce installation techniques. The following guide is a supplement to be used in conjunction with the other technical information located on the Elevate™ website (www.HolcimElevate.com). Reference to the specific Design Guide, Quick Specifications, Application Guide, Details, Technical Information Sheets (TIS), and other Specifications is necessary to ensure that the finished roof system is installed in compliance with Elevate requirements.

The following document outlines the required attachment rates and conditions that Holcim Solutions and Products US, LLC looks for to issue a warranty. When the project requires specific codes and/or uplifts to be met the attachment rates below may not be appropriate. Review of the specific project conditions and specifications should be completed, and all pertinent information must be provided to Holcim prior to the project being bid or installed. Failure to do so may result in required changes to the bids, products used, installation and/or possible denial of warranty coverage. Not all conditions are covered in this document. Please contact a Elevate Sales Representative or a Holcim Regional Technical Coordinator for conditions or information not found in this document.

Due to unknown variables associated with each building structure, Holcim suggests a licensed engineer to verify all attachment rates are appropriate for the specific project requirements. It is the responsibility of the Architect, Design Professional, Engineer and/or Building Owner to verify that the installed roofing system and related components are installed to meet the specified requirements of the International Building Code, State and Local codes and other related requirements. It is the responsibility of the specifier to review local, state, and regional codes to determine their impact on the specified system. Drainage must be evaluated by the specifier in accordance with all applicable codes. For code compliance, increased fastening density may be required depending upon project wind speed and wind uplift requirement. Subject to code requirement, it is recommended that a minimum roof slope of 1/8" per horizontal foot be provided to serve long-term aesthetics.

! IF A PROPOSED APPLICATION FALLS OUTSIDE OF THIS SPECIFICATION, CONTACT A HOLCIM REGIONAL TECHNICAL COORDINATOR FOR ADDITIONAL INFORMATION.

Within Elevate Specifications, reference is made to Elevate's Mechanically Attached Systems. Mechanically Attached Systems include:

- **Batten in The Seam (BITS) – Batten Bar or plates in the seam of the membrane.**
 - Plates are only allowed with reinforced membranes.
- **Mechanically Anchored System (Non-Reinforced Membrane) – MAS**
 - Lay out sheet battens on membrane, strip in
- **Mechanically Anchored System (Reinforced Membrane) - Reinforced MAS**
 - Lay out sheet, set plates or battens on membrane, strip in
- **Reinforced Mechanically Attached Strip – RMA**
 - Lay out strips over insulation; attach strip using plate or battens, place membrane over the strips.

Substrate and Substrate Requirements

General

1. The Elevate roof system depends on a suitable substrate to perform its intended function of weatherproofing the building.

! It is the roofing contractor's responsibility for ensuring that the substrate is acceptable for the Elevate roof system.

2. The substrate to which the Elevate roof system is installed must:
 - Be structurally sound
 - Be dry, smooth, flat, and clean
 - Be free of sharp fins, or foreign materials that could damage the membrane
 - Meet the minimum requirements for the system
3. When using asphalt to adhere to insulation to a structural concrete substrate, the concrete must be primed with an ASTM D 41 asphalt primer. The primer is applied at a rate of 1½ to 2 gallons per 100 ft² (0.61 to 0.82 L/m²). Proper flashing off times should be considered in all adhesive applications.

Acceptable substrates include but may not be limited to:

- 22-gauge steel decking, minimum 33 ksi
- Structural Concrete, minimum 2,500 psi

- Wood – Plank minimum ¾", Plywood minimum 15/32" or OSB minimum 7/16" thickness
- Cementitious Wood Fiber, minimum 2" thick
- Gypsum, minimum 2" thick
- Light Weight Insulation Concrete over Steel Pan or Structural Concrete, minimum 2" thick

Minimum Fastener Pullout Resistance for Specific System

The information listed in the chart below is for use with the referenced roof deck, fastener type, minimum pullout values and required penetration depths based on fasteners type. These values are in reference to mechanically attached insulation/cover boards under adhered membranes or mechanically attached membrane assemblies. If a listed value cannot be met, please contact a Holcim Regional Technical Coordinator to discuss. The information below is valid for Red Shield Warranties for up to 20 years. Contact a Holcim Regional Technical Coordinator for requirements on specific conditions or longer warranty terms.

Fastener Pullout Requirements – Material and Deck Type				
Deck Type	Material	Minimum Pullout ⁽³⁾	Fastener	Minimum Penetration
Steel, min. 22 gauge or heavier ⁽²⁾	Insulation	300 lb (136.1 Kg)	All Purpose (AP) Heavy Duty (HD) AccuTrac Kit	¾" through deck
	Membrane	400 lb (181.4 Kg)		¾" through deck
Steel, less than 22 gauge ⁽¹⁾⁽²⁾	Insulation	300 lb (136.1 Kg)	#12 Belted #15 Belted HailGard Heavy Duty Plus (HD+)	¾" through deck
	Membrane	N/A		¾" through deck
Structural Concrete 2,500 psi or greater (min. 2")	Insulation	300 lb (136.1 Kg)	Heavy Duty (HD) HailGard	1" into the deck
	Membrane	400 lb (181.4 Kg)	Concrete Drive	1 ¼" into the deck
Wood Plank, ¾" minimum	Insulation	300 lb (136.1 Kg)	All Purpose (AP) Heavy Duty (HD) AccuTrac Kit	1" into or through deck
	Membrane	400 lb (181.4 Kg)		
Oriented Strand Board (OSB), min. 7/16" thick	Insulation	300 lb (136.1 Kg)	#12 Belted #15 Belted Nail Driver HailGard	1" into or through deck
	Membrane	400 lb (181.4 Kg)		
Plywood, min. 15/32" thick	Insulation	300 lb (136.1 Kg)	Heavy Duty (HD) HailGard	¾" through pan
	Membrane	400 lb (181.4 Kg)		
Lightweight Insulating Concrete over Steel Pan	Insulation	300 lb (136.1 Kg)	1.7" LWC Base Ply Fastener*	Base Sheets Only
	Membrane	400 lb (181.4 Kg)		
	Nailed B.S.	40 lb (18.1 Kg)		
Lightweight Insulating Concrete over Structural Concrete	Insulation	300 lb (136.1 Kg)	Heavy Duty (HD) HailGard	1" into Concrete Deck
	Membrane	400 lb (181.4 Kg)	Concrete Drive	1 ¼" into Concrete Deck
	Nailed B.S.	40 lb (18.1 Kg)	1.7" LWC Base Ply Fastener*	Base Sheets Only
Gypsum, min. 2" thick	Insulation	300 lb (136.1 Kg)	Polymer Fastener	1" into the deck
	Membrane	N/A		
	Nailed B.S.	40 lb (18.1 Kg)		
Cementitious Wood Fiber, Min. 2" thick	Insulation	300 lb (136.1 Kg)	Polymer Fastener	1" into the deck
	Membrane	N/A		
	Nailed B.S.	40 lb (18.1 Kg)		
Base Sheet Attached to Deck with Plates and Fasteners	300 lb (136.1 Kg)		See approved fasteners	See approved fasteners
Structural Steel (Purlin)	16 ga.	800 lbf	Elevate Purlin Fastener	Min. 1" penetration into purlin
	12 ga.	1,000 lbf		
	1/8"	1,000 lbf		

NOTE:

1. Steel Decks 22 gauge or less may require additional fastening enhancements if min. pull values cannot be met.
2. Mechanically Attached Systems are not approved over corrugated steel decking.
3. Systems using Invisiweld Plates will require the fasteners to achieve a minimum of 400 lb pull resistance.
4. When Oriented Strand Board (OSB) is to be used the smooth side of the board should be facing up.

*For the attachment of base sheets only. Insulation may not be attached with the LWC Base Ply Fasteners or Two-Piece Impact Nail.

Table 1: Fastener Pullout Requirements – Material and Deck Type

! Holcim does not approve of or recognize the results of destructive testing by others for the purposes of project close-out or to satisfy contract requirements. Any damage caused by such testing may prevent

Holcim from issuing a warranty. Holcim is not responsible for costs associated with repairs or enhancements performed to the roof system as a result of testing.

Criteria for Field Testing Mechanical Attachment to Various Deck Substrates

Fastener pull tests should be performed in accordance with the requirements listed within ANSI/SPRI FX-1, Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners. All pull tests should be documented via Pullout Test Report and provided to Holcim. Official pullout results may impact the required fastening rates for the project.

Building Configuration

BUILDING, ENCLOSED; BUILDING, OPEN; BUILDING, PARTIALLY ENCLOSED; BUILDING, PARTIALLY OPEN: These definitions relate to the proper selection of internal pressure coefficients, (GCpi). “Enclosed,” “open,” and “partially enclosed” buildings are specifically defined. All other buildings are considered to be “partially open” by definition, although there may be large openings in two or more walls. An example of this would be a parking garage through which the wind can easily pass but which does not meet the definition for either an open or a partially enclosed building. The internal pressure coefficient for such a building would be ± 0.18 , and the internal pressures would act on the solid areas of the walls and roof. The standard also specifies that a building that meets both the “open” and “partially enclosed” definitions should be considered “open”.

ENCLOSED: A building that has the total area of openings in each wall, which receives positive external pressure, less than or equal to 4 sq ft (0.37 m²) or 1% of the area of that wall, whichever is smaller.

PARTIALLY ENCLOSED: A building that complies with both of the following conditions:

1. The total area of openings in a wall that receives positive external pressure exceeds the sum of the areas of openings in the balance of the building envelope (walls and roof) by more than 10%.
2. The total area of openings in a wall that receives positive external pressure exceeds 4 ft² (0.37 m²) or 1% of the area of that wall, whichever is smaller, and the percentage of openings in the balance of the building envelope does not exceed 20%.

OPEN: A building that has each wall at least 80% open.

- A building that meets both the “open” and “partially enclosed” definitions should be considered “open.”

PARTIALLY OPEN: A building that does not comply with the requirements for open, partially enclosed, or enclosed buildings.

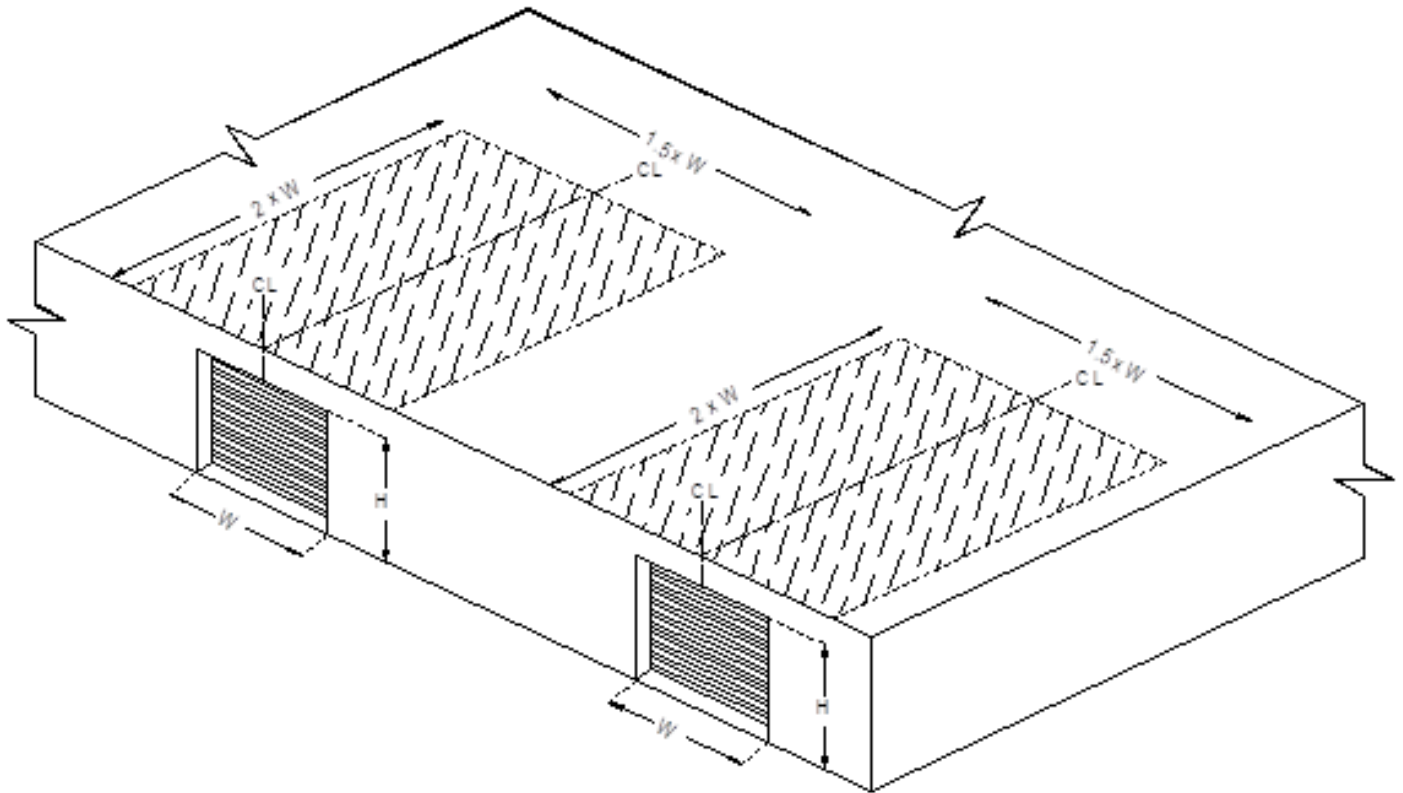
- An example of this would be a parking garage through which the wind can easily pass but which does not meet the definition for either an open or a partially enclosed building.

Large Wall Opening

ASCE 7 should be consulted to determine the appropriate building configuration, enclosed, partially enclosed or open. The building configuration impacts the appropriate design and attachment required for the roofing system. If an existing building is altered, adding large openings, change of use, etc., adjustments may need to be made to accommodate the changes.

The large wall opening enhancement is required when the sum of the various opening areas ($w \times h$) is greater than 10% of the wall area.

Perimeter $\frac{1}{2}$ sheets are required in the hatched area as shown in the diagram below. It is common installation practice to extend the perimeter along this entire building plan dimension to accommodate this rule, but it is not required. For warranty purposes Holcim finds it acceptable to utilize battens, plates, and fasteners or Invisiweld attachment methods for this enhancement.



Roof Zone Definition – Factory Mutual (FM)

The following diagrams are referenced from the FM Global Property Lost Prevention Data Sheets 1-28 and 1-29. This outlines how to determine the minimum required roof zone areas based on the building size and relative conditions.

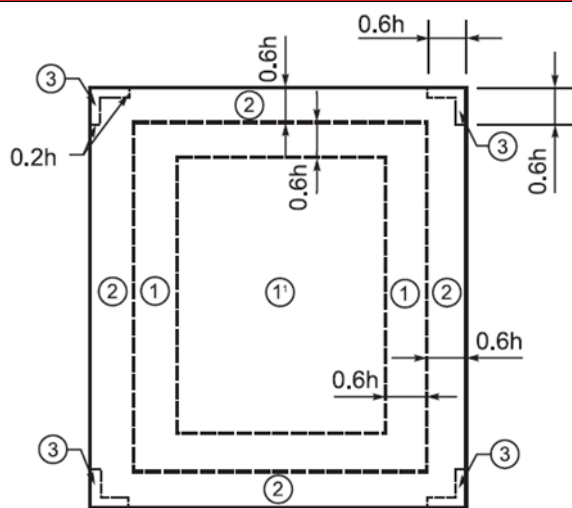
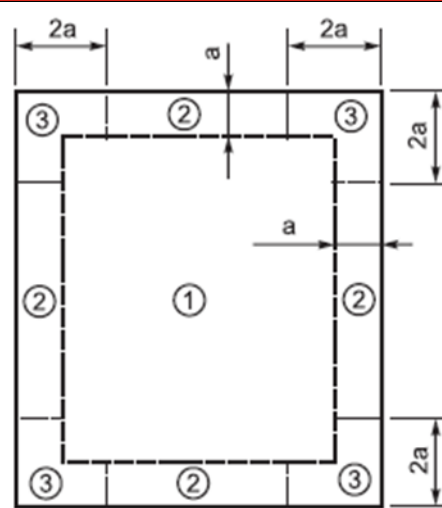
Roof Zone Layout Based on Building Height	
	
<p>For low-slope roofs $\leq 7^\circ$ (1.5 in./ft. slope) and $h \leq 60$ ft (18 m), or $h < 90$ ft (27 m) and $h/w \leq 1.0$, the roof can be divided into four zones as a function of h, where h = the mean roof height.</p> <p>Zone 3 (Corner): The roof corners, with L-shaped dimension = $0.6h$ by $0.6h$ by $0.2h$.</p> <p>Zone 2 (Perimeter): The roof perimeter, inward from the roof edge, with rectangular dimension and width = $0.6h$ from roof edges.</p> <p>Zone 1 (Field): The field-of-roof (area inside corners and perimeter corners) up to a distance of $1.2h$ from the roof perimeter.</p> <p>Zone 1' (Field Prime): Applies to relatively wide buildings ($> 2.4h$) and covers the remaining roof area inward from Zone 1.</p>	<p>Roof Slopes $\leq 7^\circ$ (1.5 in./ft slope) and $h > 60$ ft (18 m) for $h/w > 1.0$; or $h \geq 90$ ft (27.4 m) for $h/w \leq 1.0$, the roof can be divided into three zones as a function of a, where $a = 10\%$ of the lesser plan dimension, but not less than 3 ft (0.9 m).</p> <p>Zone 3 (Corner): The roof corners, with L-shaped dimension = $2a$ by $2a$ by a.</p> <p>Zone 2 (Perimeter): The roof perimeter zone width dimension = a width in from roof edges.</p> <p>Zone 1 (Field): The field-of-roof (area inside corners and perimeter areas) is the remainder of the roof area.</p>
<p>NOTE: If a parapet with a minimum height of 3 ft (0.9 m) is provided around the entire perimeter, Zone 2 values may be used in Zone 3.</p>	
<p>Example: Roof height of 30' $.6 \times 30' = 18'$ $.2 \times 30' = 6'$ Zone 3 (Corner): 0.6×30 by 0.6×30 by $0.2 \times 30 = 18' \times 18' \times 6'$ Zone 2 (Perimeter): $0.6 \times 30 = 18'$ Zone 1 (Field): $0.6 \times 30 = 18'$ Zone 1' (Field Prime): Covers the remaining roof area inward from Zone 1.</p>	<p>Example: Roof size and height of $55' \times 55' \times 65'$ $10\% \text{ of } 55' = 5.5'$ $a = 5.5'$ Zone 3 (Corner): $2 \times 5.5'$ by $2 \times 5.5'$ by $5.5' = 11' \times 11' \times 5.5'$ Zone 2 (Perimeter): $5.5'$ Zone 1 (Field): Remainder of roof area</p>

Table 2: Roof Zone Layouts Based on Building Height

Roof Slopes > 7° (>1.5")

For roof slopes > 7° (> 1.5"), depending on the slope. The width (a) of the various perimeter and corner zones for these steeper sloped roofs equals the lesser of 10% of the building width or 0.4h, but not less than 4% of the width or 3 ft (0.9 m). See FM Global Property Loss Prevention Data Sheet 1-28 for your specific conditions.

Roof Elevation Changes	
Elevation Change of ≥ 10 ft	Elevation Change of < 10 ft
<p>Where the difference in roof elevations between abutting buildings or building sections is greater than or equal to 10 ft (3.0 m), treat abutting areas of the higher building as perimeter and corner areas in accordance with figure shown above.</p>	<p>Where the difference in roof elevations between abutting buildings is less than 10 ft (3.0 m), follow guidance in figure shown above. The perimeter and field zones continue from one roof to the other. The buildings must be abutting for this to apply.</p>
<p>NOTE: The buildings do not abut if there is any horizontal separation.</p>	

Table 3: Roof Elevation Changes – Roof Zone Layout

Prescriptive Enhancement Options – Perimeter and Corner

Adhered Membrane – Insulation Enhancement

Insulation Prescriptive Enhancement – Choose One	
Option 1:	Use a system that is rated adequate for Zone 3 in all areas of the roof.
Option 2:	Prescriptive enhancements for Zones 2 and 3
Limitations:	<ul style="list-style-type: none"> ▪ Zone 1 rating in any location does not exceed Class 1-90 ▪ Building is in non-tropical cyclone-prone region and Zone 1 rating does not exceed Class 1-105
For either of the above conditions, increase the securement over the Zone 1 rating as follows:	
Assemblies using insulation fasteners:	
Zone 2:	Increase number of fasteners per board by 50% minimum, but at least one fastener per 2 ft ²
Zone 3:	Install one fastener per 1 ft ²
NOTE: Round up to the next whole fastener if necessary.	
Components adhered with adhesives applied in ribbons, spots, etc.:	
Zone 2:	Install rows not more than 67% of the Zone 1 spacing between rows, or area
Zone 3:	Install rows not more than 50% of the Zone 1 spacing between rows, or area
NOTE: Round the bead spacing down to the next whole number. 8.71 in o.c. beads spacing would be rounded down to 8 in o.c.	

Table 4: Insulation Prescriptive Enhancement – Choose One

Mechanically Attached Membrane

Membrane Prescriptive Enhancement – In Seam Securement

Prescriptively enhance by reducing the distance between rows of roof cover fasteners and stress plates or batten bars from the Zone 1 spacing using the following:

Zone 2: Ensure distance between rows is not more than 67% of the FM approved spacing used for Zone 1

Zone 3: Ensure distance between rows is not more than 50% of the FM approved spacing used for Zone 1

NOTE: For metal decks install all rows of roof cover fasteners perpendicular to the ribs of the roof deck to better distribute the wind load and prevent deck failure.

Example:

A 75 psf rated assembly using a 10' sheet size for Zone 1 (Field), decrease the row spacing for Zone 2 (Perimeter) by no more than 67% and Zone 3 (Corner) by no more than 50% of the field sheet span. (Always round down.)

Zone 1 (Field): 10' Sheets at 114" o.c. rows of fasteners

Zone 2 (Perimeter): 114" rows x .67 = 76.38" rows = Max 76" o.c. rows

Zone 3 (Corner): 114" rows x .5 = 57.5" rows = Max 57" o.c. rows

Table 5: Membrane Prescriptive Enhancement – In Seam Securement

Factory Mutual (FM) InvisiWeld Attachment Rates

FM attachment requirements and patterns may differ from those required by Holcim. The more stringent attachment rates should be used in this case. If the project is FM insured, then consult a Holcim Regional Technical Coordinator to discuss differences between the two. The attachment rates listed below are based off listed assemblies within RoofNav and are believed to be current. All assemblies and attachment rates should be validated against current information and tested assemblies before using for bidding or installation.

Uplift Rating	Field	Perimeter	Corner	Assembly/RoofNav (See Notes)
1-90 (20 Year, 55 mph)	6 5.33 Contributory Area (CA)	9 Reduce the field CA by no less than 67%	12 Reduce the field CA by no less than 50%	TPO, ISO, Steel Deck Field Rates based on listed tested assembly: 250651-0-0

NOTE:

1. Field/Zone 1 rating in any location does not exceed Class 1-90.
2. The building is in non-tropical cyclone-prone region and Field/Zone 1 rating does not exceed Class 1-105.
3. Validate all attachment rates against tested assemblies. See table below for example.
4. Rates above are based on contributory area rates.
5. 0.045" (1.14 mm) thick TPO or 0.050" (1.27 mm) thick PVC/PVC KEE approved for 15-year warranties.
6. 0.060" (1.52 mm) thick or greater membrane required for 20-year or greater warranties.
7. 0.060" (1.52 mm) thick or greater membrane required for any increased wind speed warranties.
8. 0.080" (2.03 mm) thick UltraPly TPO required for 25 and 30-year warranties.
9. PVC/PVC KEE is limited to 20-year warranties with Invisiweld attachment.
10. If RoofNav listing has linear rows listed instead of contributory area, decrease the spacing between rows by a minimum 67% for the perimeters and 50% for the corners. These assemblies may still require preliminary securement fasteners to be installed. See the RoofNav listing for details.

Table 6: Factory Mutual (FM) InvisiWeld Attachment Rates Example

Invisiweld Attached Membrane Securement Prescriptive Enhancements

Membrane Securement Enhancements – Invisiweld

Prescriptively enhance by reducing the distance between rows of roof cover fasteners and stress plates from the Zone 1 spacing using the following:

Zone 2: Decrease spacing between fastener points in one or both directions. Ensure the total tributary area to each fastener is not more than 67% of the FM approved spacing used for Zone 1.

Zone 3: Decrease spacing between fastener points in one or both directions. Ensure the total tributary area to each fastener is not more than 50% of the FM approved spacing used for Zone 1.

NOTE:

- Pre-securement of the insulation may be required.
- See tested assembly for validation.
- When rows of fasteners are used Install all rows of roof cover fasteners perpendicular to the ribs of the roof deck to better distribute the wind load and prevent deck failure.

Example:

(Based on FM LPDS 1-29, Section 2.2.10.11.1B3-4)

Zone 1: 6 fasteners per board per tested assembly (tributary area of 5.33 sq. ft. per fastener)

Zone 2: 9 fasteners per board (tributary area of 3.56 sq. ft. per fastener)

Zone 3: 12 fasteners per board (tributary area of 2.67 sq. ft. per fastener)

Table 7: Membrane Securement Enhancements - Invisiweld

Base Sheet Attachment Over FM Approved Deck Types

The table below outlines the options for prescriptive enhancement options for base sheet attachment over FM approved deck types. For non-FM approved deck types, like wood, see FM Global Property Loss Prevention Data Sheet 1-29, Section 2.2.10.14.4.

Base Sheet – Mechanically Attached – Choose One	
Option 1	Use assembly that is rated to meet/exceed Zone 3 across the whole roof.
Option 2	Use assembly that is rated to meet/exceed each zone.
Option 3	Reduce the spacing between rows of fasteners by using one intermediate row in Zone 2 and Zone 3.
Option 4	Reduce the area per fasteners to no more than 67% of the FM approved spacing in Zone 2, and not more than 50% of the FM approved spacing in zone 3.
NOTE: <ul style="list-style-type: none"> ▪ Install fasteners that engage lightweight insulating concrete (LWIC) no closer than 4 in. (100 mm) on center to avoid cracking the LWIC. ▪ When ribbed deck, such as steel deck is used, the fastener spacing within fastener rows must be in even multiples of the deck rib spacing (6 in. [150 mm] for 1-1/2 in. [38 mm] deep deck) to ensure the fastener engages the top deck flange. ▪ To adequately distribute the wind load to the roof deck and its securement and prevent deck buckling and deck securement failure, install fastener rows perpendicular to the deck ribs. 	

Table 8: Base Sheet – Mechanically Attached – Choose One

Mechanically Attached Membrane – Preliminary Insulation Securement

The table below provides the minimum preliminary insulation fastening rate required for systems using a mechanically attached membrane. Note the rates may differ based on the use or a vapor retarder, different building enclosure classification and building Zone 1 (Field) pressure rating.

Preliminary Insulation Securement				
Vapor Retarder	Building Enclosure Classification	Maximum Required Zone 1 Pressure Rating (P), psf (kPa)	Fastener Requirements for Insulation or Cover Boards up to 4 x 4 ft (1.2 x 1.2 m) board	Fastener Requirements for Insulation or Cover Boards up to 4 x 8 ft (1.2 x 2.4 m) board
No	Enclosed or Partially Enclosed	No limit	Minimum 2 per board	Minimum 4 per board
Yes	Enclosed	P = 60 (2.9)	Minimum 2 per board	Minimum 4 per board
Yes	Partially Enclosed	P = 60 (2.9)	Minimum 4 per board	Minimum 5 per board
Yes	Enclosed or Partially Enclosed	60 < P ≤ 90 (2.9 < P ≤ 4.3)	Minimum 4 per board	Minimum 5 per board
Yes	Enclosed	90 < P ≤ 300 (4.3 < P ≤ 14.4)	Minimum 4 per board	Minimum 8 per board
Yes	Partially Enclosed	90 < P ≤ 300 (4.3 < P ≤ 14.4)	Minimum 6 per board	Minimum 12 per board
Yes	Enclosed	P > 300 (14.4)	Minimum 6 per board	Minimum 12 per board
Yes	Partially Enclosed	P > 300 (14.4)	Minimum 8 per board	Minimum 16 per board
NOTE: Table 6 does not apply to roof assemblies with air barriers. Where air barriers are used, more stringent guidelines may be required in RoofNav and those must be followed.				

Table 9: Preliminary Insulation Securement

ASCE 7 – Basic Wind Speeds for Risk/Occupancy Category

The American Society of Civil Engineers (ASCE) provides basic wind speed maps based on Occupancy/Risk Category of buildings. Refer to the appropriate version of the ASCE for wind maps specific to the building’s occupancy category. These maps can be found in the specific editions of the ASCE and can be found at www.atcouncil.org/windspeed. Locations that fall within a special wind region should be reviewed by an engineer to validate the full scope of the project’s requirements.

ASCE – American Society of Civil Engineers – Roof Zones

ASCE 7-10 (IBC 2015/2012)

ASCE 7-10 offers basic wind speed maps for occupancy categories I, II, III and IV. In this edition of the ASCE Occupancy Category III and IV are combined on the same map, while categories I and II have their own maps. In this edition three maps are provided based on Occupancy/Risk Category. This version of the ASCE uses a more generalized approach to the areas of the county where most of the county falls within one wind speed and the coastal areas are more defined with contour lines and varying wind speeds.

ASCE 7-10 Perimeter and Corner Definition - Examples

The diagram below is an example only. Each building type and shape may require its own specific layout for perimeters and corners. ASCE 7-10 should be consulted for nonstandard building/roof types and shapes.

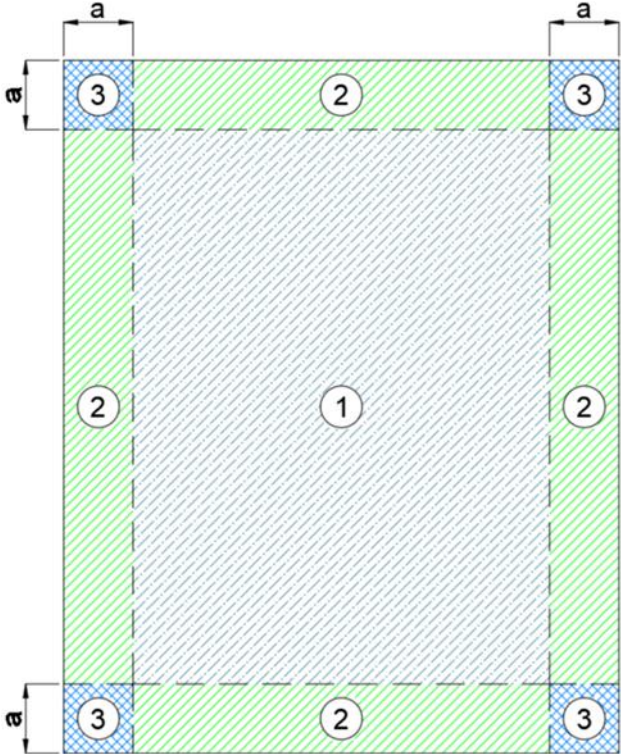
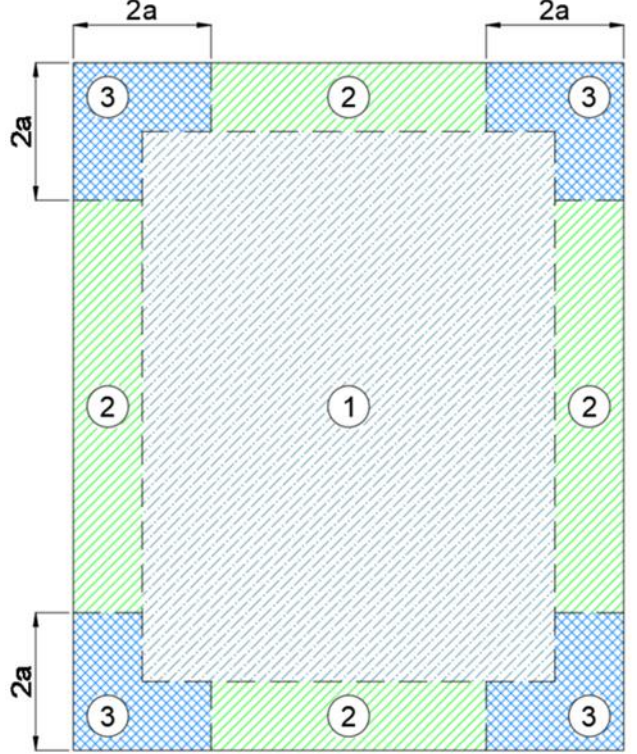
Roof Heights Where $h \leq 60$ ft.	Roof Heights Where $h > 60$ ft.
	
<p>Notation: a = 10 percent of least horizontal dimension or $0.4h$, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m). h = Eave height shall be used for $\theta \leq 10^\circ$. θ = Angle of plane of roof from horizontal, in degrees.</p>	<p>Notation: a = 10 percent of least horizontal dimension, but not less than 3 ft (0.9 m). h = Eave height shall be used for $\theta \leq 10^\circ$. θ = Angle of plane of roof from horizontal, in degrees.</p>

Table 10: ASCE 7-10 Perimeter and Corner Zone - Examples

ASCE 7-16 (IBC 2018)

ASCE 7-16 offers basic wind speed maps for occupancy categories I, II, III and IV. In this edition of the ASCE all Occupancy/Risk Categories have been defined on their own maps. In this edition four maps are provided based on Occupancy/Risk Category. This version of the ASCE uses more detailed contour lines throughout the map showing more accurate wind speed estimates.

ASCE 7-16 Perimeter and Corner Definition - Examples

Data referenced from ASCE/SEI 7-16 Minimum Design Loads and Associated Criteria for Buildings and Other Structures. All referenced information should be validated against the current document and local relevant building codes. Roof zones may change based on actual building size/layout and roof type. See ASCE documents to validate zones based on building conditions.

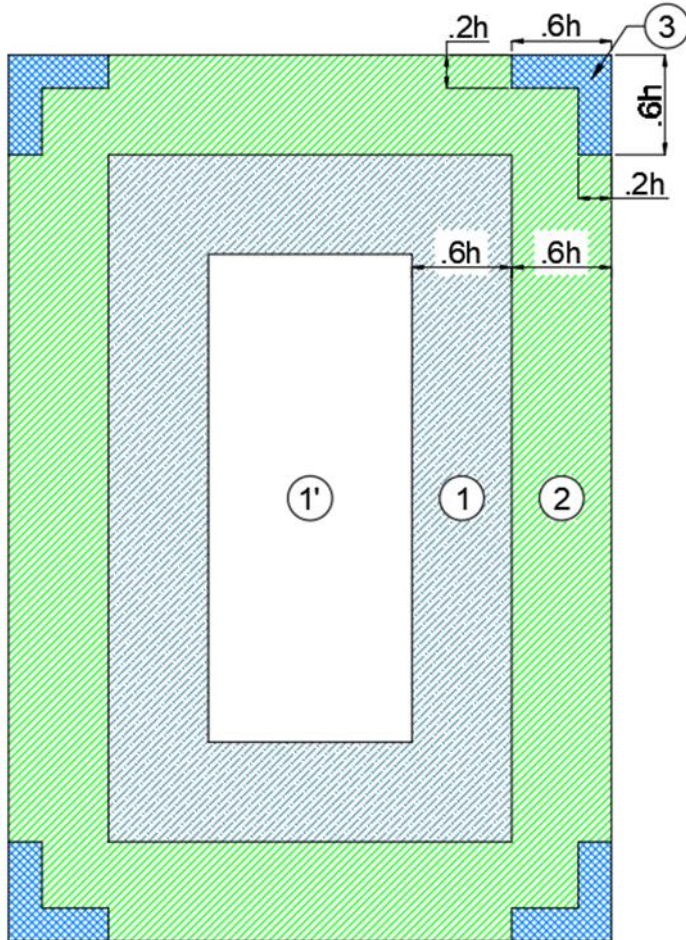
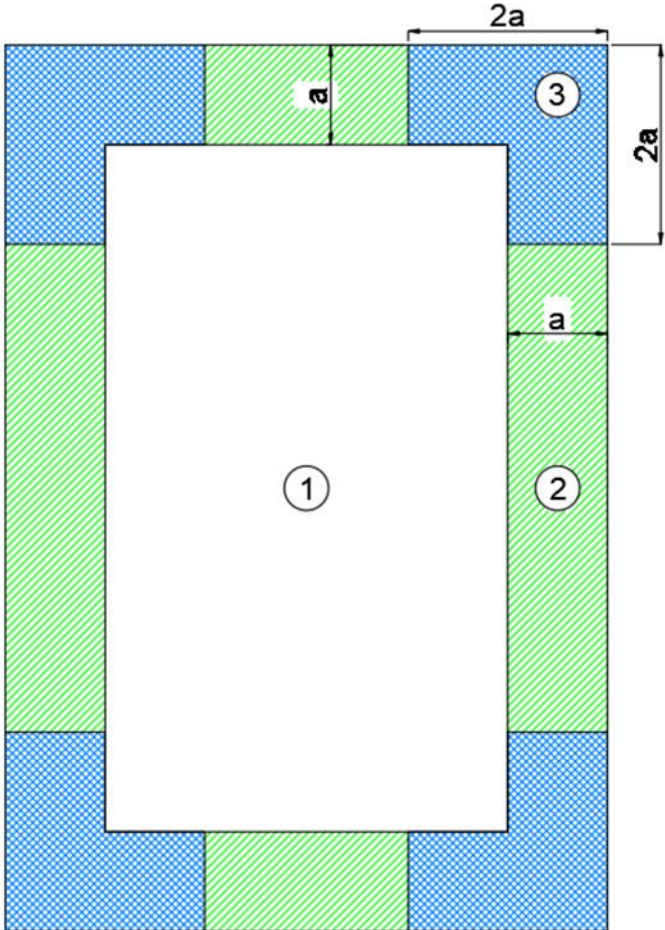
Roof Heights Where $h \leq 60$ ft.	Roof Heights Where $h > 60$ ft.
	
<p>Roof Zone Layout Example for Building Height $\leq 60'$ (Roof Slope $\leq 1.5'' (7^\circ)$) h = Roof Height</p>	<p>Roof Zone Layout Example for Building Heights $> 60'$ (Roof Slope $\leq 1.5'' (7^\circ)$) a = 10% of least horizontal dimension, but not less than 3 ft (0.9 m).</p>
<p>Example: Building Height = 30 ft .6h = 18 ft .2h = 6 ft Zone 3: 18' x 18' x 6' Zone 2: 18' Zone 1: 18' Zone 1': Remainder</p>	<p>Example: Building Dimensions: 80' x 200' Least Horizontal Dimension: 80' $a = 8'$ $2a = 16'$ Zone 3: 16' x 16' x 8' Zone 2: 8' Zone 1: Remainder</p>

Table 11: ASCE 7-16 Perimeter and Corners Zones - Examples

ASCE 7-16 – Potential Zone Layouts Based on Building Ratio Scenario (Height 60' or less)

The figures below have been referenced from the ASCE 7-16 standard. (Figure C30-1)

<p>Buildings with least horizontal dimension greater than $2.4h$.</p> <p>Example: $600' \times 1,000' \times 30' = .2h: 6' \text{ \& \ } .6h: 18'$ Zone 3: $18' \times 18' \times 6'$ Zone 2: $8'$ wide from roof edge Zone 1: $8'$ wide in from Zone 2 Zone 1': Remainder</p>	<p>Buildings with least horizontal dimension greater than $1.2h$ but less than $2.4h$.</p> <p>Example: $50' \times 100' \times 30' = .2h: 6' \text{ \& \ } .6h: 18'$ Zone 3: $18' \times 18' \times 6'$ Zone 2: $18'$ wide from roof edge Zone 1: Remainder</p>
<p>Buildings with least horizontal dimension less than $1.2h$ and largest horizontal dimension greater than $1.2h$.</p> <p>Example: $30' \times 50' \times 30' = .2h: 6' \text{ \& \ } .6h: 18'$ Zone 3: $6'$ wide from roof edge, 18 legs Zone 2: Remainder</p>	<p>Building with largest horizontal dimension less than $1.2h$.</p> <p>Example: $20' \times 20' \times 20' = .2h: 4'$ Zone 3: $4'$ wide from roof edge Zone 2: Remainder</p>
<p>When the greatest horizontal dimension is less than $0.4h$, the whole roof area is considered Zone 3.</p>	

Table 12: ASCE 7-16 – Potential Zone Layouts Based on Building Ratio Scenario (Height 60' or less)

Insulation Attachment

General

1. Insulation must provide a suitable substrate for the proposed roof system as well as insulation for the building.
2. Insulation thickness requirements may vary for code compliance. Contact the local code or insurance official before contacting a Holcim Regional Technical Coordinator at 1-800-428-4511.
3. Refer to Insulation Technical Information Sheet (TIS) for specific spanning capabilities.

Attachment

1. Insulation may be installed by various methods including fasteners, adhesives, and asphalt. It is acceptable to combine fastener and adhesive attachment methods in multi-layer applications.
2. Tapered insulation below the 1" (25.4 mm) minimum thickness must be fastened at a rate of one (1) fastener and plate per two (2) ft² (0.22 sq. m). If possible, install the tapered insulation first, covered by the flat stock.
3. Refer to specific Elevate Technical Information Sheets (TIS) for installation and fastening requirements.
4. When a composite of two insulation layers is installed, the fastening pattern required for the top board thickness must be used. A common fastener may be used to install multilayer applications. Some restrictions apply to fastener length depending on the standards used.

Multiple Layers of Insulation

1. Where overall insulation thickness is 2" (50.8 mm) or greater, Holcim recommends installing the insulation in two (2) or more layers.
2. Insulation may be installed in one or multiple layer applications for the Red Shield Warranty. If installed in multiple layers, the joints of each succeeding and adjoining layer should be staggered from the joints of previous layers by a minimum of 6" (152.4 mm) in each direction. When a composite of two insulation layers is installed, the fastening pattern required is dependent on the top board type and thickness. A common fastener may be used to simultaneously fasten all layers to the structural deck.

Attachment of Insulation to Substrate – Adhered Membrane

Red Shield Warranty	Thickness	Insulation	Insulation/Substrate Attachment ²	
			Min. # of Fasteners per 4' x 8' boards	Adhesive Ribbon Spacing 4' x 4' boards ³
55 mph (25 Year Max.) ³	¼"	DensDeck® Prime	12	F12 – P6 – C6 ³
	½"		8	
	⅝"		8	
	¼"	Securock®	10	
	½"		8	
	⅝"		8	
	½"	ISOGARD HD	12	
	½" – 1.4"	ISOGARD GL/ ISO 95+ GL/ Resista/ISOGARD CG	16	
	1.5" – 1.9"		12	
	≥ 2"		8	
	1.5"	ISOGARD HD Composite	12	
	2"		8	
	1.5"	HailGard/ISOGARD HG	12	
	2"		8	
⅝"	DensDeck® StormX™ Prime ¹	8		
55 mph (30 Year Max.)	Any Listed Above		16	F12 – P6 – C4 ³

NOTE:

1. Uplift requirements for the project may require increased fastening rates than those listed above. The rates listed in these tables are for warranty purposes only. Contact an Elevate representative for rates related to special warranty terms or conditions.
2. Applications where adhesives are used to adhere insulations directly to the steel deck require that the deck be clean, smooth, dry, and free of all processing oils or other contaminants. Bead spacing in this type of application may be increased from those listed above. Contact an Elevate representative for further information.
3. Adhesion direct to steel decking will require bead spacing to be increased to full covers (every flute) and limit increased wind speed coverage to a maximum of 80 mph.

Table 13: Attachment of Insulation to Substrate – Adhered Membrane

Mechanical Attachment of Insulation to Substrate – Mechanically Attached Membrane

1. Insulation must be fastened with appropriate Elevate fasteners and insulation plates. See Allowable Fastener tables below for information on use and warranty terms of fasteners for insulation attachment in mechanically attached membrane systems.
2. See Allowable Fastener tables below for information on use and warranty terms of fasteners for insulation attachment in mechanically attached membrane systems.
3. Fastening rates and patterns may vary for code or regulatory compliance. Contact the local code or insurance official before contacting a Holcim Regional Technical Coordinator at 800-428-4511.

Fastening Rates for Insulation in Mechanically Attached Single-Ply Systems ¹						
Maximum Warranty Term	Top Layer of Insulation		Number of Fasteners per Insulation Board ³			
	Insulation	Thickness	No Air Retarder		With an Air Retarder ²	
			4' x 4' Board	4' x 8' Board	4' x 4' Board	4' x 8' Board
Up to 25-Year	ISOGARD GL / ISO 95+ GL or Resista / ISOGARD CG	1.0" - 1.4"	4	5	8	16
		1.5" - 1.9"	4	5	6	12
		2.0" - 4"	4	5	4	8
	Dens Deck/ Dens Deck Prime Securock	¼"	4	5	8	16
		½"	4	5	6	12
		⅝"	4	5	4	8
	DensDeck StormX Prime ⁴	⅝"	4	5	4	8
	HailGard / ISOGARD HG	1.5" min.	4	5	8	16
	ISOGARD HD	½"	4	5	6	12
ISOGARD HD Comp.	1" min.	4	5	8	16	
APA Rated OSB	7/16" min.	4	5	8	16	
Up to 15-Year	Structodek	½" - 1"	4	5	8	16

NOTE:

1. Rates in this table may differ from tested assemblies. In such a case the more stringent rate should be used. Rates in this table refer to minimum warranty requirements for a standard Red Shield 20 Year Warranty unless noted.
2. The use of an Air Retarder requires that the cover board/insulation pre-securement be increased to accommodate the added uplift the system may experience due to the retarder. Proper application details for the air retarder should be followed.
3. Uplift requirements for the project may require increased fastening rates than those listed above. The rates listed in these tables are for warranty purposes only. Contact an Elevate representative for rates related to special warranty terms or conditions.
4. All-Purpose Fasteners are not approved for in seam or InvisiWeld applications into steel decks.
5. Elevate #12 Fasteners are not approved for in seam or InvisiWeld applications into steel or wood decks.

Table 14: Fastening Rates for Insulation in Mechanically Attached Single-Ply Systems

Attachment of Vacuum Insulated Panels (VIP) – Adhered Membrane Only

VIP Assembly Information			
Layer	Material	Attachment	Rate
Top Layer	½" ISOGARD HD	Adhered: Twin Jet, I.S.O. Twin Pack, or I.S.O. Stick	Maximum 12" o.c. beads
Middle Layer	VIP Panel	Adhered: Twin Jet, I.S.O. Twin Pack, or I.S.O. Stick	Maximum 12" o.c. beads
Bottom Layer	½" ISOGARD HD	Attached: Mechanical Attachment (4'x8' board)	Minimum 12 fasteners/plates
		Adhered: Twin Jet, I.S.O. Twin Pack, or I.S.O. Stick	Maximum 12" o.c. beads

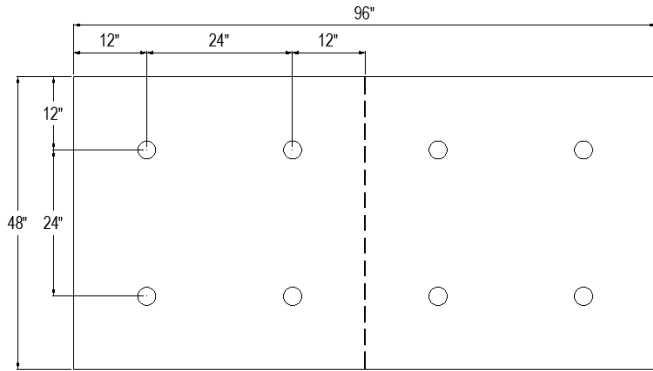
NOTE:

1. VIP panels are not to be cut or punctured in any way.
2. Damaged panels or panels thought to be damaged should not be installed.
3. Refer to the VIP Panel Application Instruction and Technical Information Sheet.
4. Increased wind speed coverage is not allowed with the use of this panel.
5. 20-year maximum Red Shield Warranty when this product is used.

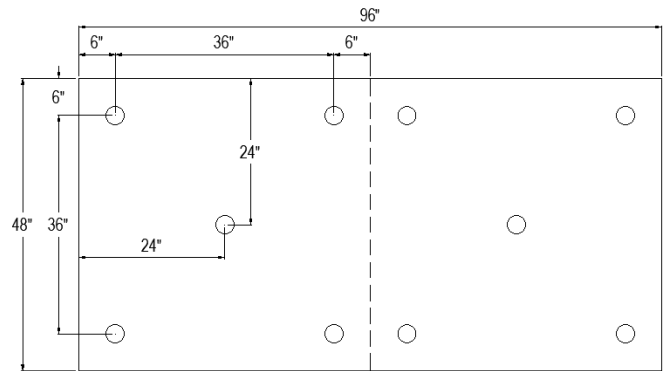
Table 15: VIP Assembly Information

Insulation Mechanical Attachment Patterns

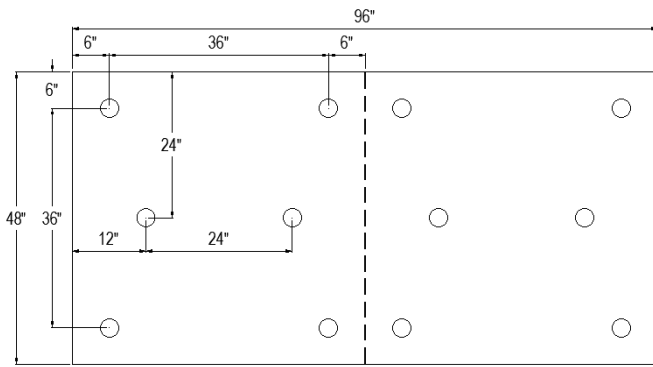
See Technical Information Sheet (TIS) 950 Insulation Attachment Patterns for example pattern layouts for proper placement of approved fasteners and plates based on board size. These fastening patterns apply to standard 4' x 8' boards. The most common fastener density and patterns are shown. Certain specifications may call for increased densities of fasteners in the perimeter or corner areas. For these patterns and other non-standard fastener densities, contact a Holcim Regional Technical Coordinator at 800-428-4511.



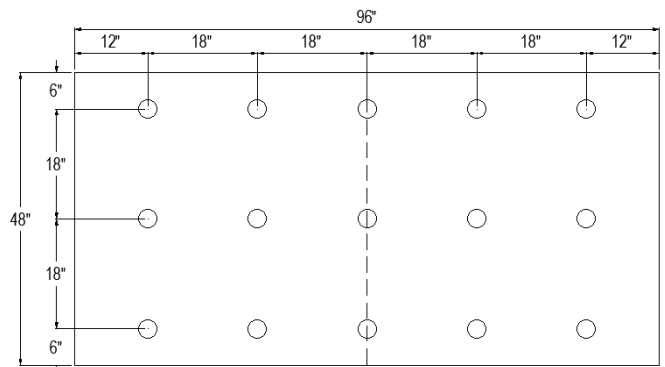
Eight (8)



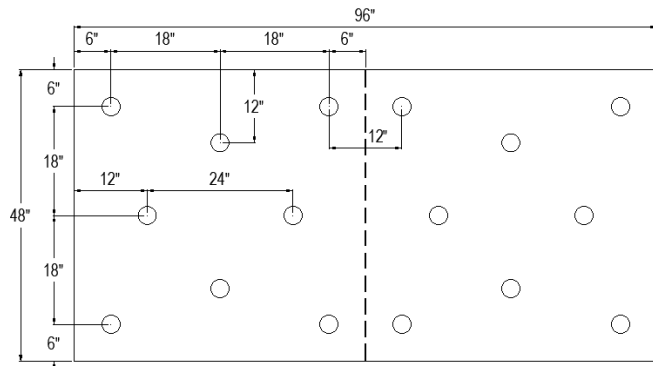
Ten (10)



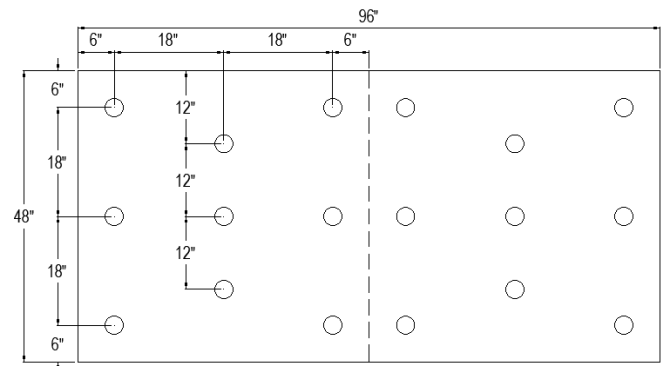
Twelve (12)



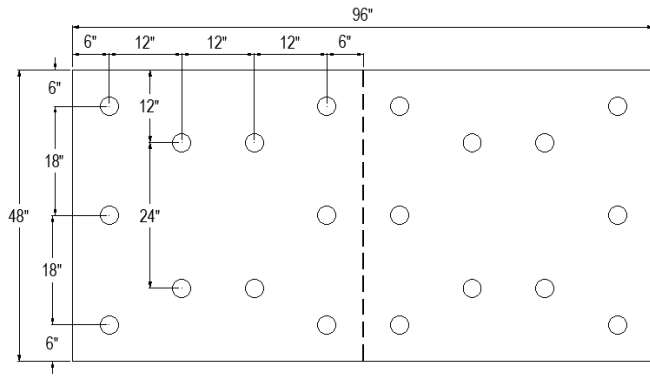
Fifteen (15)



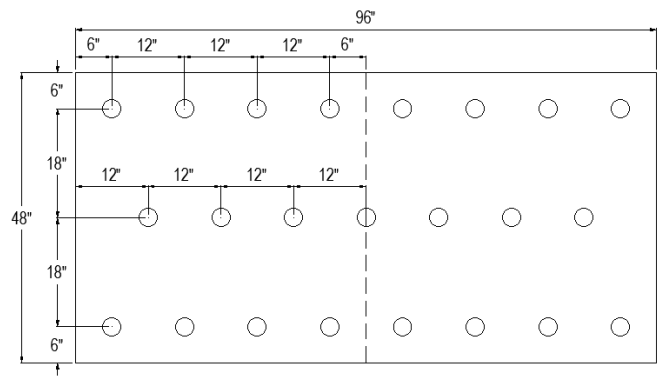
Sixteen (16)



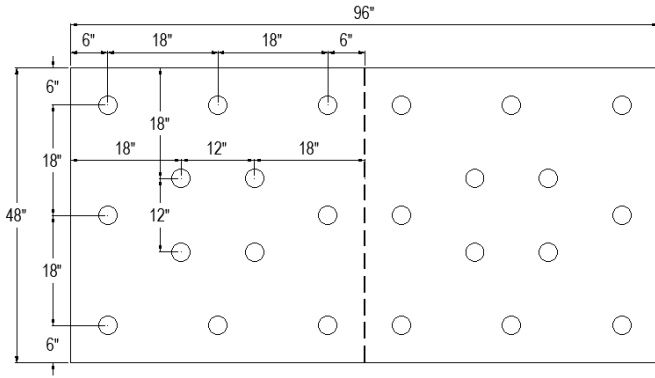
Eighteen (18)



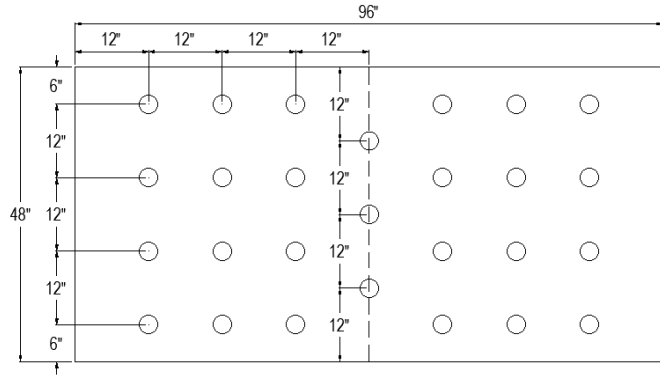
Twenty (20)



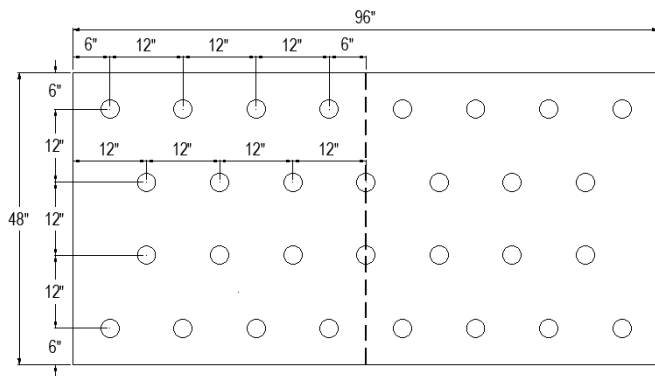
Twenty-Three (23)



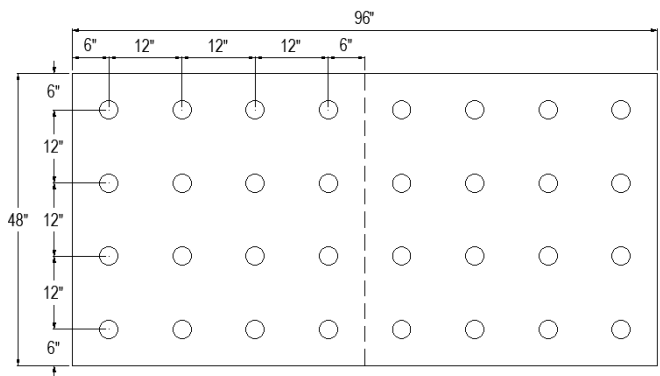
Twenty-Four (24)



Twenty-Seven (27)



Thirty (30)



Thirty-Two (32)

EPS Fanfold Attachment

- Fanfold insulation is approved for use when recover applications call for mechanically attached membrane applications. See appropriate design guide for more information.
- InvisiWeld applications are not allowed when Fanfold is the immediate substrate.
- Fanfold must have a suitable facer. "Bare" EPS must never come into contact with PVC or PVC KEE membranes, or with residual asphalt.
- Adjacent Fanfold sheets should be laid parallel and staggered ever 2' (0.61 m).
- The maximum Red Shield™ Warranty term for systems including Fanfold is 20 years. Wind speeds up to 72 MPH may be approved based on project characteristics. Hail and Cut & Puncture Protection are not available when Fanfold is used in lieu of an Elevate insulation and/or cover board.
- Contact a Regional Technical Coordinator for more information.

Attachment Rates for EPS Fanfold Sheathing (Per 32 Square Feet)

Approved Systems	Deck Type and Minimum Fastening Rate	
	Steel	Plywood/OSB/Wood Plank
Mechanically Attached Elevate UltraPly TPO Membrane (60 mil min.)	5	5

Table 16: Attachment Rates for EPS Fanfold Sheathing (Per 32 Square Feet)

Insulation Adhesive Attachment Patterns

The following Elevate Insulation Adhesives and application methods are acceptable:

Elevate Insulation Adhesive	Application Method
I.S.O. Twin Pack	Bead applied
I.S.O. Stick / Twin Jet	Bead applied
I.S.O. Spray R	Bead applied or Spray applied

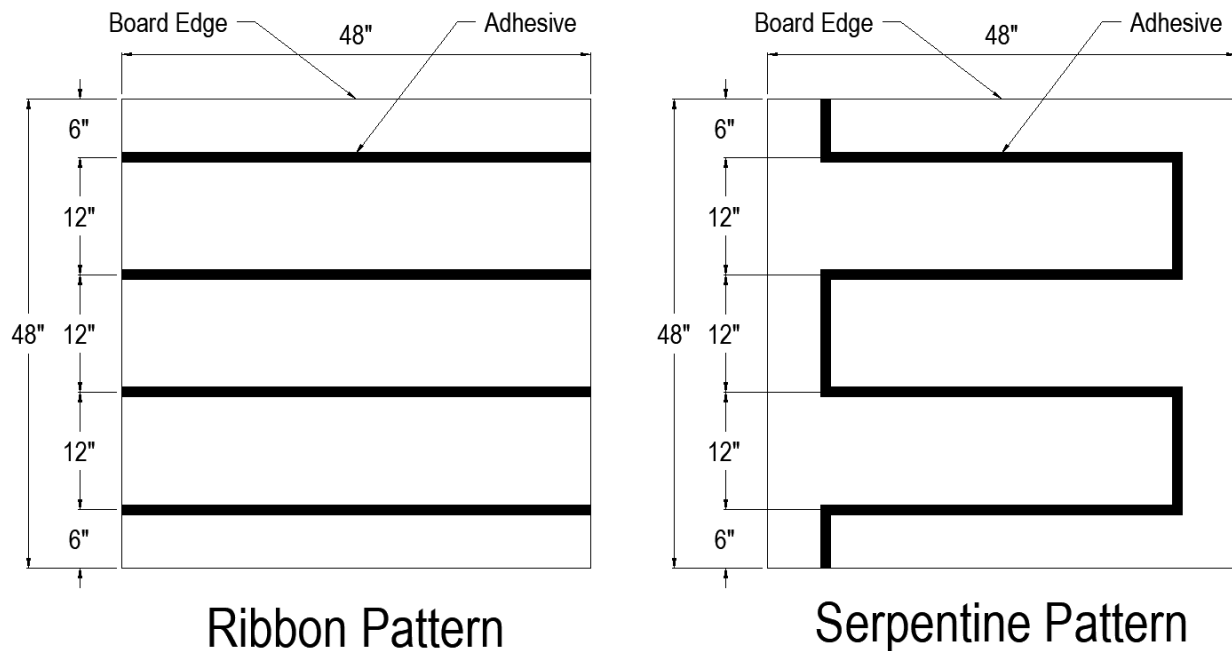


Table 17: Insulation Adhesive Attachment Patterns

The maximum size of any insulation board is 4' (1.2 m) x 4' (1.2 m) regardless of the thickness. The rate of application, with a Elevate Insulation Adhesive, is a minimum of four (4) ribbons per board to be installed in 1/2" (12.7 mm) to 3/4" (19.05 mm) beads spaced 12"/6"/6" (304.8 mm/152.4 mm) (Field/Perimeter/Corner) on center for a standard 55 mph Red Shield warranty. The adhesive application does not increase or decrease with the thickness of the board as in mechanically fastened insulation boards. Loose or unattached corners in insulation boards shall be repaired by the addition of fasteners and insulation plates as required.

Refer to the Technical Information Sheet for specific information on these products: [Foam Adhesives](#). If enhancements are required or your project presents a unique situation, contact a Holcim Regional Technical Coordinator at 800-428-4511. The images below are for example purposes only for a 12" (304.8 mm) o.c. pattern only. Refer to the specific insulation adhesive below to review row spacing details and instructions for placement.

Insulation adhered directly to a steel deck requires the steel deck to be cleaned to remove processing oils and other contaminants. Positive adhesion test should be conducted prior to application. Bead spacing for up to 20-year, 55 mph warranty coverage in this application calls for a minimum adhesive bead spacing of F: 12", P: 6", C: 6" and the bead to be placed on the top flute of the decking. On decks which do not allow this spacing reduced bead spacing may be required. Warranties greater than 20-years require the adhesive bead spacing to be full coverage or spaced over every flute.

I.S.O. Twin Pack Insulation Adhesive

- Ensure the use of a 4' (1.2 m) x 4' (1.2 m) board.
- Application surfaces must be even to ensure continuous adhesion.
- Immediately place insulation board into wet adhesive.
- The first and last adhesive bead should be inset 6" from the board edge for a 12" o.c. (304.8 mm) application, inset 3" (76.2 mm) o.c. for 6" (152.4 mm) o.c. application and inset 2" (50.8 mm) o.c. for 4" (101.6 mm) o.c. application.
- Immediately place insulation board into wet adhesive and weight with pails of Bonding Adhesive or other viable weight.
- See ribbon pattern diagram above.

I.S.O. Stick / Winter Grade Insulation Adhesive

- Ensure the use of a 4' (1.2 m) x 4' (1.2 m) board.
- Requires the PaceCart 2 Dispenser
- Application surfaces must be even to ensure continuous adhesion.
- Place board while adhesive is still wet and tacky. Adhesive should not reach a tack-free state.
- The first and last adhesive bead should be inset 6" from the board edge for a 12" (304.8 mm) o.c. application, inset 3" (76.2 mm) o.c. for 6" (152.4 mm) o.c. application and inset 2" (50.8 mm) o.c. for 4" (101.6 mm) o.c. application.
- Wait for the adhesive to develop a stringy body before placing the insulation board into the adhesive. Immediately walk the board in and weigh it down with pails of Bonding Adhesive or other available weights.
- See serpentine style pattern above.

Twin Jet Insulation Adhesive

- Ensure the use of a 4' (1.2 m) x 4' (1.2 m) board.
- Apply Twin Jet on the deck substrate in ¼" (31.75 mm) beads spaced 12" (304.8 mm) on center, or as specified to meet wind uplift requirements. Allow adhesive to reach the open/mate time and set the suitable insulation into position.
- Place maximum 4' x 4' (1.2 m x 1.2 m) insulation boards into Twin Jet Insulation Adhesive within the identified mate time.
- Immediately after setting the insulation board, provide continuous pressure using weighty objects such as adhesive pails on the insulation until the adhesive sets (typically 4-8 minutes) to ensure adequate contact between the insulation, substrate, and adhesive during the critical set-up period.

I.S.O. Spray R Insulation Adhesive

- Ensure the use of a 4' (1.2 m) x 4' (1.2 m) board.
- Performance of I.S.O. SPRAY R Adhesive should be periodically monitored during the workday to verify that sufficient rise, adhesion, and full mating is occurring.
- Requires spray rig equipment to apply.
- Application surfaces must be even to ensure continuous adhesion.
- Immediately place insulation board into wet adhesive.
- The first and last adhesive bead should be inset 6" (152.4 mm) from the board edge for a 12" (304.8 mm) o.c. application, inset 3" (76.2 mm) o.c. for 6" (152.4 mm) o.c. application and inset 2" (50.8 mm) o.c. for 4" (101.6 mm) o.c. application.
- Wait for the adhesive to develop a stringy body before placing the insulation board into the adhesive. Immediately walk the board in and weight it down with pails of Bonding Adhesive or other available weight.
- See serpentine style pattern above.

Criteria for Field Testing Insulation Adhesives for Adhesion to Deck Substrates

When Specified Uplifts Are Required

Adhesive pull tests should be performed in accordance with the requirements listed within ANSI/SPRI IA-1, Standard Field Test Procedure for Determining the Uplift Resistance of Insulation, and Insulation Adhesive Combinations over Various Substrates.

- All adhesive pull tests should be documented via Insulation Adhesive Test Report and provided to Holcim.
- Official pullout/adhesion results may impact the required fastening rates for the project.

Warranty Purposes with No Specified Uplift

1. Prepare an area large enough to allow a 4' (1.2 m) x 4' (1.2 m) insulation board to be laid in place. Follow the appropriate Elevate Technical Information Sheet guidelines for surface preparation and list of acceptable substrates. Contact a Holcim Regional Technical Coordinator at 800-428-4511 if the substrate information is not listed.
2. Apply the adhesive to the deck per recommended application rates and methods (12" o.c. (304.8 mm), ½" (12.7 mm) to ¾" (19.05 mm) bead).
3. Allow the adhesive a minimum of 60 minutes to cure.
4. After the adhesive has been allowed to cure, pull up on the adhered board by placing a hand under the corner or end of the board in the same direction as the ribbons. Make sure that the board is lifted by hand. Using tools to scrape the board may cause disbonding between the adhesive and the substrate. This will not show whether the adhesive is performing under uplift considerations. (If a tool is used, it should be used to pry or pop the board up).
5. Observe the insulation and deck. The desired result is a delamination of the surface or board facer with adhesive and facer residue remaining on the deck or the board breaks apart remaining adhered to the deck at the ribbons. **If the board is lifted and the adhesive pulls/peels off the deck or decking is pulled up with the board, contact a Holcim Regional Technical Coordinator. This will be considered an unacceptable substrate.**
6. Results should be documented via photos, location on roof and number of tests performed and provided to a Holcim Regional Technical Coordinator for approval. Results from the testing may impact the required fastening/adhesive rates required for the project.

Retarders – Air and Vapor Definition

Vapor/air retarders provide protection to the above deck components from air infiltration and condensation due to high internal moisture loads. Moisture sealed into the roof system during construction may expand during hot weather,

causing blisters to form in the roof covering and eventually leading to failure of the roof system. Vapor retarders prevent moisture from infiltrating to the above deck components. Air retarders prevent air from infiltrating to the above deck components. A vapor/air retarder for steel, wood or concrete deck may be provided in the form of a membrane sheet applied over the deck surface. The membrane sheet or film type of vapor/air retarder may be supplied as asphalt-saturated felt, vinyl plastic, Kraft paper, etc., or a laminated combination.

FM Approved vapor/air retarder sheets shall be placed directly on the deck or over a minimum FM Approved thickness of insulation or separator board. They shall be installed in accordance with the Approval requirements. Then, FM Approved insulation is placed, and fasteners driven through the components into the deck.

When an air retarder or vapor retarder is listed as a component with a mechanically fastened roof cover, it is imperative that the air/vapor retarders restrict air infiltration to the roof assembly between the top of the air retarder and the underside of the roof covering. To accomplish this, the air/vapor retarder must encapsulate these roof components. An accepted means of encapsulating these components is to fold the air/vapor retarder up along the edges of the components and seal the air/vapor retarder to the underside of the roof covering using a compatible adhesive. The encapsulating must be done at the entire roof perimeter and at all roof penetrations. Additionally, if the integrity of the air/vapor retarder is breached; e.g., equipment is added on the roof, the air/vapor retarder must be sealed to the underside of the roof cover using a compatible adhesive.

FM Approved vapor/air retarders have been evaluated for fire hazard and/or wind resistance only, not for permeability. See additional information below as it relates specifically to Vapor or Air retarders.

Vapor Retarder (Barrier)

For adhered above-roof covers, when insulation is adhered to the top surface of a vapor retarder, the vapor retarder is part of the wind load path and, as such, its strength and securement are critical. When roof covers are adhered to insulation or cover boards that are fastened through the vapor retarder into the deck, the wind load applied to the roof cover by-passes the vapor retarder. Vapor Retarders are materials designed to restrict passage of water vapor located on the “warm side” of the roof or sandwiched between insulation layers. The vapor retarder is sealed to the exterior walls of the building, but not necessarily to the underside of the roof cover. While some Elevate roofing systems may require a vapor retarder to receive a Red Shield Warranty, the need for a vapor retarder, as well as a professional architect or engineer must determine the type, placement, and location of the vapor retarder.

The following recommendations cover vapor retarder applications that maintain Class 1 and appropriate wind uplift ratings. This information has been referenced from FM LPDS 1-29, Section 2.2.10.5.

- Do not use a vapor retarder directly on steel deck unless specifically included in RoofNav assemblies for steel decks. Some vapor retarders are FM Approved only for use directly over concrete deck; use directly over steel deck will cause the roof assembly to be Class 2.
- Seal side and end laps where vapor retarders are used. Some systems are FM Approved with the retarder installed above a base layer of insulation.
- Fastener penetration of the vapor retarder can be avoided by using an FM Approved assembly that has the vapor retarder and all components above it adhered to a mechanically fastened thermal barrier.

Air Barrier (Retarder)

Used with a mechanically fastened roof cover and located directly above the roof deck. The air barrier is sealed to the underside of the roof cover, but not necessarily to the exterior walls of the building. In theory, an air barrier improves wind uplift resistance of the roof assembly by preventing air flow into the space below the roof cover and transferring a portion of the uplift load to the insulation. It should be noted that even for properly installed air barrier systems, roof penetrations made after the installation of an air barrier system can hamper the wind performance of an air barrier system if the air barrier is not sealed to the underside of the roof cover after the penetration cut is made. Consequently, there are special FM Approval restrictions on air barrier systems.

- While some Elevate roof systems may require an air retarder to receive a Red Shield warranty, the need for an air retarder, as well as the type, placement and location of the air retarder must be determined by a professional architect or engineer.
- Air retarder systems are a component of building envelope systems that control the movement of air into and out of buildings.
- An air retarder may consist of a single material or of two or more materials which, when installed as a system, make up an air impermeable, structurally adequate retarder.
- Air retarder systems are generally comprised of building components and materials that have an air permeability not exceeding 0.004 cfm/sf under a pressure differential of 0.3" water.
- No single component or material has the capability to provide a complete air retarder system for a building; therefore, air retarder systems include many components and materials that are interfaced with each other. Holcim recommends that the

individual manufacturers of these products provide written certification that their products, when used together, meet this requirement.

- If the air retarder is to perform its intended role, it must meet a number of requirements:
 - Continuity: The assembly must be linked together and sealed at all laps, seams, perimeters, and penetrations to ensure that there is no break in the air tightness of the envelope.
 - Structural Integrity: The air retarder must be capable of resisting the imposed load or must be supported by one that can. It must be capable of resisting the strongest wind load acting as either pressure or suction without rupturing or breaking away from its support. The air retarder and its support must be sufficiently rigid to resist displacement.
 - Air Impermeability: A major requirement of an air retarder is that it offers a high resistance to airflow.
 - Durability: Durability depends largely on how a material reacts to a specific environment such as moisture, temperature, ultra-violet radiation, and to the presence of other materials (incompatibility).
- The use of an Air Retarder requires that the cover board/insulation pre-securement be increased to accommodate the added uplift the system may experience due to the retarder. Proper application details for the air retarder should be followed.

! When specific uplift pressures are provided for systems using air barriers or vapor retarders the uplift pressures and/or attachment rates should be calculated by an engineer or validated by a tested assembly.

V-Force™ Application

Elevate V-Force Vapor Barrier Membrane may be applied directly to properly prepared substrate as outlined in the table below. The substrates must be clean, dry, and smooth. Some substrates may require special preparation including cleaning and/or priming. Review the Technical Information Sheet (TIS), Application Guide and details for application requirements and additional information. Reference the V-Force Requirements – Increased Wind Speed section in this guide for information related to extended wind speeds. V-Force adhered direct to steel will not be approved on projects with special wind regions or coastal areas. When uplift and fire requirements are specified, alternate applications may be required.

V-Force – Acceptable Substrates	
Acceptable Substrate	Notes
Structural Concrete	Clean, dry, and properly cured. Free of any contaminants or sources of puncture.
Steel Deck	Processing Oils must be removed. Clean, dry, and free of contaminants. (Max. 20 Years) NOTE: Factory Mutual (FM) does not recognize direct to steel deck adhesion of this product.
Plywood or OSB	Clean, dry, and free of any contaminants or sources of puncture.
DensDeck® Prime	Clean, dry, and free of any contaminants or sources of puncture.
DensDeck StormX Prime	
Securock® Gypsum Fiber	
Structodek® HD	
ISOGARD™ HD	
ISOGARD HD Composite	
Resista™ / ISOGARD CG	
HailGard / ISOGARD HG	Clean, dry, and free of any contaminants or sources of puncture.
Existing Smooth Surface BUR, SBS or APP Modified Bitumen	
NOTE:	
1. All substrates except metal decks must be primed with either Elevate SA-Water Based (WB) Primer, SA-LVOC Primer or SA-Solvent Based (SB) Primer.	
2. Hot asphalt cannot be used to adhere roofing material to V-Force Vapor Barrier membrane.	

Table 18: V-Force – Acceptable Substrates

V-Force – Acceptable Adhesives for Insulation Attachment				
TIS Number	Adhesive	Bead Spacing (o.c.) (55 mph)		
		Field	Perimeter	Corner
812	I.S.O. Twin Pack	12" (304.8 mm)	6" (152.4 mm)	4" (101.6 mm)
819	I.S.O. Stick			
831	I.S.O. Spray R			

836	Twin Jet		
NOTE: 1. All substrates except metal decks must be primed with either Elevate SA-Water Based (WB) Primer, SA-LVOC Primer or SA-Solvent Based (SB) Primer. 2. Hot asphalt cannot be used to adhere roofing material to V-Force Vapor Barrier membrane. 3. On steel deck assemblies, beads should be spaced to be located over the top flute of the steel deck. (Max. 20 Years)			

Table 19: V-Force Acceptable Adhesives for Insulation Attachment

Attachment Rate Requirements for Plate Bonded Systems with an Air Barrier

When Invisiweld and Invisiweld-S systems are to be used and an Air Barrier is installed the attachment rates may require to be increased. The table below shows standard warranties without increased wind speeds or specified uplift requirements.

Fastening Patterns for Insulation in Plate Bonded Single-Ply Systems with an Air Retarder (Barrier)*				
Maximum Warranty	Top Layer of Insulation		Number of Fasteners per 4' x 8' Insulation Board with an Air Barrier*	
	Insulation	Thickness		
Up to 20-Year** UltraPly TPO or Elevate PVC/PVC KEE membrane.	ISOGARD GL / ISO 95+ GL or Resista / ISOGARD CG	1/2" - 1.4"	16	*NOTE: 1. Rates listed in this table are Red Shield Warranty minimum attachment rates unless otherwise noted. 2. Rates listed in this table may differ from those in tested assemblies. In such cases more stringent rates should be used. 3. When specific uplift performance or wind speed coverage is required, these rates may not apply. Contact a Holcim Representative for confirmation.
		1.5" - 1.9"	12	
		2.0" - 4"	8	
	DensDeck	1/4"	16	
		1/2"	12	
		5/8"	8	
	DensDeck Prime	1/4"	12	
		1/2"	8	
		5/8"	8	
	DensDeck StormX Prime	5/8"	8	
	Securock	1/4"	10	
		1/2"	8	
5/8"		8		
HailGard / ISOGARD HG	1.5" min.	16		
ISOGARD HD	1/2"	12		
ISOGARD HD Comp.	1" min.	16		
25-Year* *Limited to 80 mil UltraPly TPO Platinum membrane.	ISOGARD GL / ISO 95+ GL or Resista / ISOGARD CG	1/2" - 1.4"	16 per board minimum	
		1.5" - 1.9"		
		2.0" - 4"		
	Dens Deck	1/4"		30 Year Details Required
		1/2"		
		5/8"		
	Dens Deck Prime	1/4"		
		1/2"		
		5/8"		
	Securock	1/4"		
		1/2"		
		5/8"		
HailGard / ISOGARD HG	1.5" min.			
ISOGARD HD	1/2"			
ISOGARD HD Comp.	1" min.			
Up to 15-Year	Structodek	1/2" - 1"	16 per board	

**AP Fasteners and Elevate #12 Fasteners are not approved for use on Invisiweld Systems.

Table 20: Fastening Patterns for Insulation in Plate Bonded Single-Ply Systems with an Air Retarder (Barrier)

Allowable Fasteners – Insulation Attachment		
TIS	Fastener	Deck Type

		Steel	Structural Concrete	Plywood/OSB/Wood Plank	Cementitious Wood Fiber	Gypsum	LWC/Steel Pan	LWC/Concrete
1001	All-Purpose Fastener	✓	-	✓	-	-	-	-
1002	Heavy-Duty Fastener	✓	✓	✓	-	-	↗	↗
1003	Pre-Assembled #12 Fastener and Plate	✓	-	✓	-	-	-	-
1005	Concrete Drive Fastener	-	✓	-	-	-	-	↗
1006	Polymer Fastener	-	-	-	✓	✓	-	-
1007	AP AccuTrac™ Kits (#12 Fasteners and insulation Plate)	✓	-	✓	-	-	-	-
1013	IsoFast™ #12 Belted Fasteners and Insulation Plates	✓	-	✓	-	-	-	-
1016	HD AccuTrac Kits™	✓	-	✓	-	-	-	-
1017	All-Purpose Stainless-Steel Fastener	✓	-	✓	-	-	-	-
1019	Heavy Duty (HD) ISOGARD™ HG / HailGard™ Fastener	✓	✓	✓	-	-	-	-
1026	Elevate #12 Fastener	✓	-	✓	-	-	-	-

NOTE:
1. Must penetrate steel pan or structural concrete.

Table 21: Allowable Fasteners – Insulation Attachment

Insulation Attachment Fastener – Warranty Coverage								
TIS	Fastener	Warranty Coverage by Deck Type						
		Steel	Structural Concrete	Plywood/OSB/Wood Plank	Cementitious Wood Fiber	Gypsum	LWC/Steel Pan	LWC/Concrete
1001	All-Purpose Fastener	20	-	20	-	-	-	-
1002	Heavy-Duty Fastener	30	30	30	-	-	30	30
1003	Pre-Assembled #12 Fastener and Plate ¹	20	-	20	-	-	-	-
1005	Concrete Drive Fastener	-	30	-	-	-	-	30
1006	Polymer Fastener	-	-	-	30	30	-	-
1007	AP AccuTrac™ Kits (#12 Fasteners and insulation Plate)	20	-	20	-	-	-	-
1013	IsoFast™ #12 Belted Fasteners and Insulation Plates	20	-	20	-	-	-	-
1016	HD AccuTrac Kits™	20	-	20	-	-	-	-
1017	All-Purpose Stainless-Steel Fastener	20	-	20	-	-	-	-
1019	Heavy Duty (HD) ISOGARD™ HG / HailGard™ Fastener	30	30	30	-	-	-	-
1026	Elevate #12 Fastener	20	-	20	-	-	-	-

Table 22: Insulation Attachment Fastener – Warranty Coverage

Modified Bitumen Base Sheet Attachment

General

The following information is intended to describe the base sheet attachment within a roofing system for Red Shield Warranty purposes. This is only one component of the overall roofing system. For more information on the system warranty requirements, please visit the Technical Database at www.HolcimElevate.com or contact a Holcim Regional Technical Coordinator at 800-428-4511.

Allowable Fasteners – Base Sheet Attachment								
TIS	Fastener	Deck Type						
		Steel	Structural Concrete	Plywood/OSB/Wood Plank	Cementitious Wood Fiber	Gypsum	LWC/Steel Pan	LWC/Concrete
1001	All-Purpose Fastener	✓	-	✓	-	-	-	-
1002	Heavy Duty Fastener	✓	✓	✓	-	-	✓ ¹	✓ ¹
1003	Pre-Assembled #12 Fastener and Plate	✓	-	✓	-	-	-	-
1005	Concrete Drive Fastener	-	✓	-	-	-	-	✓ ¹
1006	Polymer Fastener	-	-	-	✓	✓	-	-
1012	LWC Base-Ply Fasteners	-	-	-	-	✓	✓	✓
1014	IsoFast™ #15 Belted Fasteners and Membrane Plates	✓	-	✓	-	-	✓ ¹	-
1017	All-Purpose Stainless-Steel Fastener	✓	-	✓	-	-	-	-
1020	Two Piece Impact Nail	-	-	-	✓	✓	✓	✓

NOTE:
1. Must penetrate steel pan or structural concrete.

Table 23: Allowable Fasteners – Base Sheet Attachment

Base Sheet Attachment with any Modified Bitumen Base Sheet

Zone	Elevate Fasteners and Plates		Cap Nails or LWC Base Ply Fasteners	
Warranties Up to and Including 20 Years				
Laps	12" (304.8 mm) o.c. Spacing		9" (228.6 mm) o.c. Spacing	
Zone	Rows	Spacing	Rows	Spacing
Field Prime	2 Rows, Staggered 12"	18" o.c. Spacing	2 Rows, Staggered 12"	14" o.c. Spacing
Field	2 Rows, Staggered 12"	18" o.c. Spacing	2 Rows, Staggered 12"	14" o.c. Spacing
Perimeter	2 Rows, Staggered 12"	18" o.c. Spacing	2 Rows, Staggered 12"	14" o.c. Spacing
Corner	3 Rows, Evenly Spaced	16" o.c. Spacing	3 Rows, Evenly Spaced	12" o.c. Spacing
Warranties Up to and Including 30 Years				
Laps	12" (304.8 mm) o.c. Spacing		9" (228.6 mm) o.c. Spacing	
Zone	Rows	Spacing	Rows	Spacing
Field Prime	2 Rows, Staggered 12"	14" o.c. Spacing	2 Rows, Staggered 12"	12" o.c. Spacing
Field	2 Rows, Staggered 12"	14" o.c. Spacing	2 Rows, Staggered 12"	12" o.c. Spacing
Perimeter	2 Rows, Staggered 12"	14" o.c. Spacing	2 Rows, Staggered 12"	12" o.c. Spacing
Corner	3 Rows, Evenly Spaced	12" o.c. Spacing	3 Rows, Evenly Spaced	9" o.c. Spacing

NOTE:

1. Install fastener rows and/or batten bars perpendicular to the roof deck ribs.
2. Pull out tests shall be conducted, documented, and provided to Holcim prior to job installation. Pullout values may require additional fastening, alternate fastening, or result in the project being disqualified from warranty coverage.
3. Uplift pressures should be calculated by the design professional and in accordance with all relevant building codes.
4. FM Insured or specified projects may require different attachment rates, methods, or enhancements. See FM Approval listing.
5. See Detail BASE-L60 and BASE-G60 for attachment pattern example based on roof zone.
6. Warranted wind speed coverage over 55 mph, please reference the Base Sheets – Mechanical Attachment Requirements, LWC – Base Sheet Attachment Rates table in this document.
7. Not all projects may qualify for extended warranties or increased wind speeds. Review project requirements with an Elevate Sales Representative for more information.
8. See details MB-LS-4 and MB-LS-5 for lap requirements.

Table 24: Base Sheet Attachment with any Modified Bitumen Base Sheet**Base Sheet Attachment, Coiled Metal Batten, with a SBS Torch Cap**

Base Sheet	SBS Poly Torch Base or SBS Glass Torch Base
Attachment	Elevate Coiled Metal Batten and appropriate Elevate fasteners
Deck Types	Steel
Pattern	<p>See diagram below</p> <ul style="list-style-type: none"> ▪ Install one row with a coiled batten strip at min. 24" (609.6 mm) o.c. using appropriate fastener. ▪ Seams are lapped 4" (101.6 mm) and heat welded. ▪ Roll with a 20-pound roller. ▪ Fasteners can be placed at 6" (152.4 mm), 12" (304.8 mm), 18" (457.2 mm) or 24" (609.6 mm) o.c. based on desired warranty. Contact a Holcim Regional Technical Coordinator for warranty options. ▪ See details MB-LS-4 and MB-LS-5 for lap requirements.

Table 25: Base Sheet Attachment, Coiled Metal Batten, with a SBS Torch Cap**Base Sheet Attachment, MB 2" Barbed Plates, with a SBS Torch Cap**

Base Sheet	SBS Poly Torch Base or SBS Glass Torch Base
Attachment	MB 2" Barbed Metal Lap Plate and Elevate Heavy-Duty Fasteners
Deck Types	Steel
Pattern	<p>See diagram below</p> <ul style="list-style-type: none"> ▪ Install one row with MB 2" Barbed Metal Lap Plate and Heavy-Duty Fastener min. 24" (609.6 mm) o.c. ▪ Align plate edge with laying line ▪ Seams are lapped 4" (101.6 mm) and heat welded ▪ Roll with a 20-pound roller ▪ Fasteners can be placed at 6" (152.4 mm), 12" (304.8 mm), 18" (457.2 mm) or 24" (609.6 mm) o.c. based on desired warranty. ▪ See details MB-LS-4 and MB-LS-5 for lap requirements.

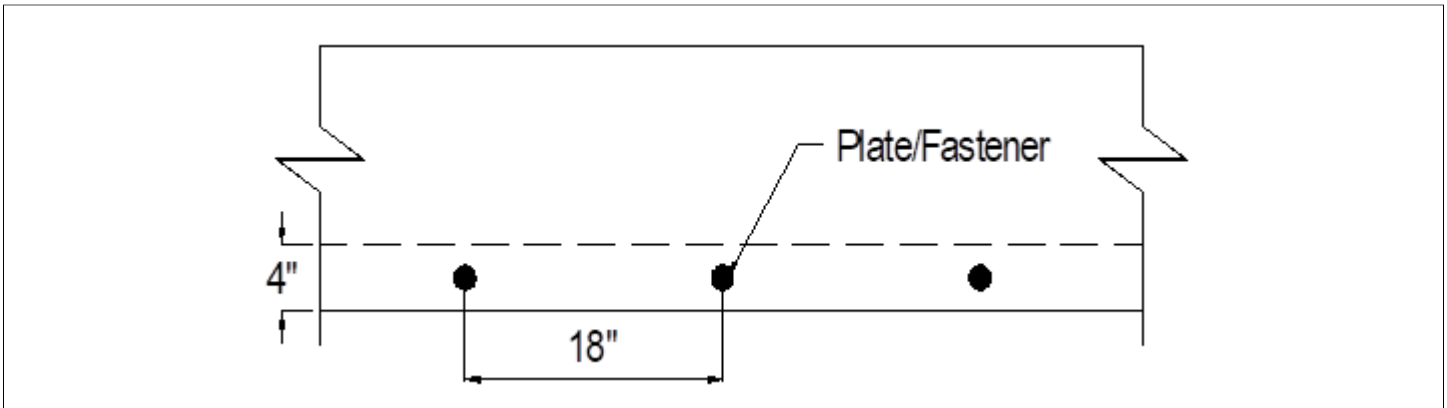


Table 26: Base Sheet Attachment, MB 2" Barbed Plates, with SBS Torch Cap

Single-Ply Membrane Attachment

Acceptable Fastener and Plate Guidelines

Allowable Fasteners – Membrane Attachment								
TIS	Fastener	Deck Type						
		Steel	Structural Concrete	Plywood/OSB/Wood Plank	Cementitious Wood Fiber	Gypsum	LWC/Steel Pan	LWC/Concrete
1001	All-Purpose Fastener	✓ ²	-	✓	-	-	-	-
1002	Heavy Duty Fastener	✓	✓	✓	-	-	✓ ¹	✓
1005	Concrete Drive Fastener	-	✓	-	-	-	-	✓
1009	Heavy Duty Plus Fastener	✓	-	-	-	-	-	-
1011	Purlin Fasteners Black E-Coated	16-gauge Structural Steel Purlins						
1014	IsoFast™ #15 Belted Fasteners and Membrane Plates	✓	-	✓	-	-	✓ ¹	-
1017	All-Purpose Stainless-Steel Fastener	-	-	✓	-	-	-	-

NOTE:

1. Must penetrate steel pan or structural concrete.
2. Elevate All-Purpose fasteners are approved for in seam attachment of Elevate RubberGard MAX Membrane in combination with Elevate V-Plate (TIS 1103) into steel and wood deck assemblies. Warranty restrictions apply.

Table 27: Allowable Fasteners – Membrane Attachment

Membrane Attachment Fastener – Warranty Coverage								
TIS	Fastener	Deck Type						
		Steel	Structural Concrete	Plywood/OSB/Wood Plank	Cementitious Wood Fiber	Gypsum	LWC/Steel Pan	LWC/Concrete
1001	All-Purpose Fastener	20	-	20	-	-	-	-
1002	Heavy Duty Fastener	30	30	30	-	-	30	30
1005	Concrete Drive Fastener	-	30	-	-	-	-	30
1009	Heavy Duty Plus Fastener	30	-	-	-	-	-	-
1011	Purlin Fasteners Black E-Coated	20 (16-gauge Structural Steel Purlins)						
1017	All-Purpose Stainless-Steel Fastener	-	-	20	-	-	-	-

Table 28: Membrane Attachment Fastener – Warranty Coverage

Elevate Plates – For the attachment of:							
TIS	Plate	RubberGard EPDM (Standard, LSFR, or FR)		Rubber Gard EPDM MAX		UltraPly TPO	Elevate PVC and PVC KEE
		Batten in the Seam (BITS)	Mechanically Attached System (MAS)	Batten in the Seam (BITS)	Mechanically Attached System (MAS)	Mechanically Attached System (MAS)	Mechanically Attached System (MAS)
1101	2" Metal Plate	✓	✓	✓	✓	✓ RPF ONLY (No Seams)	
		For attaching Elevate Reinforced Perimeter Fastening Strips (RPF Strip) to approved substrates as required by Elevate Specifications and Details.					
1102	Polymer Fastener Plate	✓	✓	✓	✓	✓ RPF ONLY (No Seams)	
		For attaching Elevate Reinforced Perimeter Fastening Strips (RPF Strip) to approved substrates as required by Elevate Specifications and Details.					
1103	V-Plate	✓	✓	✓	✓		
		For attaching Elevate RubberGard MAX membrane, Elevate RPF and QuickSeam RPF Strips, and Elevate QuickSeam R.M.A. Strip to approved substrates as required by Elevate Specifications and Details.					
1106	Insulation Fastening Plate	✓	✓	✓	✓	✓	✓
		For attaching insulation to approved substrates as required by Elevate Specifications and Details.					
1107	Polymer Fastener Insulation Plate	✓	✓	✓	✓	✓	✓
		For attaching insulation to approved substrates as required by Elevate Specifications and Details.					
1108	HD Seam Plate		✓	✓	✓	✓	✓
		For attaching Elevate UltraPly TPO and Elevate PVC membranes to approved substrates as required by Elevate Specifications and Details.					
1109	HD Plus Seam Plate					✓	✓
		For attaching Elevate UltraPly TPO membranes to approved substrates as required by Elevate Specifications and Details.					
1111	UltraPly TPO InvisiWeld Plate					✓	
		For attaching Elevate UltraPly TPO membranes to approved substrates as required by Elevate Specifications and Details.					
2112	Elevate PVC InvisiWeld Plate						✓
		For attaching Elevate PVC membranes to approved substrates as required by Elevate Specifications and Details.					
✓ = Acceptable for use See the specific plate TIS for specific application data							

Table 29: Elevate Plates Approved Use

Elevate Battens and Bars – For the attachment of:							
TIS	Plate	RubberGard EPDM (Standard, LSFR, or FR)		Rubber Gard EPDM MAX		UltraPly TPO	Elevate PVC and PVC KEE
		Batten in the Seam (BITS)	Mechanically Attached System (MAS)	Batten in the Seam (BITS)	Mechanically Attached System (MAS)	Mechanically Attached System (MAS)	Mechanically Attached System (MAS)
1201	Coiled metal Batten Strip	✓		✓		(Perimeter Enhancement Only)	(Perimeter Enhancement Only)
		For anchoring membrane and flashing details to approved substrates as required by Elevate Specifications and Details.					
1202	Metal Batten Strip	✓		✓		(Perimeter Enhancement Only)	(Perimeter Enhancement Only)
		For anchoring membrane and flashing details to approved substrates as required by Elevate Specifications and Details.					
1204	Polymer Fastener Metal Batten Strip	*	*	*			
		For anchoring RubberGard membrane to approved substrates as required by Elevate Specifications and Details. *Base Tie-ins only.					
1205	Termination bar	✓	✓	✓	✓	✓	✓
		For anchoring and sealing flashing terminations to approved substrates as required by Elevate Specifications and Details.					
1206	Aluminum Drain Bar	✓	✓	✓	✓	✓	✓
		Used with Elevate Adhered and Ballasted systems for terminating the RubberGard membrane to approved substrates as required by Elevate Specifications and Details.					
1207	Polymer Batten Strip	*	*	*			
		Used for anchoring membrane and flashing details to the approved substrates as required by Elevate Specifications and Details. *Base Tie-ins only.					
✓ = Acceptable for use See the specific batten or bar TIS for specific application data							

Table 29: Elevate Battens and Bars Approved Use

Elevate Fastener – For the attachment of accessories:					
TIS	Fastener	Batten Strips		Seam Plates	Termination Bars
1001	All-Purpose Fastener	✓		✓	✓
1002	Heavy-Duty Fastener	✓		✓	✓
1005	Concrete Drive Fastener	✓		✓	✓
		Do not use with polymer batten strips.			
1006	Polymer Fastener	✓		✓*	✓*
		(Special battens and plates required) *Only approved for base tie-ins, membrane must be adhered.			
1009	HD Plus Fastener	✓		✓	
		Elevate Metal Batten Strips in Batten in the Seam (B.I.T.S.), M.A.S. and Reinforced MAX, mechanically attached systems.			
1011	Purlin Fastener	✓		✓	
		Membrane and QuickSeam R.M.A. Strip to 12 – 18 gauge structural steel purlins. The Elevate Purlin Fastener can be used in conjunction with Elevate 2" Metal Plates, Elevate V-Plates, or batten strips.			
1012	LWC Base Ply Fastener	For the attachment of base sheets. Insulation may not be attached with LWC Base Ply Fastener			
✓ = Acceptable for use See the specific fastener TIS for specific application data					

Table 30: Elevate Fastener Approved Use with Accessories

Perimeter Enhancements

NOTE: It is necessary for the overall strength of the system to reinforce the perimeter and corners areas on a roof due to these areas receiving an increased uplift pressure. These increased pressures cause additional stress on the roofing system. The following enhancements assist in alleviating this change in pressure.

TPO Details			
Detail Number	Detail Name	Membrane Type	Max. Warranty Period
UT-PE-1	Batten or HD Plates with 8" Welded Cover Strip at Perimeter Enhancement	UltraPly TPO	20 Years
UT-PE-2	Batten or HD Plates with 9.5" UltraPly TPO QuickSeam Flashing at Perimeter Enhancement	UltraPly TPO	20 Years
UT-PE-3	Batten with 5.5" UltraPly TPO QuickSeam Flashing at Perimeter Enhancement	UltraPly TPO	20 Years
UT-PE-4	Batten or HD Plates with UltraPly QuickSeam R.M.A. at Perimeter Enhancement	UltraPly TPO	20 Years
UT-PE-5	UltraPly TPO Invisiweld at Perimeter Enhancement	UltraPly TPO	20 Years
UT-PE-6	Batten or HD Plate and UltraPly TPO 8" Cover Strip	UltraPly TPO	20 Years
UT-PE-7	Batten or HD Plate and UltraPly TPO 9.5" QuickSeam Flashing	UltraPly TPO	20 Years

Table 31: TPO Details – Perimeter Enhancements

EPDM Details			
Detail Number	Detail Name	Membrane Type	Max. Warranty Period
B-1	QuickSeam Batten Cover at "T" Perimeter	RubberGard EPDM	20 Years
B-7	QuickSeam R.M.A. Strip at T-Perimeter	RubberGard EPDM	20 Years

Table 32: EPDM Details – Perimeter Enhancements

PVC and PVC KEE Details			
Detail Number	Detail Name	Membrane Type	Max. Warranty Period
PVC-PE-1	Batten or HD Plates with 8" Welded PVC Cover Strip at Perimeter Enhancement	Elevate PVC	20 Years
PVC-PE-2	Elevate PVC Invisiweld at Perimeter Enhancement	Elevate PVC	20 Years
PVC-PE-3	Batten or HD Seam Plate with Elevate PVC 8" Cover Strip at Perimeter Enhancement	Elevate PVC	20 Years

Table 33: PVC and PVC KEE Details – Perimeter Enhancements

Peel Stops

Peel stops are required in the following situations:

- Projects located in HVHZ, coastal or other high wind zones.
- Buildings with roof heights greater than 60' (18.29 m) tall with parapets less than 3' (0.91 m) in height and wind speed coverage at or greater than 90 mph.
- Projects over wood, lightweight concrete (LWC/LWIC), tectum, gypsum, and unidentifiable decking.
- Projects where decking pullout values do not meet Elevate requirements.
- Projects with large wall openings.
- If atypical project conditions exist and are not represented in this document, please contact a Holcim Regional Technical Coordinator for review and approval of warranty requirements prior to installation.
- Reference Details UT-PE-08 (TPO), PVC-PE-01 (PVC/PVC KEE), or B-1 (EPDM).

Factory Mutual (FM) Attachment Layout Examples

Factory Mutual (FM) does not recognize the “picture framing” method of membrane attachment. FM requires the use of the “Finger” or “T” method of attachment. The current FM Maximum Deck Span Charts and some typical layout patterns are located on the Elevate website (www.HolcimElevate.com) under the Technical Information Codes section. These layouts are examples only and may not fit the needs of the specific job. All perimeter and corner areas should be calculated based on specific building information and standards set by FM within Loss Prevention Data Sheet (LPDS) 1-28. Details below represent prescriptive enhancements. Not all projects will qualify for prescriptive enhancements. Every project should be evaluated against FM’s LPDS’s and other related standards to validate this method of attachment.

RubberGard EPDM MAX Factory Mutual Mechanically Attached Layout Examples				
Detail Name	Row Spacing (Maximum)			
	Field Prime	Field	Perimeter	Corner
FM - EPDM Membrane Layout Example - 72 Inch Rows	Same as Field or per tested assembly	72" o.c.	48" o.c.	36" o.c.
FM - EPDM Membrane Layout Example - 72 Inch Rows - Building Greater Than 60 Feet Tall		72" o.c.	48" o.c.	36" o.c.
FM - EPDM Membrane Layout Example - 84 Inch Rows		84" o.c.	56" o.c.	42" o.c.
FM - EPDM Membrane Layout Example - 84 Inch Rows - Building Greater Than 60 Feet Tall		84" o.c.	56" o.c.	42" o.c.
FM - EPDM Membrane Layout Example - 114 Inch Rows		114" o.c.	76" o.c.	57" o.c.
FM - EPDM Membrane Layout Example - 114 Inch Rows - Building Greater Than 60 Feet Tall		114" o.c.	76" o.c.	57" o.c.
FM - EPDM Membrane Layout Example - RMA 114 Inch Rows - Building 60 Feet Tall or Less		114" o.c.	76" o.c.	57" o.c.
FM - EPDM Membrane Layout Example - RMA 114 Inch Rows - Building Greater Than 60 Feet Tall		114" o.c.	76" o.c.	57" o.c.

NOTE: The layouts listed above are for example use only. The above listings do not validate full assembly applications. Individual project validation should be completed prior to using the information listed above.

Table 34: RubberGard EPDM MAX Factory Mutual Mechanically Attached Layout Examples

UltraPly TPO Factory Mutual Mechanically Attached Layout Examples				
Detail Name	Row Spacing (Maximum)			
	Field Prime	Field	Perimeter	Corner
FM - TPO Membrane Layout Example - 6 Foot Sheets	Same as Field or per tested assembly	72" o.c.	48" o.c.	36" o.c.
FM - TPO Membrane Layout Example - 6 Foot Sheets - Building Greater Than 60 Feet Tall		72" o.c.	48" o.c.	36" o.c.
FM - TPO Membrane Layout Example - 8 Foot Sheets		90" o.c.	60" o.c.	45" o.c.
FM - TPO Membrane Layout Example - 8 Foot Sheets - Building Greater Than 60 Feet Tall		90" o.c.	60" o.c.	45" o.c.
FM - TPO Membrane Layout Example - 10 Foot Sheets		114" o.c.	76" o.c.	57" o.c.
FM - TPO Membrane Layout Example - 10 Foot Sheets - Building Greater Than 60 Feet Tall		114" o.c.	76" o.c.	57" o.c.
FM - TPO Membrane Layout Example - 12 Foot 4 Inch Sheets		142" o.c.	95" o.c.	71" o.c.
FM - TPO Membrane Layout Example - 12 Foot 4 Inch Sheets - Building Greater Than 60 Feet Tall		142" o.c.	95" o.c.	71" o.c.

NOTE: The layouts listed above are for example use only. The above listings do not validate full assembly applications. Individual project validation should be completed prior to using the information listed above.

Table 35: UltraPly TPO Factory Mutual Mechanically Attached Layout Examples

Elevate PVC and PVC KEE Factory Mutual Mechanically Attached Layout Examples

Detail Name	Row Spacing (Maximum)			
	Field Prime	Field	Perimeter	Corner
FM - PVC Membrane Layout Example – 10 Foot Sheets	Same as Field or per tested assembly	114" o.c.	76" o.c.	57" o.c.
FM - PVC Membrane Layout Example – 10 Foot Sheets - Building Greater Than 60 Feet Tall		114" o.c.	76" o.c.	57" o.c.
NOTE: The layouts listed above are for example use only. The above listings do not validate full assembly applications. Individual project validation should be completed prior to using the information listed above.				

Table 36: Elevate PVC and PVC KEE Factory Mutual Mechanically Attached Layout Examples

Elevate InvisiWeld Factory Mutual Mechanically Attached Layout Examples				
Detail Name	Per Board Fastening (EXAMPLE) NOTE: See actual listing for attachment rate details			
	Field Prime	Field	Perimeter	Corner
FM TPO/PVC Membrane Layout Example Invisiweld Layout	Same as Field or per tested assembly	6	9	12
FM TPO/PVC Membrane Layout Example Invisiweld Layout – Building Greater Than 60 Feet Tall		6	9	12
NOTE: The layouts listed above are for example use only. The above listings do not validate full assembly applications. Individual project validation should be completed prior to using the information listed above.				

Table 37: Elevate InvisiWeld Factory Mutual Mechanically Attached Layout Examples

Layouts in Chart Form – Elevate Standard Warranty Requirements

Single-Ply Mechanically Attached System layouts are in the Elevate Technical Information section on the Elevate website (www.HolcimElevate.com). These layouts are suitable for typical 55 mph warranty requirements. If uplift pressures, increased wind speed warranty requirements or other specific codes must be met, then alternate layout or attachment rates may be required. Reference either the tested assembly requirements and/or the Increased Wind Speed supplemental section of this guide for appropriate membrane layouts. Contact a Regional Technical Coordinator for additional information.

To determine the correct **Fastening Rate** and **Perimeter Layout**:

1. Determine the System Type
EXAMPLE: The membrane being installed is
 - RubberGard EPDM (Standard, LSFR, or FR)
 - 7.5' panels
 - Batten in the Seam system (B.I.T.S.)
2. Based on the Roof Height, from the table below, determine the:
 - Layout Design Number
 - Field Fastening Rate
 - Perimeter Fastening Rate
 EXAMPLE: Roof Height of up to 60'
 - Layout Design Number: B-7-2
 - Field Fastening Rate: 12" o.c.
 - Perimeter Fastening Rate: 12" o.c.

RubberGard EPDM (LSFR, or FR), 45, 60 or 90 mil, Batten in the Seam (BITS)						
Maximum Warranty Term	Seam Attachment		Roof Height	Layout Number	Fastening Rate	
	System Type	Panel Width			Field	Perimeter
15-Year	7' BITS	7 ½'	Up to 60'	B-7-2	12" o.c.	12" o.c.
	7' BITS	7 ½'	61' to 120'	B-7-4	12" o.c.	12" o.c.
	8 ½' BITS	9'	Up to 40'	B-9-2	12" o.c.	12" o.c.
	8 ½' BITS	9'	41' to 80'	B-9-4	12" o.c.	12" o.c.
	9 ½' BITS	10'	Up to 20'	B-10-2	12" o.c.	12" o.c.
	9 ½' BITS	10'	21' to 40'	B-10-4	12" o.c.	12" o.c.
20-Year (60 mil min)	7' BITS	7 ½'	Up to 60'	B-7-2	12" o.c.	12" o.c.
	7' BITS	7 ½'	61' to 120'	B-7-4	12" o.c.	12" o.c.
	8 ½' BITS	9'	Up to 40'	B-9-2	12" o.c.	12" o.c.
	8 ½' BITS	9'	41' to 80'	B-9-4	12" o.c.	12" o.c.
	9 ½' BITS	10'	Up to 20'	B-10-2	12" o.c.	12" o.c.
	9 ½' BITS	10'	21' to 40'	B-10-4	12" o.c.	12" o.c.

Table 38: RubberGard EPDM – Non-Reinforced – Sheet Layouts

RubberGard EPDM MAX, 45, 60 or 75 mil, Mechanically Attached System (MAS)						
Maximum Warranty Term	Seam Attachment		Roof Height	Layout Number	Fastening Rate	
	System Type	Panel Width			Field	Perimeter
15-Year	10' M.A.S.	Any	Up to 20'	M -10-2	12" o.c.	12" o.c.
	10' M.A.S.	Any	21' to 40'	M -10-4	12" o.c.	12" o.c.
20-Year (60 mil min)	10' M.A.S.	Any	Up to 20'	M -10-2	12" o.c.	12" o.c.
	10' M.A.S.	Any	21' to 40'	M -10-4	12" o.c.	12" o.c.

Table 39: RubberGard EPDM MAX – MAS Sheet Layouts

RubberGard EPDM MAX, 45, 60 or 75 mil, Mechanically Attached System (RMA)						
Maximum Warranty Term	Seam Attachment		Roof Height	Layout Number	Fastening Rate	
	System Type	Panel Width			Field	Perimeter
15-Year	10' R.M.A.S.	10'	Up to 40'	R-10-2	12" o.c.	12" o.c.
	10' R.M.A.S.	10'	41' to 80'	R-10-4	12" o.c.	12" o.c.
20-Year (60 mil min)	10' R.M.A.S.	10'	Up to 40'	R-10-2	12" o.c.	12" o.c.
	10' R.M.A.S.	10'	41' to 80'	R-10-4	12" o.c.	12" o.c.

Table 40: RubberGard EPDM MAX – RMA Sheet Layouts

UltraPly TPO, 45 mil, Mechanically Attached System (MAS)						
Maximum Warranty Term	Seam Attachment		Roof Height	Layout Number	Fastening Rate	
	System Type	Panel Width			Field	Perimeter
15-Year	Single Weld	96"	Up to 60'	UT-96-112	6" o.c.	6" o.c.
	Single Weld	96"	61' to 120'	UT-96-212	6" o.c.	6" o.c.
	Single Weld	120"	Up to 30'	UT-120-112	6" o.c.	6" o.c.
	Single Weld	120"	Up to 60'	UT-120-212	6" o.c.	6" o.c.
	Single Weld	120"	61' to 120'	UT-120-412	6" o.c.	6" o.c.
	Single Weld	148"	Up to 60'	UT-148-212	6" o.c.	6" o.c.
	Single Weld	148"	61' to 120'	UT-148-412	6" o.c.	6" o.c.
15-Year	Single Weld	96"	Up to 60'	UT-96-112	12" o.c.	12" o.c.
	Single Weld	96"	61' to 120'	UT-96-212	12" o.c.	12" o.c.
	Single Weld	120"	Up to 30'	UT-120-112	12" o.c.	12" o.c.
	Single Weld	120"	Up to 60'	UT-120-212	12" o.c.	12" o.c.
	Single Weld	120"	61' to 120'	UT-120-412	12" o.c.	12" o.c.
	Single Weld	148"	Up to 60'	UT-148-212	12" o.c.	12" o.c.
	Single Weld	148"	61' to 120'	UT-148-412	12" o.c.	12" o.c.

Table 41: UltraPly TPO 45 mil – MAS Sheet Layout

UltraPly TPO, 60/80 mil, Mechanically Attached System (MAS)						
Maximum Warranty Term	Seam Attachment		Roof Height	Layout Number	Fastening Rate	
	System Type	Panel Width			Field	Perimeter
20-Year	Single Weld	96"	Up to 60'	UT-96-112	12" o.c.	12" o.c.
	Single Weld	96"	61' to 120'	UT-96-212	12" o.c.	12" o.c.
	Single Weld	120"	Up to 30'	UT-120-106	6" o.c.	6" o.c.
	Single Weld	120"	Up to 30'	UT-120-112	12" o.c.	12" o.c.
	Single Weld	120"	Up to 60'	UT-120-212	12" o.c.	12" o.c.
	Single Weld	120"	61' to 120'	UT-120-412	12" o.c.	12" o.c.
	Single Weld	148"	Up to 60'	UT-148-212	12" o.c.	12" o.c.
	Single Weld	148"	61' to 120'	UT-148-412	12" o.c.	12" o.c.
25-Year	Single Weld	96"	Up to 60'	UT-96-106	6" o.c.	6" o.c.
	Single Weld	96"	61' to 120'	UT-96-206	6" o.c.	6" o.c.
	Single Weld	120"	Up to 60'	UT-120-206	6" o.c.	6" o.c.
	Single Weld	120"	61' to 120'	UT-120-406	6" o.c.	6" o.c.
	Single Weld	148"	Up to 60'	UT-148-206	6" o.c.	6" o.c.
	Single Weld	148"	61' to 120'	UT-148-406	6" o.c.	6" o.c.
30-Year (80 mil. min.)	Single Weld	96"	Up to 60'	UT-96-106	6" o.c.	6" o.c.
	Single Weld	96"	61' to 120'	UT-96-206	6" o.c.	6" o.c.

Table 42: UltraPly TPO 60-80 mil – MAS Sheet Layout

Elevate PVC and PVC KEE 120, 50 mil, Mechanically Attached System (MAS)						
Maximum Warranty Term	Seam Attachment		Roof Height	Layout Number	Fastening Rate	
	System Type	Panel Width			Field	Perimeter
15-Year	Single Weld	120"	Up to 60'	PVC-120-2-12	12" o.c.	12" o.c.
	Single Weld	120"	61' to 120'	PVC-120-4-12	12" o.c.	12" o.c.

Table 43: Elevate PVC and PVC KEE 50 mil – MAS Sheet Layout

Elevate PVC and PVC KEE 120, 60/80 mil, Mechanically Attached System (MAS)						
Maximum Warranty Term	Seam Attachment		Roof Height	Layout Number	Fastening Rate	
	System Type	Panel Width			Field	Perimeter
20-Year	Single Weld	120"	Up to 60'	PVC-120-2-12	12" o.c.	12" o.c.
	Single Weld	120"	61' to 120'	PVC-120-4-12	12" o.c.	12" o.c.

Table 44: Elevate PVC and PVC KEE 60-80 mil – MAS Sheet Layout

Elevate PVC XR and PVC KEE XR, 60/80 mil, Mechanically Attached System (MAS)						
Maximum Warranty Term	Seam Attachment		Roof Height	Layout Number	Fastening Rate	
	System Type	Panel Width			Field	Perimeter
20-Year	Single Weld	120"	Up to 60'	PVC-120-2-12	12" o.c.	12" o.c.
	Single Weld	120"	61' to 120'	PVC-120-4-12	12" o.c.	12" o.c.

Table 45: Elevate PVC XR and PVC KEE XR 60-80 mil – MAS Sheet Layout

LWC - Base Sheet Attachment Rates						
Peak Gust Wind Speed Coverage	Regional Wind Speed					
	Up to 120 mph			121 mph or greater		
	Lap	Field/Perimeter	Corner	Lap	Field/Perimeter	Corner
55 mph	35" Rows, 9" o.c.	2 Rows, 12" o.c. Staggered, 18" o.c. Spacing	3 Rows, Equally Spaced, 16" o.c. spacing	35" Rows, 9" o.c.	2 Rows, 12" o.c. Staggered, 16" o.c. spacing	3 Rows, Equally Spaced, 14" o.c. spacing

Table 46: LWC – Base Sheet Attachment Rates

InvisiWeld Attachment

General

Invisiweld is an induction welded system that requires the use of an induction welder to weld the InvisiWeld Plate to the UltraPly TPO or Elevate PVC membrane. It also requires the membrane horizontal seams to be heat welded with a standard automatic welder. Please consult the full Elevate UltraPly TPO Invisiweld and/or Elevate PVC and PVC KEE Invisiweld Application Guides for full instructions.

Induction Welded Membrane

Activate the weld between the roof membrane and InvisiWeld plate using the electromagnetic induction device as supplied by others. The induction coil, demarked by a red circle on the device, must be positioned over the center of the InvisiWeld plate, ± 1" (25 mm). When the induction welding cycle is complete, immediately place a magnetic cooling clamp over the welded roof membrane and plate assembly. This will ensure that there is adequate clamping of the membrane to the plate during cooling, ensuring a good weld. The magnetic cooling clamp device must be left in place for at least 60 seconds while the weld cools and sets.

The magnetic cooling clamp will increase in temperature during continued use. This will cause damage to the membrane. Holcim recommends keeping a pail of cool, clean water near the installation area to dip the magnetic cooling clamp into to reduce its temperature.

Holcim recommends the use of a bathroom plunger to inspect the individual InvisiWeld plate welds. By applying the rubber end of a plunger to the membrane adjacent to the welded InvisiWeld plate and pulling upwards, the condition of the weld can be assessed. This is a good tool to ensure that no InvisiWeld plate welds were missed during roofing.

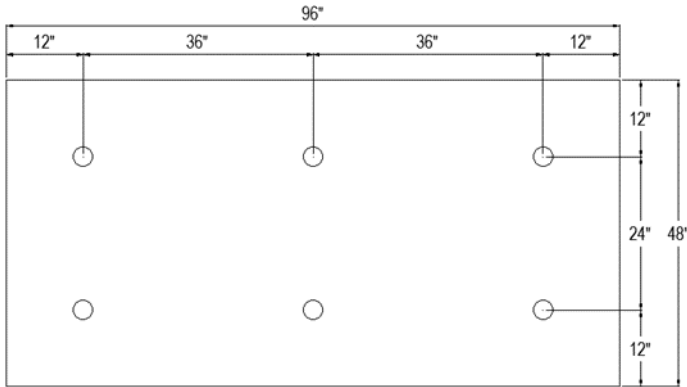
Heat Welded Membrane Seams

Horizontal field splices, these areas are to be welded first. Wherever possible, all field splices on the horizontal surface (including flashing) should be completed using an automatic heat welder that has been designed for hot air welding of thermoplastic membranes. Seams made with the automatic welder shall be a minimum of 1½" (38 mm) wide. Seams made with hand welders shall be a minimum of 2" (50 mm) wide. Use silicone hand rollers to assure proper mating of surfaces as hand welding proceeds. On vertical surface welds, or where an automatic welder is not

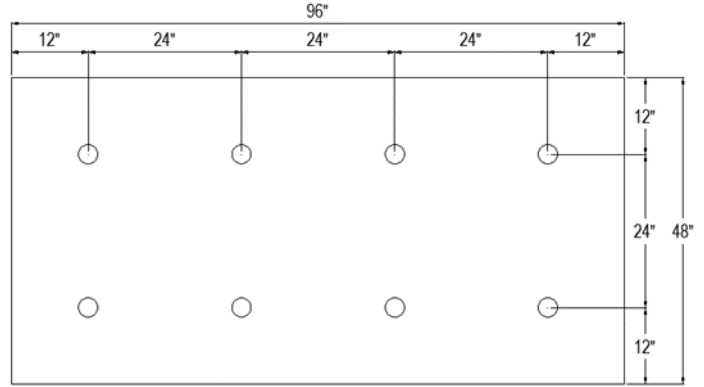
practical, hand welders shall be used. Avoid overlapping membrane seams with plate locations. The plates may cause the robotic welder to jump when it hits the plates affecting the quality of the seam completed by the robotic welder.

InvisiWeld Fastener Patterns

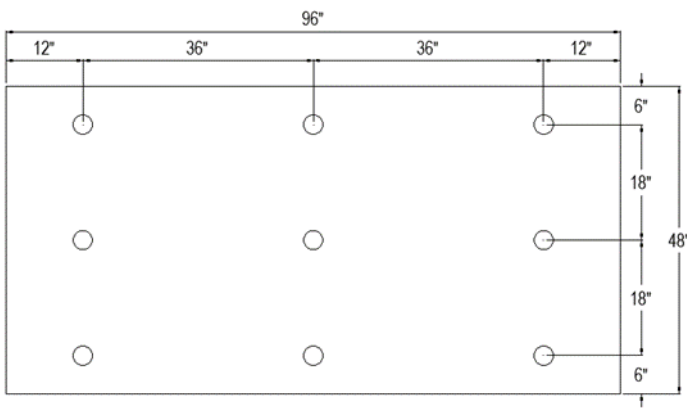
On standard InvisiWeld projects, fastening rates may be listed as per board, contributory area, or linear rows. Fastening rates and/or patterns should be followed when outlined in a tested assembly. Refer to details TPO-IW-7 or PVC-IW-7 for InvisiWeld plate patterns approved for warranted applications. Please contact a Holcim Regional Technical Coordinator if specific patterns are not represented within the referenced details.



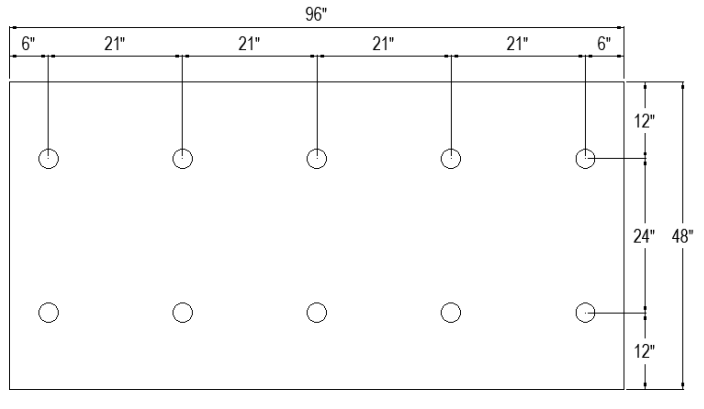
Six (6)



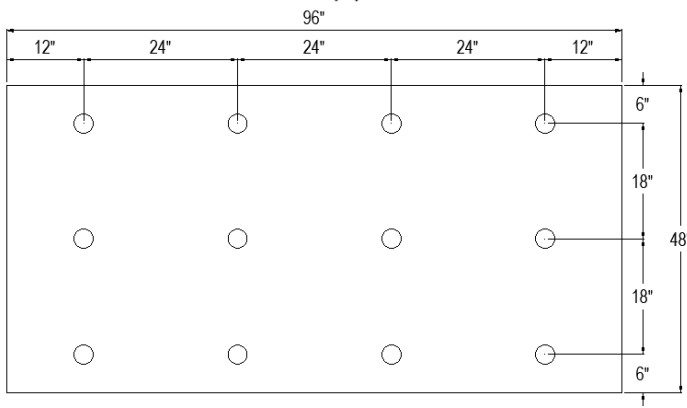
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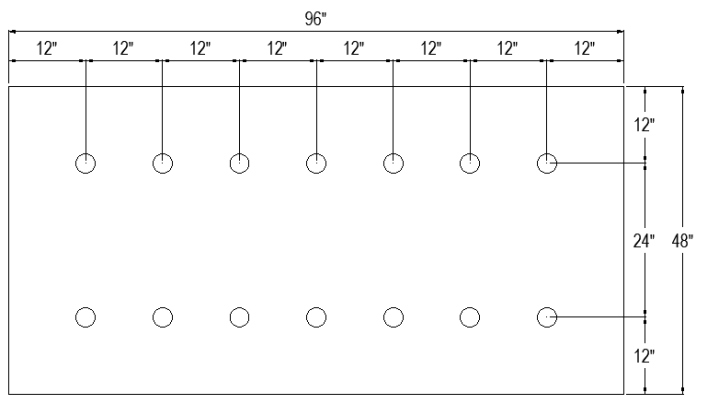
Nine (9)



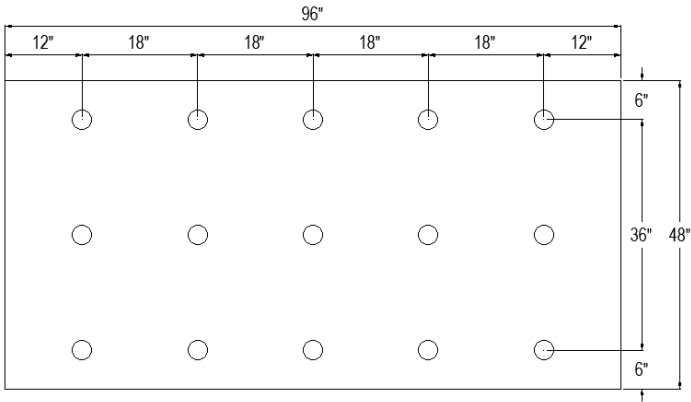
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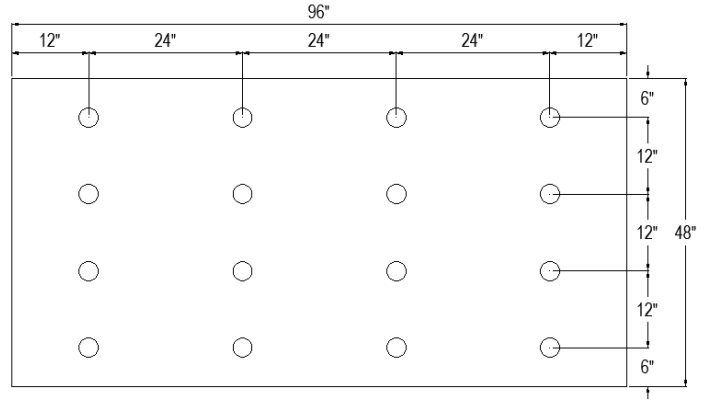
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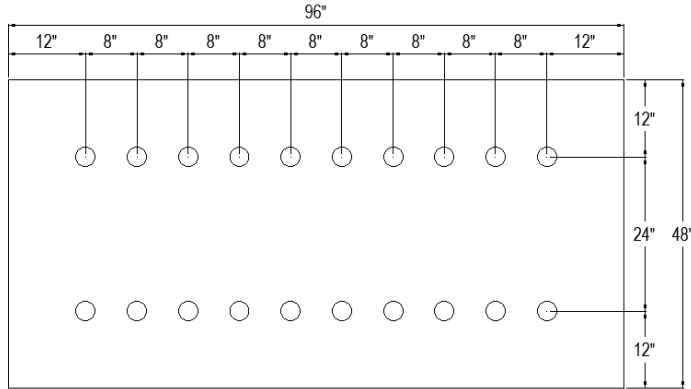
Fourteen (14)



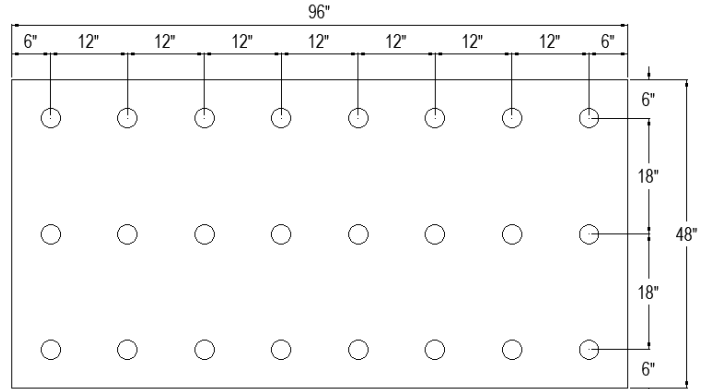
Fifteen (15)



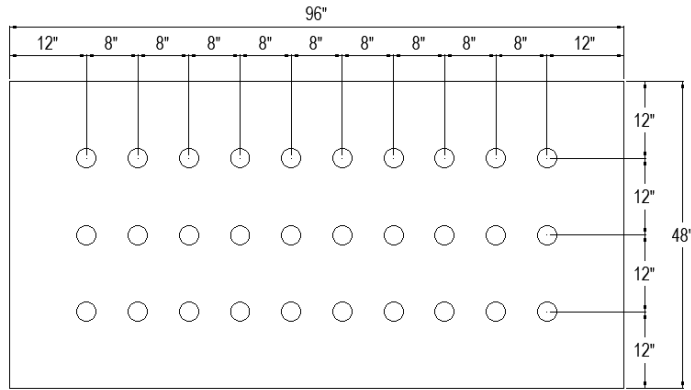
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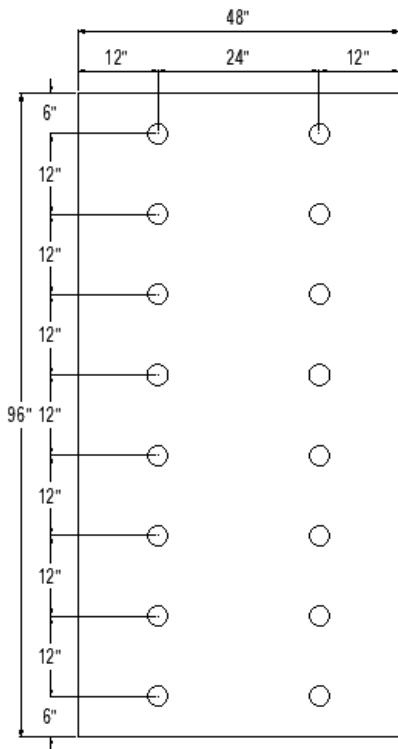
Twenty (20)



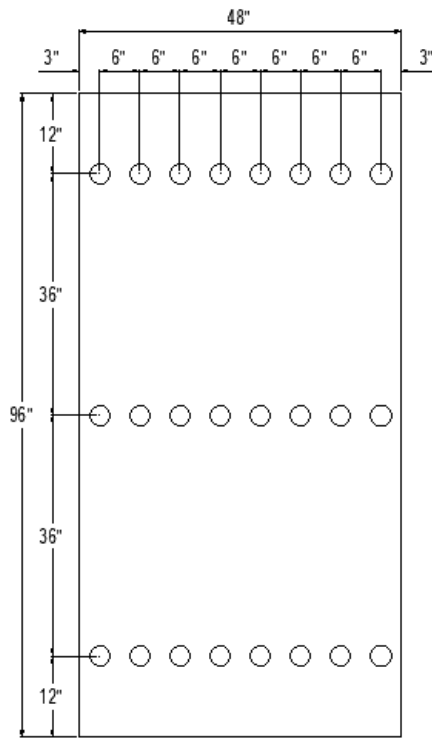
Twenty-Four (24)



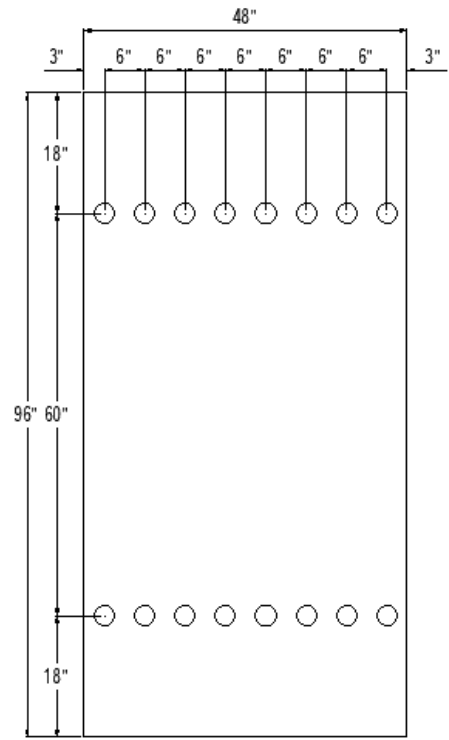
Thirty (30)



24/12 Linear Pattern
*Preliminary attachment may be required



36/6 Linear Pattern
*Preliminary attachment may be required



60/6 Linear Pattern
*Preliminary attachment may be required

InvisiWeld Warranty Requirements

The attachment rates below are for standard Red Shield Warranty requirements. Increased Wind Speeds, specific uplift requirements or other codes or specifications may alter the attachment rates listed below. The more stringent attachment rates should be used in this case. Contact your Building System Advisor for specific questions.

Red Shield Warranty	Field	Perimeter	Corner	Assembly	Fasteners
5, 10 or 15 Year ²	6	8	8	Rates based on Elevate ISO 95+/ISOGARD GL as the top layer installed. Cover board choice may alter these rates. Rates for specific assemblies should be validated.	HD Fasteners
20 Year ³					
25 and 30 Year ⁵	6	10	16		

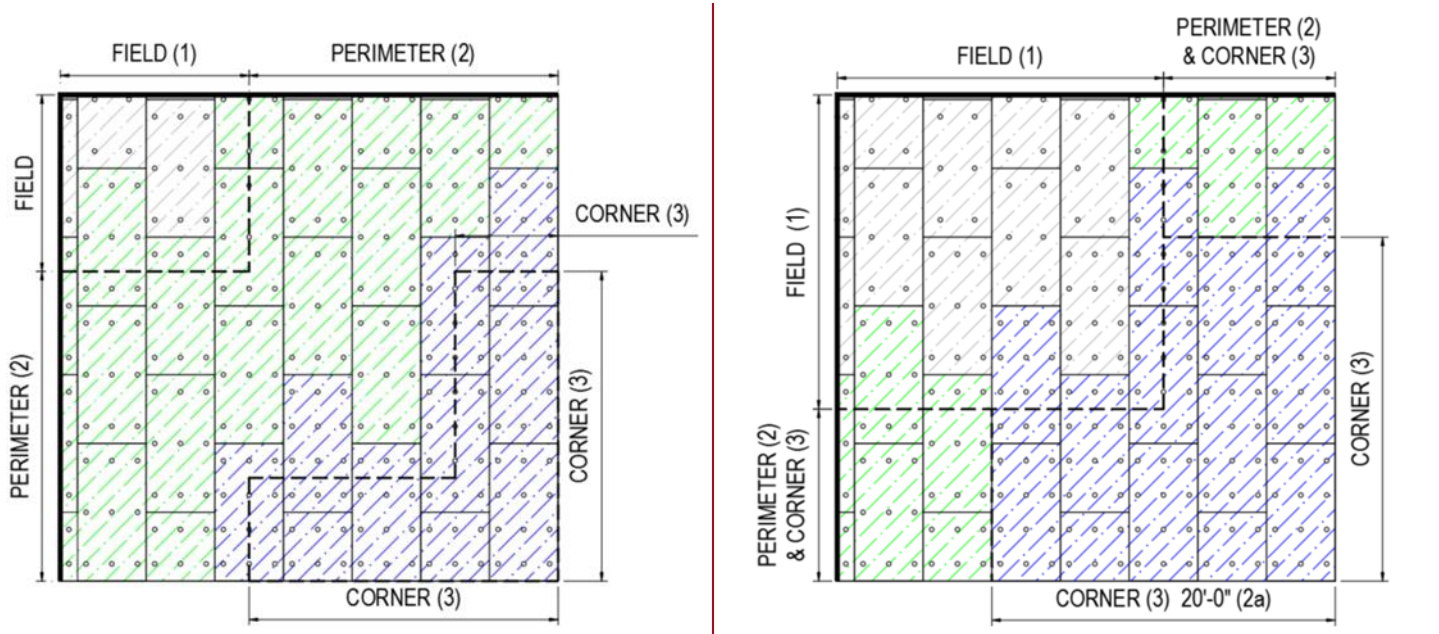
NOTE:

1. Rates above are based on contributory area rates.
2. 0.045" (1.14 mm) thick TPO and 0.050" (1.27 mm) thick Elevate PVC or PVC KEE approved for 15-year warranties.
3. 0.060" (1.52 mm) thick TPO or greater required for 20 and 25 year warranties.
4. 0.060" (1.52 mm) thick or greater TPO, PVC or PVC KEE required for any increased wind speed warranties.
5. 0.080" (2.03 mm) thick UltraPly TPO required for 30-year warranties.
6. 0.060" and 0.080" (1.52 mm and 2.03 mm) Elevate PVC or PVC KEE approved for 20-year warranties.
7. If the RoofNav listing has linear rows listed instead of contributory area, decrease the spacing between rows by a minimum 67% for the perimeters and 50% for the corners.
8. Elevate All-Purpose (AP) Fasteners are not approved for use on InvisiWeld Applications into Steel Decks.
9. Elevate #12 Fasteners are not approved for use on InvisiWeld Applications.

Table 47: InvisiWeld Warranty Attachment Requirements

InvisiWeld Enhancement Requirements

On standard InvisiWeld projects, Elevate fasteners and InvisiWeld Plates are to be used. It is important to be aware that the standard enhancements must carry over to the next board as shown by the example below. The required perimeter enhancement will be defaulted to in the field area if the perimeter board extends into that area. The same is true for the corner enhancements. All-Purpose Fasteners are not approved for use on InvisiWeld Applications into Steel Decks. The zone layouts shown below are for example purposes only. Actual layout requirements may vary based on project conditions.



Example layout for buildings with heights of 60' or less.

Example layout for buildings with heights greater than 60' in height.

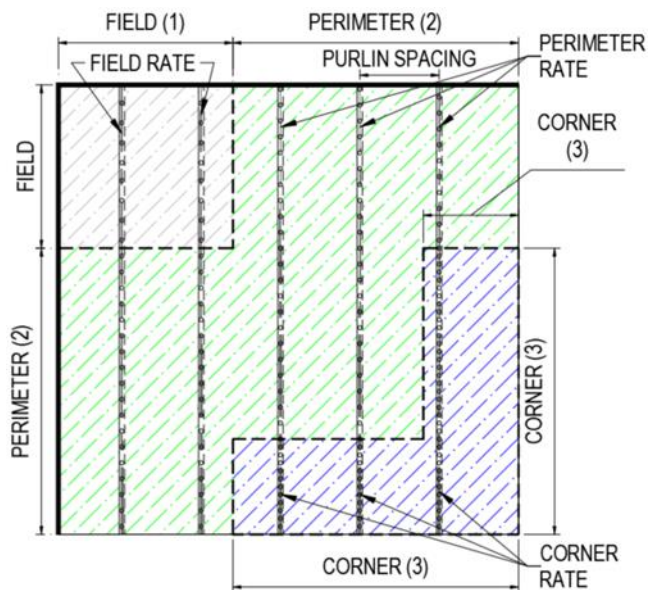
Table 48: InvisiWeld Enhancement Roof Zone Layout

Metal Building Re-Cover (MBR) – InvisiWeld Attachment Rates – Standard Warranty

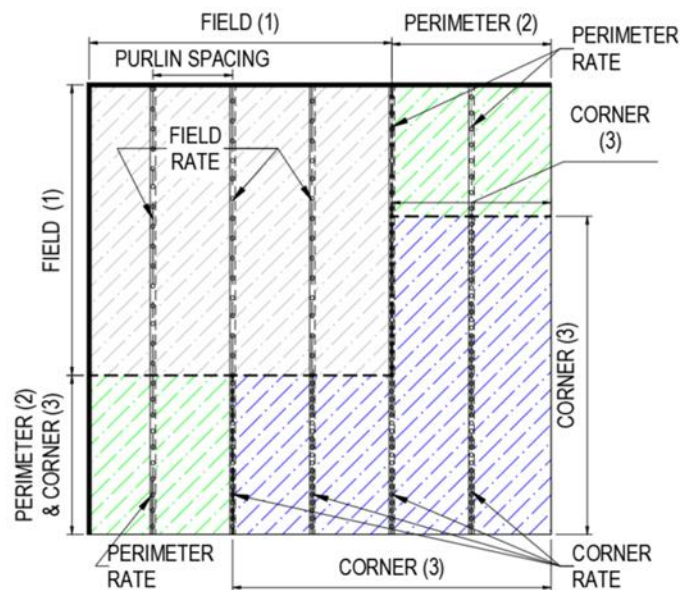
Membrane must be attached to InvisiWeld Plates that are installed directly into purlins with Elevate Purlin Fasteners at a minimum of 10' o.c. in the field (every other purlin) and 5' o.c. for perimeter and corner (every purlin) areas. Fastening rates may vary based on conditions. Specific uplifts, code conditions or wind speed requirements may alter the requirements, in this case the more stringent requirements should be followed. The zone layouts shown below are for example purposes only. Actual layout requirements may vary based on project conditions.

Metal Building Re-Cover					
Warranty Length	Material	Attachment Method	Roof Zone		
			Field	Perimeter	Corner
Up to 20 Years	Membrane (≤ 60' (18.29 m))	Purlin Fastener	12" o.c. (every other purlin)	12" o.c. (every purlin)	6" o.c. (every purlin)
	Membrane (> 60' (18.29 m))	Purlin Fastener	Contact a Regional Technical Coordinator		
	Cover Board/Insulation	Heavy Duty (HD)	5	5	5
Added Air Retarder*	N/A	Heavy Duty (HD)	8	12	16

* The use of an Air Retarder requires that the cover board/insulation pre-securement be increased to accommodate the added uplift the system may experience due to the retarder. Proper application details for the air retarder should be followed.



Example layout for buildings with heights of 60' or less.



Example layout for buildings with heights greater than 60' in height.

Table 49: Metal Building Re-Cover – Invisiweld Zone Layout

Metal Building Re-Cover – Mechanically Attached FM Enhancement Options

Factory Mutual Loss Prevention Data Sheet 1-31 – 3.1.4.1

It is not practical to provide additional rows of fasteners for re-cover systems in which the mechanically attached, single-ply roof cover is secured directly to the purlins because the existing purlins are at a fixed distance, typically 4' to 6' (1.2 m to 1.8 m) on center. For these cases it is acceptable to increase the fastening density of the new single-ply roof cover by decreasing the spacing between fasteners along each fastener row or batten bar in the specific zones. The fastener spacing should be a minimum of 60% (perimeter) and 40% (corner) of the FM Approved spacing but no closer than 3" oc. Pre-secure the insulation per DS 1-29. **NOTE:** Not intended to be used with Invisiweld Systems.

Example:

- Reduce the perimeter fastener spacing to a maximum of 60% of the field spacing.
Field = 12" o.c. – Perimeter = 12" x .6 = 7.2" (round down if necessary)
- Reduce the corner fastener spacing to a maximum of 50% of the field spacing.
Field = 12" o.c. – Corner = 12" x .5 = 6" (round down if necessary)

NOTE: Refer to tested assembly to validate FM Approved fastening rates for insulation installed over an existing metal building.

Standing Seam Roof (SSR) Factory Mutual (FM) Inseam Enhancement Options

1. Find a tested assembly that meets each or all three zones of the roof.
2. For SSR in regions not prone to tropical cyclones, secure the system as required for the field of the roof in accordance with RoofNav. In the perimeter and corner areas, use a purlin and internal clip spacing that is a maximum of one-half and one-third that required for the field of the roof, respectively.
3. For SSR in regions prone to tropical cyclones, see Factory Mutual LPDS 1-31 Section 2.2.2.2 B and 2.2.2.3.

Ballast Warranty Requirements

The ballast rates below are for standard Red Shield Warranty requirements. See product specific Design and Application Guides along with details and related technical documents for additional information. Project conditions, increased wind speed warranties, specific uplift requirements or other codes or specifications may alter the attachment rates listed below. The more stringent attachment rates should be used in this case. Contact a Holcim Regional Technical Coordinator for specific questions. Regarding size and roughness of stone ballast refer to local building codes, the ANIS/SPRI Wind Design Standard for Ballasted Single-ply Roofing Systems RP-4 or Factory Mutual Loss Prevention Data Sheet 1-29 for information regarding stone ballast requirements on loose laid single-ply roofing systems. Building height, parapet height and exposure category may impact allowance of ballast systems.

Chart of Minimum Coverage Requirements for Various Ballast Gradations		
ASTM Size No. Stone	Nominal Size	Minimum Acceptable Coverage
4 (Elevate Minimum)	¾" (19 mm) to 1½" (38 mm)	10 lb/ft ² (49 kg/m ²)
3	1" (25 mm) to 2" (51 mm)	10 lb/ft ² (49 kg/m ²)
2	1½" (38 mm) to 2½" (63 mm)	13 lb/ft ² (63.5 kg/m ²)
1	1½" (38 mm) to 3½" (89 mm)	16 lb/ft ² (78 kg/m ²)
ASTM Size No. Stone	Nominal Size	Minimum Acceptable Coverage
4	Standard Concrete Pavers	18 lb/ft ² (88 kg/m ²)
	Interlocking, Beveled, Doweled or Contoured Fit LWC Pavers	10 lb/ft ² (49 kg/m ²)
2	Concrete Pavers	22 lb/ft ² (107 kg/m ²)
	Interlocking, Beveled, Doweled or Contoured Fit LWC Pavers	10 lb/ft ² (49 kg/m ²)

Table 50: Chart of Minimum Coverage Requirements for Various Ballast Gradations

Ballast Roof Zones:

Zone 1' (Field Prime) and Zone 1 (Field): Remainder

Zone 2 (Perimeter) and Zone 3 (Corner): Width equal to at least 60% of the roof height, but not less than 8.5 ft (2.6 m) or 4% lesser plan dimension



Increased Wind Speed Warranty Attachment Guide

December 2023

NOTE: The contents of this guide are considered accurate at the time of posting. All information contained within should be validated for accuracy as it relates to specific project conditions or requirements. Specific codes, uplifts or other factors may result in changes to the information contained within this document. Validate all specific conditions with a Holcim Regional Technical Coordinator prior to its use.

Elevate Increased Wind Speed Warranty Minimum Attachment Rate Guide

The following document outlines the required attachment rates and conditions that Holcim Solutions and Products US, LLC looks for to issue a warranty that contains increased wind speed coverage. When the project requires specific codes and/or uplifts to be met the attachment rates below may not be appropriate. Review of the specific project conditions and specifications should be completed, and all pertinent information must be provided to Holcim prior to the project being bid on or installed. Failure to do so may result in required changes to the bids, products used, installation and/or possible denial of warranty coverage. Not all conditions are covered in this document. Please contact an Elevate Sales Representative or a Holcim Regional Technical Coordinator for conditions or information not found in this document.

Due to unknown variables associated with each building structure, Holcim suggests a licensed engineer to verify all attachment rates are appropriate for the specific project requirements. It is the responsibility of the Architect, Design Professional, Engineer and/or Building Owner to verify that the installed roofing system and related components are installed to meet the specified requirements of the International Building Code, State and Local codes and other related requirements. It is the responsibility of the specifier to review local, state, and regional codes to determine their impact on the specified system. Drainage must be evaluated by the specifier in accordance with all applicable codes. For code compliance, increased fastening density may be required depending upon project wind speed and wind uplift requirement. Subject to code requirement, it is recommended that a minimum roof slope of 1/8" per horizontal foot be provided to serve long-term aesthetics.

Metal-Edge Systems and Copings should be designed in compliance with Section 1504.5 of the International Building Code and shall be tested in accordance with ANSI/SPRI ES-1. Shop fabricated or factory formed metal is required for increased wind speed warranties over 90 mph. Contact a Holcim Regional Technical Coordinator when this condition is in question.

Projects that require specific codes or uplift pressures may require additional enhancements. Attachment rates may vary from those listed in these documents. In such cases the more stringent fastening rates apply.

Wind Speed and Uplift are not interchangeable. Please be sure to present a Holcim Regional Technical Coordinator with the projects calculated uplift requirements along with the desired wind speed request.

Please note that Regional Wind Speeds are mentioned in the tables below. These values can be found using several sources. ASCE, IBC and FM are a few examples. The ASCE 7-10 Basic Wind Speeds per risk category have been provided at the end of this document. Holcim references the Basic Wind Maps found in Factory Mutual Loss Prevention Data Sheet 1-28 which can be found within the Factory Mutual RoofNav application (www.roofnav.com).

Re-Cover and Re-Roof projects may not qualify for increased wind speed warranties. These applications will require at least one layer of new insulation/cover board to be mechanically attached to the structural deck. Documented Pull Tests are required on all projects where the deck type cannot be validated or on projects that are re-cover/re-roof applications.

Alaska, Hawaii, and International Projects

Contact a Holcim Regional Technical Coordinator or your Elevate Sales Representative for further information.

Metal Roofing

Contact a Holcim Regional Technical Coordinator or your Elevate Sales Representative for further information.

Asphalt or Mod-Bit Roofing

- Attachment rates for the insulation and cover boards will be the same as those listed in the insulation and cover board attachment rate table located at the end of this document.
- Warranty requests with wind speeds greater than 90 MPH will require hot asphalt or torched membrane applications.
- ISO 95+ GL™ / ISOGARD™ GL or ISOGARD HD is not an acceptable substrate for torched membranes.
- All systems that utilize hot asphalt or torched attachment of cap/base sheets require a suitable cover board to be used.

General Notes

- Warranty requests of 25-30 years may require additional requirements. Review project requirements with a Holcim Regional Technical Coordinator.
- All assemblies that require an increased wind speed greater than 90mph require the addition of a cover board. Cover board thickness ½" or minimum. 90-99 mph request will require a minimum of 2" ISO 95+ GL / ISOGARD GL to be used if no cover board is present.
- Projects located in HVHZ, coastal or other high wind zones may require additional enhancements.
- Peel stop details may be required. Please review the Peel Stop section of this document or contact a Holcim Regional Technical Coordinator for more information.
- Projects that require specific uplift pressures may require additional enhancements. Attachment rates may vary from those listed in these documents. In such cases the more stringent fastening rates apply.
- The use of an air barrier is highly recommended on systems with 100 mph or greater wind speed coverage added. Six (6) mil poly is acceptable. The use of air barriers requires mechanical attachment of at least the base layer of insulation.
- The use of air barriers may result in increased fastening rates. Consult a Holcim Regional Technical Coordinator for more information.
- Some assemblies may not be acceptable over improperly designed decks. Contact Holcim Regional Technical Coordinator for specific requirements.
- Elevate Water Based Bonding Adhesive – P and Elevate PVC Water Based Bonding adhesive is only approved for use on warranties up to 15 years and with a maximum wind speed coverage of 55 mph.
- Required fastener pullout values: Adhered Membrane ≥ 300 lb -or- Mechanically Attached ≥ 400 lb.
- Pulls for mechanically attached membrane must be minimum 400 lb (documented). Pull values under listed requirement require attachment into the truss/structure.
- Platinum warranties require a minimum of 1" of ISO 95+ GL / ISOGARD GL be installed over the deck.
- HailGard™ Fasteners are to be used with HailGard/ISOGARD HG insulation, OSB or Plywood insulation/cover boards only.
- FM Insured projects do not allow perimeter half sheets to be used around the entire perimeter. The "Finger" method of attachment at the appropriate locations is acceptable. Alternate attachment rates and methods may be required.
- Holcim recommends the use of the "Finger" method of attachment on mechanically attached membranes when increased wind speeds are to be warranted.
- When oriented strand board (OSB) is to be used the smooth side of the board should be placed up.
- Ballasted systems (stone ballast paver or heavy-weight pavers (90 lb minimum)) may qualify for up to 72 mph increased wind speed coverage on buildings with 30 ft. height or less when installed per the Holcim approved guidelines.
- Systems using decorative ballast, decorative pavers or garden roofing do not qualify for increased wind speed warranties.
- Jet Bond Spray Adhesive is approved for increased wind speed coverage up to 120 MPH within an approved assembly.
- Jet Bond PVC Spray Adhesive is approved for use with Elevate PVC (non-fleece) Membrane only. Jet Bond PVC Spray Adhesive is approved for increased wind speed coverage up to 90 MPH within an approved assembly.
- RubberGard EPDM SA and UltraPly TPO SA may qualify for Increased Wind Speed Warranties up to 120 MPH when used in an approved assembly.
- Base tie-in attachment spacing to match membrane attachment spacing on increased wind speed warranties.

Edge Metal Requirements

Elevate metal must be used and installed per Elevate details and standards for warranty inclusion. ES-1 certified metal and details are required for increased wind speed warranties over 80 mph. Contractors participating in the Holcim ES-1 Metal Cleat Program may receive up to 90 mph coverage for qualifying products. To meet Holcim's technical specifications, all edge metal, metal copings and edge systems whether field fabricated, shop fabricated, or factory formed should be designed in compliance with the International Building Code (IBC) and be tested/installed in accordance with ANSI/SPRI/FM4435/ES-1 standard and requirements. Reference the tables below for more available warranty terms and wind speed coverage options.

Elevate Edge Metal and Flashing Warranty Breakdown*		
Material	Included in Red Shield	Warranty and Terms
Metal by Others	No	Non-Elevate metal not included in the Red Shield Warranty. Acceptable for use on standard warranties of Max. 20-Years, 55 mph installed per appropriate details/guidelines.
Elevate Metal – Field Fabricated	Yes	Max. 20-Years, 80 mph Installed per current Elevate details/guidelines. (No increased wind speeds when installed per non-Elevate guidelines.)
Elevate Metal – Shop Fabricated (ES-1 Metal Cleat Program)	Yes	Max. 20-Years, up to 90 mph Installed per current Elevate details/guidelines. Factory Cleat required (ANSI/SPRI ES-1).
Factory Formed – Other Suppliers (Using Elevate Metal)	Yes	Max. 20-Years, 90 mph Elevate metal purchased direct from approved factory fabricator.
Elevate Branded Metal – Factory Formed	Yes	Max. 30-Years, up to 120 mph Factory formed Elevate Metal and accessories, installed per current details/guidelines. Elevate branded and purchased from Elevate.

*See warranty sample for specific coverage.

Table 51: Elevate Edge Metal and Flashing Warranty Breakdown

Elevate Warranted Pre-Engineered Edge Metal Systems		
Red Shield Platinum (30 Year)	Red Shield (25 Year)	Red Shield (5 – 20 Year)
Fascia		
Elevate AnchorGard® SP Fascia	Elevate SP Rail Fascia	Elevate Gravel Stop
Elevate AnchorGard® SP Extended Fascia	Elevate MB Rail Fascia	Elevate Drip Edge
Elevate AnchorGard® SP HG Fascia	Elevate Extended SP Rail Fascia	Elevate TPO Coated Drip Edge
Elevate AnchorGard® Canted WD Fascia	Elevate Extended MB Rail Fascia	Elevate PVC Coated Drip Edge
Elevate AnchorGard® Canted Nailer Fascia	Elevate Snap-On Fascia	Elevate TPO Skirted Drip Edge
Elevate AnchorGard® Extended Canted WD Fascia	Elevate System 300 Fascia	Elevate PVC Skirted Drip Edge
Elevate AnchorGard® Extended Canted Nailer Fascia	Elevate EdgeGard+ Fascia	Elevate Flash-Thru Drip Edge
Elevate AnchorGard® SP Butyl Strip Fascia	Elevate EdgeGard+ Crimp Fascia	Elevate Extender
Elevate AnchorGard® HG Butyl Strip Fascia		Elevate Extender with Offset
Elevate AnchorGard® Drip Edge		
Elevate AnchorGard® MB Fascia		
Elevate AnchorGard® MB Extended Fascia		
Elevate AnchorGard® MB HG Fascia		
Elevate AnchorGard® Platinum Fascia		
Elevate AnchorGard® Platinum Extended Fascia		
Elevate AnchorGard® Platinum HG Fascia		

Elevate Warranted Pre-Engineered Edge Metal Systems (Continued)		
Red Shield Platinum (30 Year)	Red Shield (25 Year)	Red Shield (5 - 20 Year)
Coping		
Elevate Coping	Elevate Snap-On Coping	Elevate Continuous Cleat Coping
Elevate Gold Coping	Elevate Snap-On Gold Coping	Elevate Flush Face Coping
	Elevate One Coping	Elevate Single Cantilever Coping
		Elevate Dual Cantilever Coping
		Elevate Double Tapered Coping
Wood Nailer Alternatives		
Elevate AnchorGard® Nailer-T		
Elevate Edgebox RI		
ES-1 Cleat Program		
		Elevate ES-1 Drip Edge
		Elevate ES-1 Gravel Stop
		Elevate ES-1 Flat Coping
		Elevate ES-1 Snap-On Fascia
		Elevate ES-1 Tapered Coping
Standard Warranty - Other		
Elevate Termination Bar*		Elevate Metal Field Fab (NIP)
Elevate Drain Bar*		
Elevate Clad Metal Field Fab (NIP)*		
<i>*Per Elevate Platinum Details</i>		
Increased Wind Speed Coverage - Edge Metal to be included in Red Shield Warranty Coverage		
Up to 55 mph	Up to and including 90 mph	Up to and including 120 mph

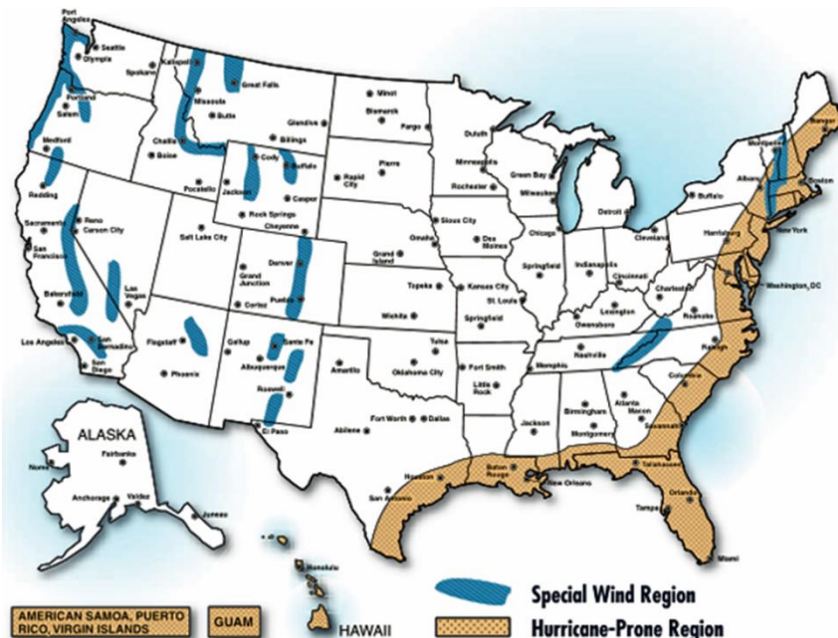
NOTE:

1. Non-Elevate metal is **NOT** included in the Red Shield Warranty.

Table 52: Elevate Warranted Pre-Engineered Edge Metal Systems

Hurricane-Prone Regions and Special Wind Regions

! Engineer review of project conditions and attachment rates required for projects located in Special Wind and Hurricane-Prone Regions



Increased Wind Speed Warranty Attachment Requirements

Cover Board/Insulation Attachment Rates - Adhered Single-Ply Membrane Roofing Systems			
Peak Gust Wind Speed Coverage	Minimum Insulation/Substrate	Insulation/Substrate Attachment	
		Min. # of Fasteners per 4' x 8' board ¹	Adhesive Ribbon Spacing 4' x 4' boards
72 - 80 mph	¼" DensDeck® Prime	12	Field: 12" (304.8 mm) Perimeter: 6" (152.4 mm) Corner: 6" (152.4 mm)
	⅝" DensDeck StormX Prime	12	
	¼" Securock®	12	
	½" ISOGARD HD	12	
	≥ 2" ISOGARD GL/ISO 95+ GL or ISOGARD CG/RESISTA	8	
	2" ISOGARD HD Composite	8	
90 mph	HailGard/ISOGARD HG or OSB	16	Field: 12" (304.8 mm) Perimeter: 6" (152.4 mm) Corner: 4" (101.6 mm)
	½" DensDeck Prime	12	
	⅝" DensDeck StormX Prime	12	
	½" Securock	12	
	≥ 2" ISOGARD GL/ISO 95+ GL or ISOGARD CG/RESISTA	12	
	½" ISOGARD HD	16	
100 mph	2" ISOGARD HD Composite	12	Ribbons min. 4" (101.6 mm) o.c.
	HailGard/ISOGARD HG or OSB	16	
	½" DensDeck Prime	16	
	⅝" DensDeck StormX Prime	16	
	⅝" Securock	16	
	≥ 2" ISOGARD GL/ISO 95+ GL (25 psi) or ISOGARD CG/RESISTA (25 psi)	16	
	½" ISOGARD HD	16	
110 mph	1½" HailGard/ISOGARD HG	18	Ribbons min. 4" (101.6 mm) o.c.
	7/16" OSB	18	
	2" ISOGARD HD Composite	16	
	⅝" DensDeck Prime	16	
	⅝" DensDeck StormX Prime	16	
	⅝" Securock	16	
120 mph	½" ISOGARD HD	24	Ribbons min. 4" (101.6 mm) o.c.
	Min. 1½" HailGard/ISOGARD HG	18	
	7/16" OSB	18	
	⅝" DensDeck Prime	24	
	⅝" DensDeck StormX Prime	24	
	⅝" Securock	24	
	Min. 1½" HailGard/ISOGARD HG	24	
	7/16" OSB	20	

NOTE:

1. Due to unknown variables associated with each building structure, Holcim Solutions and Products US, LLC suggests a licensed engineer to verify all attachment rates are appropriate for the specific project requirements. It is the responsibility of the Architect, Design Professional, Engineer and / or Building Owner to verify that the installed roofing system and related components are installed to meet the specified requirements of the International Building Code, State and Local codes and other related requirements. For code compliance, increased fastening density may be required depending upon project wind speed and wind uplift requirement.
2. All pertinent information regarding code requirements, uplift requirements and special conditions should be disclosed at the time of project review, bid and system approval. Lack of the appropriate information may result in increased costs associated with changes required to meet the code or warranty requirements.
3. This chart is only to be used for buildings with heights at 60' height or less. Buildings over 60' require design data and project specifications be provided.
4. Projects located in Hurricane-Prone and / or Special Wind Regions (See Map Below), may require additional project enhancements. Projects in these locations must be reviewed by a Holcim Regional Technical Coordinator for approval*.

Table 53: Cover Board / Insulation Attachment Rates - Adhered Membrane Roofing Systems

SEE ADDITIONAL NOTES ON THE NEXT PAGE

Additional Notes

- See Elevate Edge Metal and Flashing Warranty Breakdown table and the Elevate Warranted Pre-Engineered Edge Metal Offering warranty coverage table for warranty term and increased wind speed coverage options.
 - Buildings with heights between 51'-100' increase perimeter/corner zones to a minimum 12' wide* and increased board fastening rates by no less than 50% more fasteners/plates, maximum 32 fasteners per board*.
 - The base layer of insulation, when mechanically attached, must be a min. of 2" to use listed fastening above if the additional insulation or cover board is to be adhered. ½" - ¾" diameter bead required on all adhesives unless otherwise noted*.
 - Assemblies with insulation adhered directly to the steel deck may qualify for a maximum of 80 mph at an attached rate of 12/6/4 inches on center. Deck must be clean, with oils or residue removed. Ensure adhesives are applied to top of ribs in this minimum bead spacing.
 - FM does not recognize adhesion of insulation materials direct to steel decks. Alternate attachment methods may be required*.
 - Building heights over 60' may require increased fastening rates over what is listed above*.
 - Attachment rates may change based on uplift requirements for the specific project.
 - The attachment rates listed in this table are for warranty purposes only.
 - The attachment rates listed in this table are for new construction only.
 - Re-Roof or Recover attachment rates may vary based on project conditions, pull test values and other related information*.
 - Peel Stops may be required on any increased wind speed warranty at or over 90 mph*.
 - Warranty requests of 25 - 30 years may include additional requirements*.
 - RubberGard EPDM SA and UltraPly TPO SA may qualify for Increased Wind Speed Warranties up to 120 MPH when used in an approved assembly.
 - Deck Requirements
 - Steel Decks – Minimum 22 ga, 33 ksi
 - Concrete Decks – Smooth/Dry concrete deck is required.
 - Wood Decks – New or Like New Deck required and pull tests validated.
 - LWC over Steel/Concrete – Maximum increased wind speed of 90 mph.
 - Wood, Gypsum, Tectum and LWC/LWIC Deck type may require additional fasteners than what is listed above*.
 - Gypsum and Cementitious Wood Fiber deck – Min. bead spacing F6-P4-C4 inches on center for increased wind speeds, 90mph max.
 - Plywood and OSB decks are limited to 90 mph wind speed coverage. See Wood Deck section below for more information.
 - Re-Cover over existing insulated systems that contain a base sheet and/or insulation materials (adhered/attached) require mechanical attachment of an approved base sheet or at least one layer of insulation/cover board into an approved deck.
 - Re-Cover over a gravel surface BUR (direct to deck) may be approved, subject to the following:
 - Adhesion tests must be performed. Document the successful results and provide them to your Holcim Regional Technical Coordinator for approval.
 - If adhesion tests are not favorable, an approved primer or mechanical attachment may be required.
 - If approved:
 - Power Wash, Power Broom, Spud/Scrape existing gravel to make the surface as smooth as possible.
 - Any damaged, wet, loose, or otherwise compromised components of the existing system must be replaced with like materials.
 - Adhesive rates increase to full coverage (FS).
 - Limited to max. 90 mph with approval.
 - A Re-Cover over a Granule Surface BUR (Direct to Deck) may be approved, subject to the following:
 - Adhesion tests must be performed. Document the successful results and provide them to your Holcim Regional Technical Coordinator for approval.
 - If adhesion tests are not favorable, an approved primer or mechanical attachment may be required.
 - If approved:
 - Broom existing surface to ensure it is as clean as possible and all loose granules are removed.
 - Any damaged, wet, loose, or otherwise compromised components of the existing system must be replaced with like materials.
 - Adhesive rates increase to full coverage (FS).
 - Limited to max. 90 mph with approval.
 - Contact a Holcim Regional Technical Coordinator when building conditions are not outlined by the information listed in this document.
- *Please validate with a Holcim Regional Technical Coordinator**

Ballasted Roofing Systems

Stone, Elevate Ballast Pavers, and Heavy-Weight (90 lb) Paver Ballast

Holcim increased wind speed coverage for ballasted roofing systems is limited to 72 mph on buildings with a height of 30 feet or less and following the outlined information below. Ballast weight must be increased to accommodate the increased risk associated with higher winds. All increased wind speed warranty requests are subject to review by the Holcim Regional Technical Coordinator. It is the responsibility of the building owner to validate that the structure can support the added weight of the ballast material. Holcim is not responsible for any movement or scouring of ballast materials. Holcim is not responsible for any ballast materials falling/flying off the roof. Elevate PVC and PVC KEE membranes are not approved for ballast applications.

Stone Ballast

- A minimum continuous parapet height from the finished roof of 36 inches is required.
 - If minimum height cannot be met, then heavy-weight (90 lb min.) concrete pavers are required in all perimeter/corner areas.
- The weight of stone ballast must be a minimum of 12/15/18 lb/ft in corresponding Field/Perimeter/Corner zones.

Paver Ballast

- A minimum continuous parapet height from the finished roof of 36 inches is required.
- Elevate Ballast Pavers are acceptable when installed per Elevate installation instructions, details, and other guidelines.
- Elevate SkyPaver composite roof paver products are not considered a valid ballast option.

Please contact a Holcim Regional Technical Coordinator for further information.

Half Sheet Information

Warranty

The information listed in the tables below is approved for Red Shield Warranty purposes only. The half sheet totals used below do not indicate compliance to building codes or other specific compliance. The designer, architect and building owner should validate the system installed to be appropriate per all local, state, and national building code requirements.

See the ASCE 7 Roof Zones section to determine code compliant roof zones and perimeter width requirements.

Increased Wind Speed System Options – UltraPly TPO

UltraPly TPO Mechanically Attached or Adhered Membrane Options									
Warranty Length	Warranty Wind Speed Coverage – Membrane Attachment								Membrane Thickness (Minimum)
	55, 72 & 80 mph		90 mph		100 mph		110 to 120 mph		
	Adhered	Mech. Attached	Adhered	Mech. Attached	Adhered	Mech. Attached	Adhered	Mech. Attached	
5, 10 or 15 years	✓	✓	N/A	N/A	N/A	N/A	N/A	N/A	45 mil
	✓	✓	✓	✓	✓	✓	✓	N/A	60 mil
20 years	✓	✓	✓	✓	✓	✓	✓	N/A	60 mil
25 years	✓	✓	✓	✓	✓	✓	✓	N/A	60 mil
30 years	✓	✓	✓	✓	✓	✓	✓	N/A	80 mil

NOTE:

1. Wind speeds over 80 mph require the use of 60-80 mil membranes.
2. At wind speeds of 100 MPH maximum sheet size of 8' allowed, attached at a maximum of 6" o.c.
3. At wind speeds of 110-120 MPH, Elevate InvisiWeld Attachment only for mechanically attached systems.
4. 45 mil UltraPly TPO is only acceptable on 5, 10 and 15-year warranties up to 80 mph.
5. UltraPly TPO XR adhered with Twin Jet in spatter application is not approved for Increased Wind Speeds over 90MPH.
6. Warranty requests of 25 - 30 years may require additional requirements. Review project requirements with a Holcim Regional Technical Coordinator.
7. Refer to the appropriate version of the ASCE for wind maps not found within this document.
8. Location-specific basic wind speeds shall be permitted to be determined using www.atcouncil.org/windspeed.
9. See adhered membrane table for coverboard requirements for mechanically attached and Invisiweld attached systems.

Table 54: UltraPly TPO Mechanically Attached or Adhered Membrane Options

TPO - Steel/Concrete - 22 ga Steel Deck or 2,500 psi Structural Concrete Decks						
Peak Gust Wind Speed Coverage	Maximum Roof Height	Min. # Perimeter Sheets by Regional Wind Speeds		Field Sheet Size (Width)	Perimeter Sheet Size (Width)	Fastening Rate
		Up to 120 mph	121 mph or Greater			
72 – 80 mph	< 60'	2	3	12'-4" 10' 8' 5'	6' 5' 5' -	6" o.c. 12" o.c. 12" o.c. 12" o.c.
	≥ 60'	4	5	12'-4" 10' 8' 5'	6' 5' 5' -	6" o.c. 12" o.c. 12" o.c. 12" o.c.
90 mph	< 60'	3	4	10' 8' 5'	5' 5' -	6" o.c. 12" o.c. 12" o.c.
	≥ 60'	4	5	10' 8' 5'	5' 5' -	6" o.c. 12" o.c. 12" o.c.
100 mph	< 60'	4	5	8' 5'	5' -	6" o.c. 6" o.c.
	≥ 60'	5	6	8' 5'	5' -	6" o.c. 6" o.c.
110 – 120 mph	< 60'	Invisiweld Only – 12-20-30				

NOTE:

1. Wind speeds over 80 mph require the use of 60-80 mil membranes.
2. FM Insured projects do not allow perimeter half sheets to be used around the entire perimeter. The “finger” method of attachment at the appropriate locations is acceptable. Alternate attachment rates and methods may be required.
3. FM insured projects may not allow the attachment rates listed above. Validation using FM RoofNav should be used.
4. Ensure deck type/span allow for attachment rate shown above. When specific uplift pressures must be met, not all options above will be valid.
5. Building heights over 100' may require additional enhancements.
6. Heavy Duty or Heavy Duty Plus Fasteners are required on steel decks: minimum 33 ksi, 22 ga, 72" maximum deck span.
7. Concrete Drive Fasteners or Heavy-Duty Fasteners are required on concrete decks.
8. Warranty requests of 25 - 30 years may require additional requirements. Review project requirements with a Holcim Regional Technical Coordinator. Maximum 6" o.c. spacing for mechanically attached systems.
9. Refer to the appropriate version of the ASCE for wind maps not found within this document.
10. Location-specific basic wind speeds shall be permitted to be determined using www.atcouncil.org/windspeed.
11. See adhered membrane table for coverboard requirements for mechanically attached and Invisiweld attached systems.

Table 55: TPO – Steel / Concrete – Membrane Attachment Requirements – Increased Wind Speed

TPO – Wood Decks							
Peak Gust Wind Speed Coverage	Deck Type	Max. Roof Height	Min. # Perimeter Sheets by Regional Wind Speeds		Field Sheet Size (Width)	Perimeter Sheet Size (Width)	Fastening Rate
			Up to 120 mph	121 mph or Greater			
72-80 mph	5/8" OSB	< 60'	2	3	12'-4" 10'	6' 5'	6" o.c. 6" o.c.
		≥ 60'	4	5	8' 5'	5' -	12" o.c. 12" o.c.
	15/32" Plywood (3-Ply)	< 60'	2	3	12'-4" 10'	6' 5'	6" o.c. 6" o.c.
		≥ 60'	4	5	8' 5'	5' -	12" o.c. 12" o.c.
	15/32" Plywood (5-Ply)	< 60'	2	3	12'-4" 10'	6' 5'	6" o.c. 6" o.c.
		≥ 60'	4	5	8' 5'	5' -	12" o.c. 12" o.c.
90 mph	5/8" OSB	< 60'	3	4	10' 8'	5' 5'	6" o.c. 12" o.c.
		≥ 60'	4	5	5'	-	12" o.c.
	15/32" Plywood (3-Ply)	< 60'	3	4	10' 8'	5' 5'	6" o.c. 12" o.c.
		≥ 60'	4	5	5'	-	12" o.c.
	15/32" Plywood (5-Ply)	< 60'	3	4	10' 8'	5' 5'	6" o.c. 12" o.c.
		≥ 60'	4	5	5'	-	12" o.c.
100 mph	Wood Plank 3/4" min. (T&G)	< 60'	3	4	5'	5'	6" o.c.
	2 x 6 Plank						

NOTE:

1. Fire Treated Plywood may be used provided it has not been treated with Ammonium Phosphates.
2. Wood deck condition must be new or like new. No wet, damaged, dry rot or severely punctured decking allowed.
3. Wind speeds over 80 mph require the use of 60-80 mil membranes.
4. FM Insured projects do not allow perimeter half sheets to be used. Alternate attachment rates and methods may be required.
5. 20 Year maximum warranty term (new construction) on OSB decks.
6. Minimum 1" deck penetration with all fasteners.
7. Warranty requests of 25 - 30 years may require additional requirements. Review project requirements with a Holcim Regional Technical Coordinator. Maximum 6" o.c. spacing for mechanically attached systems.
8. Refer to the appropriate version of the ASCE for wind maps not found within this document.
9. Location-specific basic wind speeds shall be permitted to be determined using www.atcouncil.org/windspeed.
10. See adhered membrane table for coverboard requirements for mechanically attached and Invisiweld attached systems.

Table 56: TPO – Wood Deck – Membrane Attachment Requirements – Increased Wind Speed

TPO - LWC over Steel/Structural Concrete - UltraPly TPO Membrane Mechanically Attached into Min. 22 ga Steel Pan/Deck or 2,500 psi Structural Concrete

Peak Gust Wind Speed Coverage	Deck Type	Max. Roof Height	Min. # Perimeter Sheets by Regional Wind Speeds		Field Sheet Size (Width)	Perimeter Sheet Size (Width)	Fastening Rate
			Up to 120 mph	121 mph or Greater			
72-80 mph	Steel Pan/Deck	60'	2	2	10'	5'	6" o.c.
	Structural Concrete				8'	5'	12" o.c.
90 mph	Steel Pan/Deck	60'	3	4	10'	5'	6" o.c.
	Structural Concrete				8'	5'	12" o.c.

NOTE:

1. Wind speeds over 80 mph require the use of 60-80 mil membranes.
2. FM Insured projects do not allow perimeter half sheets to be used around the entire perimeter. The “finger” method of attachment at the appropriate locations is acceptable. Alternate attachment rates and methods may be required.
3. Validate deck types/spans allow for attachment rate shown above. When specific uplift pressures are to be met not all options above will be valid.
4. Minimum 2" thick LWC
5. For Cellular Light Weight Concrete decks that are properly prepared and dry, Holcim does not require a vapor retarder, however one is recommended, if insulation is installed with the system.
6. Warranty requests of 25 - 30 years may require additional requirements. Review project requirements with a Holcim Regional Technical Coordinator. Maximum 6" o.c. spacing for mechanically attached systems.
7. Refer to the appropriate version of the ASCE for wind maps not found within this document.
8. Location-specific basic wind speeds shall be permitted to be determined using www.atcouncil.org/windspeed.
9. See adhered membrane table for coverboard requirements for mechanically attached and Invisiweld attached systems.

Table 57: TPO – LWC over Steel/Concrete Deck – Membrane Attachment Requirements – Increased Wind Speed

UltraPly TPO - Invisiweld Attachment Requirements

Peak Gust Wind Speed Coverage	Attachment Rate Per Board		
	Field	Perimeter	Corner
72 mph	6	10	15
80 mph	8	12	16
90 - 100 mph	8	14	20
110 - 120 mph	12	20	30

NOTE:

1. Minimum 60 mil membrane required for warranties of 81 mph or greater.
2. Cover board required for wind speeds of 110 mph or greater. See adhered membrane table for type and thickness.
3. 45 mil UltraPly TPO is only acceptable on 5, 10 and 15-year warranties up to 80 mph.
4. FM Insured projects may require alternate attachment rates or patterns than those listed above.
5. Attachment rates listed above may change due to specific uplift requirements.
6. Attachment rates above may change due to specific substrate used.
7. Attachment rates above may change due to warranty length requested.
8. Attachment rates above may change due to the addition of a vapor/air barrier (retarder).
9. Warranty requests of 25 - 30 years may require additional requirements. Review project requirements with a Holcim Regional Technical Coordinator.
10. Refer to the appropriate version of the ASCE for wind maps not found within this document.
11. Location-specific basic wind speeds shall be permitted to be determined using www.atcouncil.org/windspeed.
12. See adhered membrane table for coverboard requirements for mechanically attached and Invisiweld attached systems.

Table 58: TPO – Invisiweld Attachment Requirements – Increased Wind Speed

Metal Building Re-Cover – Increased Wind Speed Min. Requirements (20 Year max.)²					
Wind Speed	Material	Attachment Method	Roof Zone		
			Field	Perimeter	Corner
72 – 80 mph	Membrane – Every Purlin	Purlin Fastener	12" o.c.	6" o.c.	6" o.c.
90 mph					
72 – 90 mph	Cover Board/Insulation	Heavy Duty (HD)	8	8	8
Added Air Retarder ¹			8	12	16

NOTE:

- The use of an Air Retarder requires that the cover board/insulation pre-securement be increased to accommodate the added uplift the system may experience due to the retarder. Proper application details for the air retarder should be followed.
- Rates listed in this table are for warranty purposes only and may change based on project conditions, relevant building codes, or when performance requirements must be validated.

Table 59: Metal Building Re-Cover – Membrane Attachment Requirements – Increased Wind Speed

Increased Wind Speed System Options – Elevate PVC and PVC KEE

Increased Wind Speed System Options

Elevate PVC and PVC XR Adhered Membrane					
Warranty Length	Warranty Wind Speed Coverage – Membrane Attachment				Membrane Thickness (Minimum)
	55, 72 & 80 mph	90 mph	100 mph	110 to 120 mph	
	Adhered	Adhered	Adhered	Adhered	
5, 10 or 15 years	✓	N/A	N/A	N/A	50 mil
	✓	✓	✓	✓	60 mil
20 years	✓	✓	✓	✓	60 mil

NOTE:

- Wind speeds over 80 mph require the use of 60-80 mil membranes.
- Elevate 50 mil. PVC and PVC KEE membranes are limited to 15-year warranty coverage.
- Elevate PVC Water Based Bonding Adhesive is only approved for use on warranties up to 15 years and with a maximum wind speed coverage of 55 mph.

Table 60: Elevate PVC and PVC XR – Adhered Membrane – Increased Wind Speed

Elevate PVC KEE, PVC KEE XR and PVC KEE XRT Adhered Membrane					
Warranty Length	Warranty Wind Speed Coverage – Membrane Attachment				Membrane Thickness (Minimum)
	55, 72 & 80 mph	90 mph	100 mph	110 to 120 mph	
	Adhered	Adhered	Adhered	Adhered	
5, 10 or 15 years	✓	N/A	N/A	N/A	50 mil
	✓	✓	✓	✓	60 mil
20 years	✓	✓	✓	✓	60 mil
25 years	✓	✓	✓	✓	60 mil
30 years	✓	✓	✓	✓	80 mil

NOTE:

- Wind speeds over 80 mph require the use of 60-80 mil membranes.
- Elevate 50 mil. PVC and PVC KEE membranes are limited to 15-year warranty coverage.
- Elevate PVC Water Based Bonding Adhesive is only approved for use on warranties up to 15 years and with a maximum wind speed coverage of 55 mph.

Table 61: Elevate PVC KEE, PVC KEE XR and PVC KEE XRT – Adhered Membrane – Increased Wind Speed

Elevate PVC and PVC KEE Mechanically Attached

Warranty Length	Warranty Wind Speed Coverage – Membrane Attachment				Membrane Thickness (Minimum)
	55, 72 & 80 mph	90 mph	100 mph	110 to 120 mph	
	Mech. Attached	Mech. Attached	Mech. Attached	Mech. Attached	
5, 10 or 15 years	✓	N/A	N/A	N/A	50 mil
	✓	✓	N/A	N/A	60 mil
20 years	✓	✓	N/A	N/A	60 mil

NOTE:

1. Wind speeds over 80 mph require the use of 60-80 mil membranes.
2. Elevate 50 mil. PVC and PVC KEE membranes are limited to 15-year warranty coverage.
3. See adhered membrane table for coverboard requirements for mechanically attached systems.

Table 62: Elevate PVC and PVC KEE – Mechanically Attached Membrane Requirements – Increased Wind Speed

PVC or PVC KEE – Min. 22 ga Steel Deck or 2,500 psi Structural Concrete Decks

Peak Gust Wind Speed Coverage	Max Building Height	Min. # Perimeter Sheets by Regional Wind Speeds		Field Sheet Size (Width)	Perimeter Sheet Size (Width)	Fastening Rate
		Up to 120 mph	121 mph or Greater			
72-80 mph	< 60'	2	3	10' 5'	5' -	12" o.c.
	≥ 60'	4	5	10' 5'	5' -	12" o.c.
90 mph	< 60'	3	4	10' 5'	5' -	6" o.c. 12" o.c.
	≥ 60'	4	5	10' 5'	5' -	6" o.c. 12" o.c.

NOTE:

1. Wind speeds over 80 mph require the use of 60-80 mil membranes.
2. FM Insured projects do not allow perimeter half sheets to be used around the entire perimeter. The “finger” method of attachment at the appropriate locations is acceptable. Alternate attachment rates and methods may be required.
3. FM insured projects may not allow the attachment rates listed above. Validation using FM RoofNav should be used.
4. Ensure deck type/span allow for attachment rate shown above. When specific uplift pressures must be met, not all options above will be valid.
5. Building heights over 100' may require additional enhancements.
6. Heavy Duty or Heavy Duty Plus Fasteners are required on steel decks: minimum 33 ksi, 22 ga, 72" maximum deck span.
7. Concrete Drive Fasteners or Heavy-Duty Fasteners are required on concrete decks.
8. Refer to the appropriate version of the ASCE for wind maps not found within this document.
9. Location-specific basic wind speeds shall be permitted to be determined using www.atcouncil.org/windspeed.
10. Elevate 50 mil. PVC and PVC KEE membranes are limited to 15-year warranty coverage.
11. See adhered membrane table for coverboard requirements for mechanically attached and Invisiweld attached systems.

Table 63: Elevate PVC or PVC KE – Steel / Concrete – Membrane Attachment Requirements – Increased Wind Speed

Elevate PVC and PVC KEE – Wood Decks							
Peak Gust Wind Speed Coverage	Deck Type	Max. Roof Height	Min. # Perimeter Sheets by Regional Wind Speeds		Field Sheet Size (Width)	Perimeter Sheet Size (Width)	Fastening Rate
			Up to 120 mph	121 mph or Greater			
72-80 mph	5/8" OSB	< 60'	2	3	10'	5'	6" o.c. 12" o.c.
		≥ 60'	4	5	5'	-	12" o.c.
	15/32" Plywood (3-Ply)	< 60'	2	3	10'	5'	6" o.c. 12" o.c.
		≥ 60'	4	5	5'	-	12" o.c.
	15/32" Plywood (5-Ply)	< 60'	2	3	10'	5'	6" o.c. 12" o.c.
		≥ 60'	4	5	5'	-	12" o.c.
90 mph	5/8" OSB	< 60'	3	4	10'	5'	6" o.c. 12" o.c.
		≥ 60'	4	5	5'	-	12" o.c.
	15/32" Plywood (3-Ply)	< 60'	3	4	10'	5'	6" o.c. 12" o.c.
		≥ 60'	4	5	5'	-	12" o.c.
	15/32" Plywood (5-Ply)	< 60'	3	4	10'	5'	6" o.c. 12" o.c.
		≥ 60'	4	5	5'	-	12" o.c.

NOTE:

1. Fire Treated Plywood may be used provided it has not been treated with Ammonium Phosphates.
2. Wood deck condition must be new or like new. No wet, damaged, dry rot or severely punctured decking allowed.
3. Wind speeds over 80 mph require the use of 60-80 mil membranes.
4. When specific uplift pressures are to be met not all options above will be valid.
5. Validate deck types/spans allow for attachment rate shown above.
6. FM Insured projects do not allow perimeter half sheets to be used. Alternate attachment rates and methods may be required.
7. 20-Year maximum warranty term (new construction) on OSB decks.
8. Minimum 1" deck penetration with all fasteners.
9. Refer to the appropriate version of the ASCE for wind maps not found within this document.
10. Location-specific basic wind speeds shall be permitted to be determined using www.atcouncil.org/windspeed.
11. Elevate 50 mil PVC and PVC KEE membranes are limited to 15-year warranty coverage.
12. See adhered membrane table for coverboard requirements for mechanically attached and Invisiweld attached systems.

Table 64: Elevate PVC and PVC KEE – Wood Deck – Membrane Attachment Requirements – Increased Wind Speed

Elevate PVC and PVC KEE - LWC over Steel/Structural Concrete – Mechanically Attached into Min. 22 ga Steel Pan/Deck or 2,500 psi Structural Concrete							
Peak Gust Wind Speed Coverage	Deck Type	Max. Roof Height	Min. # Perimeter Sheets by Regional Wind Speeds		Field Sheet Size (Width)	Perimeter Sheet Size (Width)	Fastening Rate
			Up to 120 mph	121 mph or Greater			
72-80 mph	Steel Pan/Deck	60'	2	2	10'	5'	6" o.c. 12" o.c.
	Structural Concrete				5'	-	12" o.c.
90 mph	Steel Pan/Deck	60'	3	4	10'	5'	6" o.c. 12" o.c.
	Structural Concrete				5'	-	12" o.c.

NOTE:

1. Wind speeds over 80 mph require the use of 60-80 mil membranes.
2. FM Insured projects do not allow perimeter half sheets to be used around the entire perimeter. The “finger” method of attachment at the appropriate locations is acceptable. Alternate attachment rates and methods may be required.
3. Validate deck types/spans allow for attachment rate shown above.
4. When specific uplift pressures are to be met not all options above will be valid.
5. Minimum 2" thick LWC
6. For Cellular Light Weight Concrete decks that are properly prepared and dry, Holcim does not require a vapor retarder, however one is recommended, if insulation is installed with the system.
7. Refer to the appropriate version of the ASCE for wind maps not found within this document.
8. Location-specific basic wind speeds shall be permitted to be determined using www.atcouncil.org/windspeed.
9. Elevate 50 mil PVC and PVC KEE membranes are limited to 15-year warranty coverage.
10. See adhered membrane table for coverboard requirements for mechanically attached and Invisiweld attached systems.

Table 65: Elevate PVC and PVC KEE – LWC over Steel /Concrete Deck – Membrane Attachment Requirements – Increased Wind Speed

Elevate PVC and PVC KEE - Invisiweld Attachment Requirements

Peak Gust Wind Speed Coverage	Attachment Rate Per Board		
	Field	Perimeter	Corner
72 mph	6	10	15
80 mph	8	12	16
90 - 100 mph	8	14	20

NOTE:

1. Minimum 60 mil membrane required.
2. FM Insured projects may require alternate attachment rates or patterns than those listed above.
3. Attachment rates listed above may change due to specific uplift requirements.
4. Attachment rates above may change due to specific substrate used.
5. Attachment rates above may change due to warranty length requested.
6. Attachment rates above may change due to the addition of a vapor/air barrier (retarder).
7. Refer to the appropriate version of the ASCE for wind maps not found within this document.
8. Location-specific basic wind speeds shall be permitted to be determined using www.atcouncil.org/windspeed.
9. Elevate 50 mil PVC and PVC KEE membranes are limited to 15-year warranty coverage.
10. See adhered membrane table for coverboard requirements for mechanically attached and Invisiweld attached systems.

Table 66: Elevate PVC and PVC KEE - InvisiWeld Attachment Requirements - Increased Wind Speed

Increased Wind Speed System Options – RubberGard™ MAX EPDM

RubberGard MAX EPDM Mechanically Attached or Adhered Membrane Options

Warranty Length	Warranty Wind Speed Coverage – Membrane Attachment								Membrane Thickness (Minimum)
	55, 72 & 80 mph		90 mph		100 mph		110 to 120 mph		
	Adhered	Mech. Attached	Adhered	Mech. Attached	Adhered	Mech. Attached	Adhered	Mech. Attached	
5, 10 or 15 years	✓	✓	✓	✓	✓	N/A	✓	N/A	60 mil
20 years	✓	✓	✓	✓	✓	N/A	✓	N/A	60 mil
25 years	✓	✓	✓	✓	✓	N/A	✓	N/A	60 mil
30 years	✓	✓	✓	✓	✓	N/A	✓	N/A	80 mil

NOTE:

1. Elevate Water Based Bonding Adhesive - P is only approved for use on warranties up to 15 years and with a maximum wind speed coverage of 55 mph.
2. Warranty requests of 25-30 years may require additional requirements. Review project requirements with a Holcim Regional Technical Coordinator. Maximum 6" o.c. spacing for mechanically attached systems.
3. Refer to the appropriate version of the ASCE for wind maps not found within this document.
4. Location-specific basic wind speeds shall be permitted to be determined using www.atcouncil.org/windspeed.
5. See adhered membrane table for coverboard requirements for mechanically attached and Invisiweld attached systems.

Table 67: RubberGard MAX EPDM - Membrane Attachment Options - Increased Wind Speed

**RubberGard MAX EPDM - Steel/Concrete -
22 ga Steel or 2,500 psi Structural Concrete Decks**

Peak Gust Wind Speed Coverage	Max Building Height	Min. # Perimeter Sheets by Regional Wind Speeds		Field Sheet Size (Width)	Perimeter Sheet Size (Width)	Fastening Rate
		Up to 120 mph	121 mph or Greater			
72 ¹⁰ -80 mph	< 60'	2	3	10' 8' 5'	5' 4' 4'	6" o.c. 12" o.c. 12" o.c.
	≥ 60'	4	5	10' 8' 5'	5' 4' 4'	6" o.c. 12" o.c. 12" o.c.
90 mph	< 60'	3	4	10' 8' 5'	5' 4' 4'	6" o.c. 12" o.c. 12" o.c.
	≥ 60'	4	5	10' 8' 5'	5' 4' 4'	6" o.c. 12" o.c. 12" o.c.

NOTE:

1. Ensure deck type/span allow for attachment rate shown above. When specific uplift pressures must be met, not all options above will be valid.
2. FM Insured projects do not allow perimeter half sheets to be used around the entire perimeter. The "finger" method of attachment at the appropriate locations is acceptable. Alternate attachment rates and methods may be required.
3. Building heights over 100' may require additional enhancements.
4. Heavy Duty or Heavy Duty Plus Fasteners are required on steel decks: minimum 33 ksi, 22 ga, 72" maximum deck span.
5. Concrete Drive Fasteners or Heavy-Duty Fasteners are required on concrete decks.
6. Warranty requests of 25 - 30 years may require additional requirements. Review project requirements with a Holcim Regional Technical Coordinator. Maximum 6" o.c. spacing for mechanically attached systems.
7. Refer to the appropriate version of the ASCE for wind maps not found within this document.
8. Location-specific basic wind speeds shall be permitted to be determined using www.atcouncil.org/windspeed.
9. See adhered membrane table for coverboard requirements for mechanically attached and Invisiweld attached systems.
10. Elevate All-Purpose Fasteners (TIS 1001) may be used in combination with Elevate V-Plate (TIS 1103) for in-seam securement of Elevate RubberGard MAX Membrane up to 72 mph in approved applications into appropriate wood decks.

Table 68: RubberGard MAX EPDM - Steel / Concrete - Membrane Attachment Requirements - Increased Wind Speed

RubberGard MAX EPDM – Wood Decks

Peak Gust Wind Speed Coverage	Deck Type	Max. Roof Height	Min. # Perimeter Sheets by Regional Wind Speeds		Field Sheet Size (Width)	Perimeter Sheet Size (Width)	Fastening Rate
			Up to 120 mph	121 mph or Greater			
72 ¹⁰ -80 mph	5/8" OSB	< 60'	2	3	10'	5'	6" o.c.
		≥ 60'	4	5	8'	4'	12" o.c.
	15/32" Plywood (3-Ply)	< 60'	2	3	5'	-	12" o.c.
		≥ 60'	4	5	10'	5'	6" o.c.
	15/32" Plywood (5-Ply)	< 60'	2	3	8'	4'	12" o.c.
		≥ 60'	4	5	5'	-	12" o.c.
90 mph	5/8" OSB	< 60'	3	4	10'	5'	6" o.c.
		≥ 60'	4	5	8'	4'	12" o.c.
	15/32" Plywood (3-Ply)	< 60'	3	4	5'	-	12" o.c.
		≥ 60'	4	5	10'	5'	6" o.c.
	15/32" Plywood (5-Ply)	< 60'	3	4	8'	4'	12" o.c.
		≥ 60'	4	5	5'	-	12" o.c.

NOTE:

1. 20 Year maximum warranty term (new construction) on OSB decks.
2. Fire Treated Plywood may be used provided it has not been treated with Ammonium Phosphates.
3. Wood deck condition must be new or like new. No wet, damaged, dry rot or severely punctured decking allowed.
4. FM Insured projects do not allow perimeter half sheets to be used around the entire perimeter. The "finger" method of attachment at the appropriate locations is acceptable. Alternate attachment rates and methods may be required.
5. Minimum 1" deck penetration with all fasteners.
6. Warranty requests of 25 - 30 years may require additional requirements. Review project requirements with a Holcim Regional Technical Coordinator. Maximum 6" o.c. spacing for mechanically attached systems.
7. Refer to the appropriate version of the ASCE for wind maps not found within this document.
8. Location-specific basic wind speeds shall be permitted to be determined using www.atcouncil.org/windspeed.
9. See adhered membrane table for coverboard requirements for mechanically attached and Invisiweld attached systems.
10. Elevate All-Purpose Fasteners (TIS 1001) may be used in combination with Elevate V-Plate (TIS 1103) for in-seam securement of Elevate RubberGard MAX Membrane up to 72 mph in approved applications into appropriate wood decks.

Table 69: RubberGard MAX EPDM – Wood Deck - Membrane Attachment Requirements – Increased Wind Speed

RubberGard MAX EPDM - LWC over Steel/Structural Concrete - Mechanically Attached into min. 22 ga Steel Pan/Deck or 2,500 psi Structural Concrete

Peak Gust Wind Speed Coverage	Deck Type	Max. Roof Height	Min. # Perimeter Sheets by Regional Wind Speeds		Field Sheet Size (Width)	Perimeter Sheet Size (Width)	Fastening Rate
			Up to 120 mph	121 mph or Greater			
72-80 mph	Steel Pan/Deck	60'	2	2	10'	5'	6" o.c.
	Structural Concrete				8'	4'	12" o.c.
90 mph	Steel Pan/Deck	60'	3	4	10'	5'	6" o.c.
	Structural Concrete				8'	4'	12" o.c.
					5'	-	12" o.c.

NOTE:

1. Validate deck types/spans allow for attachment rate shown above. When specific uplift pressures are to be met not all options above will be valid.
2. FM Insured projects do not allow perimeter half sheets to be used around the entire perimeter. The "finger" method of attachment at the appropriate locations is acceptable. Alternate attachment rates and methods may be required.
3. Minimum 2" thick LWC
4. Warranty requests of 25 - 30 years may require additional requirements. Review project requirements with your Holcim Regional Technical Coordinator. Maximum 6" o.c. spacing for mechanically attached systems.
5. Refer to the appropriate version of the ASCE for wind maps not found within this document.
6. Location-specific basic wind speeds shall be permitted to be determined using www.atcouncil.org/windspeed.
7. See adhered membrane table for coverboard requirements for mechanically attached and Invisiweld attached systems.

Table 70: RubberGard MAX EPDM – LWC over Steel or Concrete Deck - Membrane Attachment Requirements – Increased Wind Speed

Increased Wind Speed System Options – Base Sheets

LWC - Base Sheet Attachment Rates

Peak Gust Wind Speed Coverage	Regional Wind Speed					
	Up to 120 mph			121 mph or greater		
	Lap	Field/Perimeter	Corner	Lap	Field/Perimeter	Corner
72-80 mph	35" Rows, 8" o.c.	2 Rows, 12" o.c. Staggered 17" o.c. spacing	3 Rows, Equally Spaced, 15" o.c. spacing	35" Rows, 8" o.c.	2 Rows, 12" o.c. Staggered, 14" o.c. spacing	3 Rows, Equally Spaced, 12" o.c. spacing
90 mph	35" Rows, 7" o.c.	2 Rows, 12" o.c. Staggered 16" o.c. spacing	3 Rows, Equally Spaced, 14" o.c. spacing	35" Rows, 7" o.c.	2 Rows, 12" o.c. Staggered, 12" o.c. spacing	3 Rows, Equally Spaced, 10" o.c. spacing

NOTE:

1. Wind speeds over 80 mph require the use of 60-80 mil membranes.
2. FM Insured or other code/testing agencies may require different/additional attachment methods/rate.
3. Elevate 1.7" LWC Base Ply Fasteners – Pull out value minimum 40 lb/fastener.
4. Minimum 2" thick LWC required.
5. For Cellular Light Weight Concrete decks that are properly prepared and dry, Holcim does not require a vapor retarder, however one is recommended, if insulation is installed with the system.
6. Warranty requests of 25 - 30 years may require additional requirements. Review project requirements with a Holcim Regional Technical Coordinator. Maximum 6" o.c. spacing for mechanically attached systems.
7. Refer to the appropriate version of the ASCE for wind maps not found within this document.
8. Location-specific basic wind speeds shall be permitted to be determined using www.atcouncil.org/windspeed.
9. See details MB-LS-4 and MB-LS-5 for lap requirements.

Table 71: Base Sheet Attachment into LWC – Increased Wind Speed

V-Force™ Application – Increased Wind Speed

Increased wind speed approvals with Elevate V-Force Vapor Barrier Membrane applied directly to properly prepared substrate is outlined in the table below. Review the Technical Information Sheet (TIS), Application Guide and details for application requirements and additional information. Reference the V-Force Requirements – Attachment section in this guide for information related to extended wind speeds. V-Force adhered direct to steel will not be approved on projects with special wind regions or coastal areas. When uplift and fire requirements are specified, alternate applications may be required.

V-Force Direct to Steel Deck – Acceptable Adhesives for Insulation Attachment – Increased Wind Speed				
TIS Number	Adhesive	Bead Spacing (o.c.) (72 - 80 mph)		
		Field	Perimeter	Corner
812	I.S.O. Twin Pack	6" (152.4 mm)	6" (152.4 mm)	4" (101.6 mm)
819	I.S.O. Stick			
831	I.S.O. Spray R			
836	Twin Jet			
NOTE: <ol style="list-style-type: none"> All substrates except metal decks must be primed with either Elevate SA-Water Based (WB) Primer, SA-LVOC Primer or SA-Solvent Based (SB) Primer. Hot asphalt cannot be used to adhere roofing material to V-Force Vapor Barrier membrane. On steel deck assemblies, beads should be spaced to be located over the top flute of the steel deck. (Max. 20 Years) 				

Table 72: V-Force Direct to Steel Deck – Acceptable Adhesives for Insulation Attachment – Increased Wind Speed

This guide is meant to highlight Elevate products and specifications provided by Holcim Solutions and Products US, LLC and is subject to change without notice. Holcim takes responsibility for furnishing quality materials which meet published Elevate product specifications or other technical documents, subject to normal roof manufacturing tolerances. Neither Holcim nor its representatives practice architecture. Holcim Solutions a Products US, LLC offers no opinion on and expressly disclaims any responsibility for the soundness of any structure. Holcim accepts no liability for structural failure or resultant damages. Consult a competent structural engineer prior to installation if the structural soundness or structural ability to properly support a planned installation is in question. No Holcim representative is authorized to vary this disclaimer.