

HYDROGUARD®



Installation Guide

1.0 GENERAL DESIGN CONSIDERATIONS

The design professional should consider the following factors when designing a Protected Membrane Roof utilizing Hydroguard.

Roof Structure

The building structure (new or retrofit) must be strong enough to support the present and future dead loads on the roof, including the ballast, as well as the anticipated live loads.

Slope

The roof slope should not exceed two inches in twelve inches.

Design Wind Speed

Design wind speed for the building location shall be determined from the Wind Speed Map, (Fig. 1) or from the local code authority.

Roof Height

The roof height from the ground level to the top of the new roofing system may be different on different sides of the building. Therefore, the height shall be based on the most severe condition.

Parapet Height

The height of the parapet wall shall be measured from the top of the paver ballast to the top of the parapet. If the height varies, the shortest parapet height should be used.

Gravel Stop

If a gravel stop is used at the building perimeter, its height above the paver ballast shall be a minimum of two inches.

2.0 SELECTING APPROPRIATE SECUREMENT MATERIALS

Once installed, Hydroguard must be secured at all perimeters. Additional securement may also be required depending on wind conditions, building height and parapet height. Hydrotech employs three securement systems utilizing pavers.

In order to determine which securement system is required for your roof, follow these steps:

- 1) Determine building height
- 2) Determine parapet height
- 3) Determine building site exposure. (See Building Exposures, below)
- 4) Determine design wind speed (Wind Speed Map, Fig. 1)

Once the above information has been gathered, consult the Hydroguard Securement System Tables (pages 3 through 5), to determine which method is appropriate for your application.

2.1 Building Exposures

The surrounding terrain has an effect on the overall wind exposure of the building. The exposure in which a specific building or other structure is sited shall be assessed as being in one of the following categories:

Exposure A: Large city centers with at least 50% of the buildings having a height in excess of 70 ft. (21.3m). Use of this exposure category shall be limited to those areas for which terrain representative of Exposure A prevails in the upwind direction for a distance of at least 0.5 mi. (0.8km) or ten times the height of the

building or other structure, whichever is greater. Possible channeling effects or increased velocity pressures due to the building or structure being located in the wake of adjacent buildings shall be taken into account.

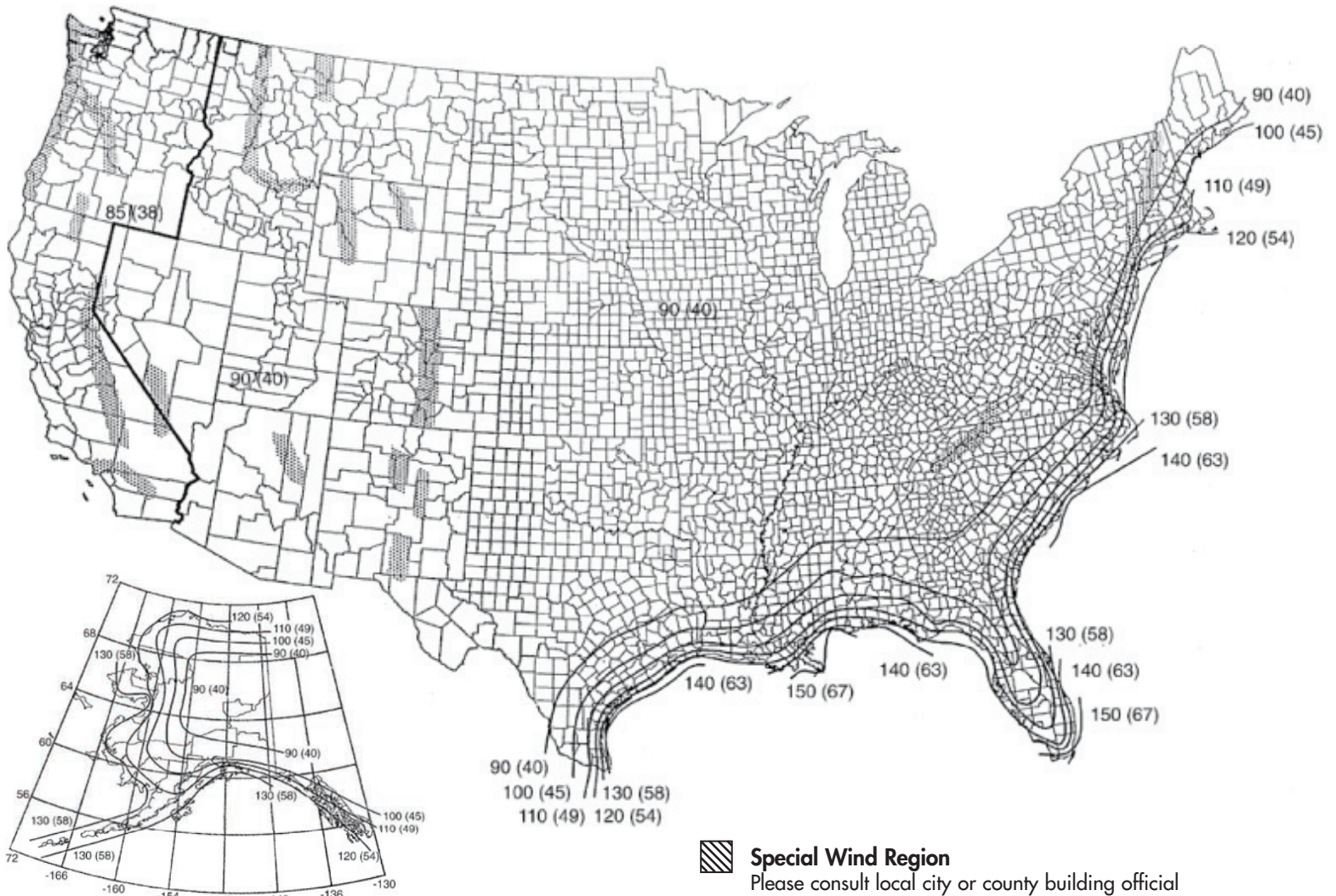
Exposure B: Urban and suburban areas, wooded areas, or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger. Use of this exposure category shall be limited to those areas for which terrain representative of Exposure B prevails in the upwind direction for a distance of at least 2,360 ft. (800 m) or ten times the height of the building or other structure, whichever is greater.

Exposure C: Open terrain with scattered obstructions having heights generally less than 30 ft. (9.1 m). This category includes flat open country and grasslands, and all water surfaces in hurricane prone regions.

Exposure D: Flat, unobstructed areas exposed to wind flowing over open water for a distance of at least 1 mi. (1.61 km). This exposure shall apply only to those buildings and other structures exposed to wind coming from over the water. Exposure D extends inland from the shoreline a distance of 5,000 ft. (1,524 m) or ten times the height of the building or structure, whichever is greater. Consult American Hydrotech for design in Exposure D areas.

Figure 1
ASCE 7-02 Wind Speed Map

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Alaska Note:
 For coastal areas and
 islands, use nearest contour

 **Special Wind Region**
 Please consult local city or county building official

• Population Center

Location	V mph	m/s
Hawaii	105	47
Puerto Rico	145	65
Guam	170	76
Virgin Islands	145	65
American Samoa	125	56

- Notes**
1. Values are 3 second gust speeds in miles per hour (m/s) at 33 feet (10m) above ground for Exposure C category and are associated with an annual probability of 0.02.
 2. Linear interpolation between wind speed contours is permitted.
 3. Islands and coastal areas shall use wind speed contour of coastal area.
 4. Mountainous terrain, gorges, ocean promontories, and special regions shall be examined for unusual wind conditions.

Hydroguard Securement System Tables

For Use with Hydrotech Monolithic Membrane 6125

A. FROM 2.5 INCH HIGH GRAVEL STOP TO LESS THAN 6.0 INCH HIGH PARAPET						
Building Height Feet	MAXIMUM WIND SPEED (MPH)					
	System 1		System 2		System 3	
	Exposures A+C	Exposure B	Exposures A+C	Exposure B	Exposures A+C	Exposure B
0 - 15	130	140	140	140	140	140
> 15 - 30	120	140	130	140	130	140
> 30 - 45	120	140	120	140	120	140
> 45 - 60	120	140	120	140	120	140
> 60 - 75	120	130	120	130	120	140
> 75 - 90	NO	NO	NO	NO	NO	NO
> 90 - 105	NO	NO	NO	NO	NO	NO
> 105 - 120	NO	NO	NO	NO	NO	NO
> 120 - 135	NO	NO	NO	NO	NO	NO
> 135 - 150	NO	NO	NO	NO	NO	NO

B. FOR PARAPET HEIGHTS FROM 6.0 TO LESS THAN 12.0 INCHES						
Building Height Feet	MAXIMUM WIND SPEED (MPH)					
	System 1		System 2		System 3	
	Exposures A+C	Exposure B	Exposures A+C	Exposure B	Exposures A+C	Exposure B
0 - 15	140	140	140	140	140	140
> 15 - 30	140	140	140	140	140	140
> 30 - 45	130	140	140	140	140	140
> 45 - 60	130	140	140	140	140	140
> 60 - 75	130	130	130	130	140	140
> 75 - 90	85	90	90	100	90	100
> 90 - 105	NO	NO	85	85	90	90
> 105 - 120	NO	NO	85	85	85	85
> 120 - 135	NO	NO	85	85	85	85
> 135 - 150	NO	NO	85	85	85	85

Hydroguard Securement System Tables

For Use with Hydrotech Monolithic Membrane 6125

C. FOR PARAPET HEIGHTS FROM 12.0 TO LESS THAN 18.0 INCHES						
Building Height Feet	MAXIMUM WIND SPEED (MPH)					
	System 1		System 2		System 3	
	Exposures A+C	Exposure B	Exposures A+C	Exposure B	Exposures A+C	Exposure B
0 - 15	140	140	140	140	140	140
> 15 - 30	140	140	140	140	140	140
> 30 - 45	130	140	140	140	140	140
> 45 - 60	130	140	140	140	140	140
> 60 - 75	130	140	140	140	140	140
> 75 - 90	100	110	100	120	110	120
> 90 - 105	100	110	100	120	110	120
> 105 - 120	100	110	100	110	110	120
> 120 - 135	90	110	100	110	100	120
> 135 - 150	90	100	100	110	100	120
> 150 - 200	90	90	100	100	100	100
> 200 - 300	90	90	90	90	100	100
> 300 - 400	85	90	90	90	90	90
> 400 - 500	85	90	90	90	90	90

D. FOR PARAPET HEIGHTS FROM 18.0 TO LESS THAN 36.0 INCHES						
Building Height Feet	MAXIMUM WIND SPEED (MPH)					
	System 1		System 2		System 3	
	Exposures A+C	Exposure B	Exposures A+C	Exposure B	Exposures A+C	Exposure B
0 - 15	140	140	140	140	140	140
> 15 - 30	140	140	140	140	140	140
> 30 - 45	140	140	140	140	140	140
> 45 - 60	140	140	140	140	140	140
> 60 - 75	140	140	140	140	140	140
> 75 - 90	120	140	130	140	140	140
> 90 - 105	120	130	130	140	130	140
> 105 - 120	120	120	130	140	130	140
> 120 - 135	120	120	120	130	130	140
> 135 - 150	120	120	120	130	130	130
> 150 - 200	110	110	120	120	130	130
> 200 - 300	110	110	110	110	120	120
> 300 - 400	110	110	110	110	120	120
> 400 - 500	100	100	100	100	110	110

Hydroguard Securement System Tables

For Use with Hydrotech Monolithic Membrane 6125

E. FOR PARAPET HEIGHTS OF 36.0 INCHES OR MORE						
Building Height Feet	MAXIMUM WIND SPEED (MPH)					
	System 1		System 2		System 3	
	Exposures A+C	Exposure B	Exposures A+C	Exposure B	Exposures A+C	Exposure B
0 - 15	140	140	140	140	140	140
> 15 - 30	140	140	140	140	140	140
> 30 - 45	140	140	140	140	140	140
> 45 - 60	140	140	140	140	140	140
> 60 - 75	140	140	140	140	140	140
> 75 - 90	140	140	140	140	140	140
> 90 - 105	140	140	140	140	140	140
> 105 - 120	140	140	140	140	140	140
> 120 - 135	140	140	140	140	140	140
> 135 - 150	140	140	140	140	140	140
> 150 - 200	130	130	140	140	140	140
> 200 - 300	120	120	130	130	130	130
> 300 - 400	120	120	130	130	130	130
> 400 - 500	110	110	120	120	120	120

3.0 INSTALLATION

3.1 Preparation

A. Hydroguard insulation panels must be protected during installation.

1) Hydroguard panels not fully installed shall be provided with temporary ballast to prevent wind disturbance or board movement due to flotation.

2) Hydroguard insulation panels not fully installed must be protected from construction damage. Completed roof systems should not be used as construction staging area or for storage.

3.2 Multi-Layer Installations of Extruded Polystyrene and Hydroguard Insulation

A. Layer(s) of insulation underlying the Hydroguard Insulation panels must be extruded polystyrene with a minimum compressive strength of 40 lbs. per sq. in.

B. The lower layer must be equal to or thicker than the thickness of the Hydroguard Insulation panels.

C. All joints shall be staggered in relation to other layer(s).

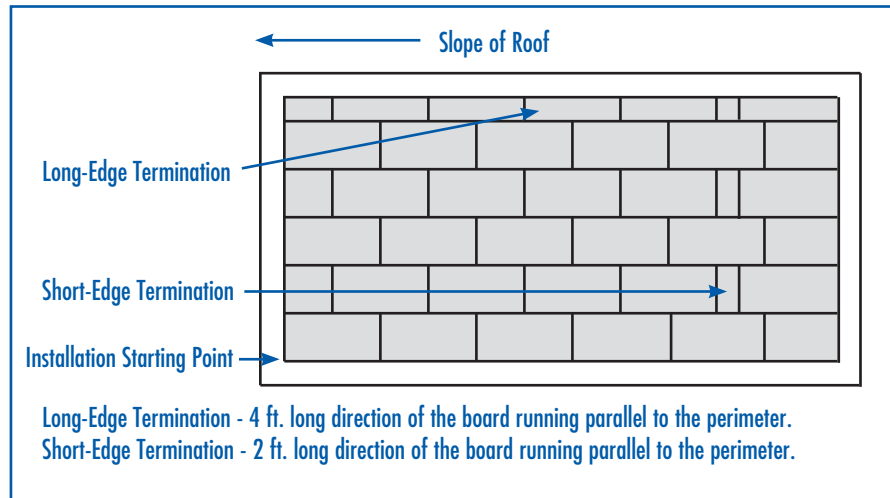
D. All layers shall be installed unadhered.

3.3 Hydroguard Insulation Panels Installation

A. Commencing installation of Hydroguard Insulation panels.

1) Always start at a corner close to the source of the prevailing wind. Work from the bottom of slope to the top (See section 3.3, B.5).

Figure 2. Correct Termination



2) Start the first row with a whole board at a corner with groove side towards the edge of the roof. Snap a chalk line the width of one board (2 ft.) away from the perimeter edge as a guide. Lay the boards tightly in the row.

3) To obtain a stagger, the second row of boards should begin with a half board. Two additional chalk lines at 90 degree angles to the first at 4 ft. and 6 ft. away from the perimeter edge should be snapped to help maintain end stagger by indicating starter lines for the ends of the first boards in the next rows.

4) Once the array is started it must be continued across the entire roof area.

5) Insulation boards shall be cut using masonry saw blades.

B. General Placement of Hydroguard Insulation Boards.

1) Tight tongue and groove integrity (with no gaps greater than 1/4 in.) and a staggered-joint array must be maintained.

2) Boards must remain unadhered to the membrane.

3) All sides of the boards must be tightly butted to the adjacent boards.

4) The concrete mortar surface on the boards must not be in contact with terminations such as parapets, curbs, etc. Use of 1/2 in. thick polyethylene foam is suggested.

5) Boards shall be laid with 4 ft. long side in the direction of the roof slope. Array should begin at the bottom of steep roof slopes and be continued to the roof peak. This is most critical for roof slopes greater than 1/2" : 12.

C. Placing Insulation Boards Across Slope Changes

The direction in which the insulation boards are laid will affect how well the boards will conform to slope changes without being cut. Laying insulation boards over uneven portions of the roof deck may cause the concrete surface to crack. This cracking alone will not adversely affect system or product performance but breakage exposing insulation may.

Insulation boards must not bridge over uneven portions of the deck. That will cause the insulation units to break (a crack through the concrete and the insulation). In these cases during installation the boards must be cut and additional securement added (see section 3.4.A). In certain cases an appropriate piece of cut insulation may be placed under the Hydroguard Insulation panels to even the deck.

1) Insulation units shall be cut to conform to slope changes on the deck and to prevent breakage of boards spanning across slope changes.

2) Additional securement must be added if tongue and groove or staggered joint array is compromised or if boards are cut to lay flat on adjacent planes (see section 3.4.A).

3) Small cut pieces must not be used in the system where a full board or a larger piece can be used.

D. Terminations

1) Panels must be a maximum of 1/2 in. from all terminations or penetrations. The insulation may be beveled to conform to the slope of cant strips.

2) Boards must be terminated immediately adjacent to drain bonnet. Boards may be installed over the drains where the drain opening has been protected using a flat perforated metal cover. The boards should be marked to indicate the drain.

3) Perimeter terminations

3a) Long-Edge Termination: Perimeter termination method when 4 ft. long edge of board is against the perimeter. Pieces with width equal to or greater than 6 in. must be placed in position with tongue and groove

Figure 3. Correct Termination Piece, Long-Edge Termination

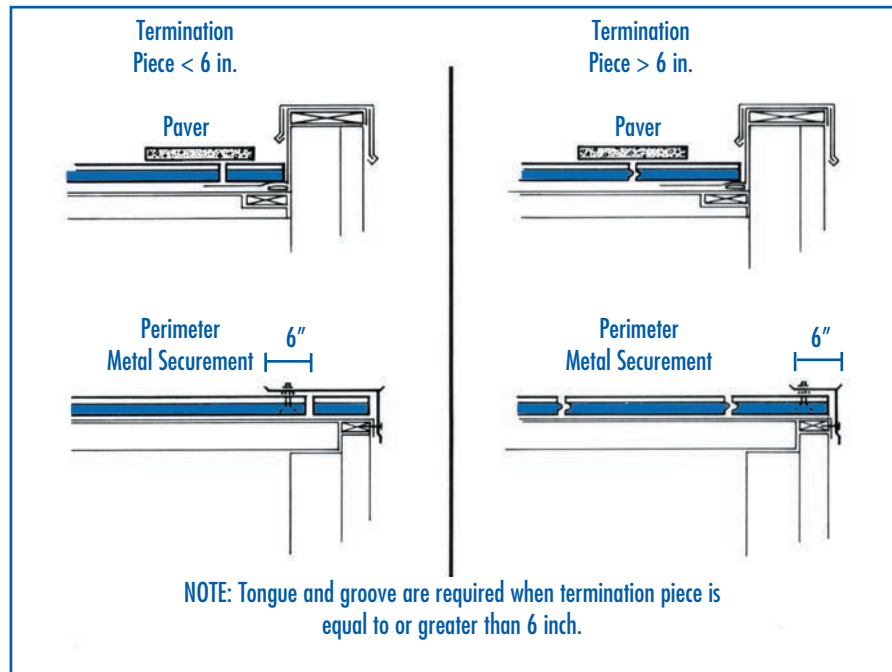
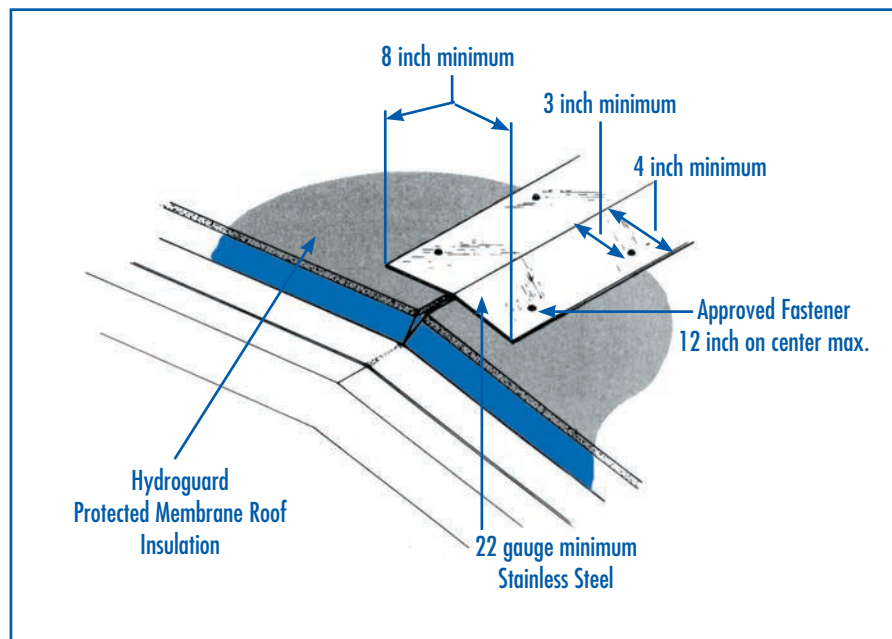


Figure 4. Alternate Strapping Where Tongue & Groove Integrity Is Lost



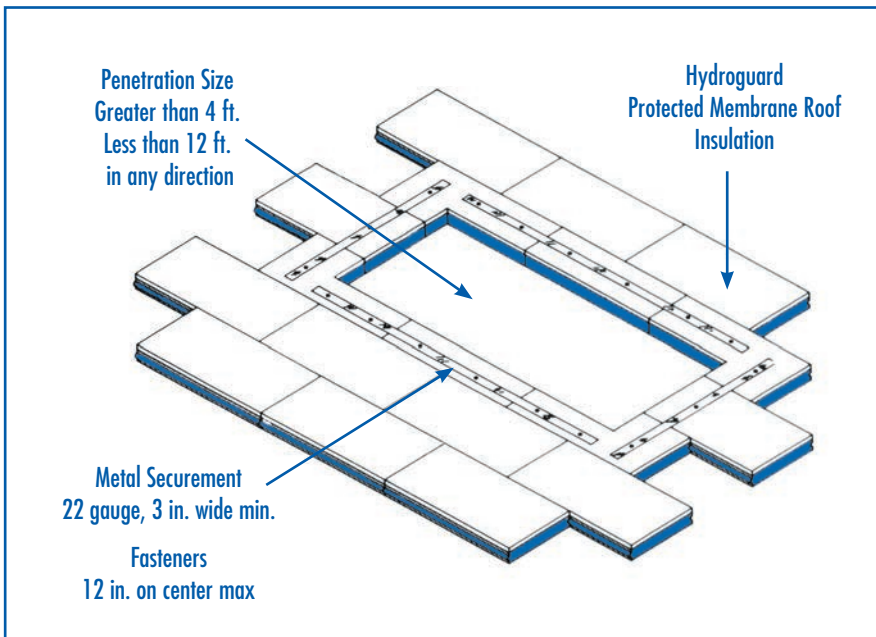
integrity. For terminating pieces less than 6 in. wide, tongue and groove is not required (Fig. 3).

3b) Short-Edge Termination: Perimeter termination method when 2 ft. long edge of board is against the perimeter. Boards ending a row with lengths less than 6 in. may be

moved into the array of the roof as the second board from the perimeter. (Fig. 2)

4) All foam exposed directly to the sun shall be coated with exterior grade latex paint or otherwise protected.

Figure 5. Metal Securement Around Internal Penetration, Tongue and Groove Integrity Maintained



3.4 Securement Where Tongue and Groove Integrity Has Been Lost

A. Interruptions in Tongue and Groove Integrity

1) Wherever tongue and groove integrity is lost or cuts are made through the boards, securement must be added. Pavers, a minimum of 19 lbs. 2 in. x 8 in. x 16 in., should be placed in continuous rows on each side of the cut, laid with their long edge perpendicular to the cut.

Alternatively, a metal strap (8 in. wide minimum), can be centered on the break and fastened on both edges, 12 in. on center (Fig.4). The strap must extend a minimum of 4in. onto the face of the board and the fasteners must be a minimum of 3 in. from edges.

B. Internal Penetrations

1) All penetrations greater than 4 ft., but less than 12 ft. in any direction, shall be secured with pavers

2 in. x 8 in. x 16 in. laid with their long edge perpendicular to the internal penetration. Also acceptable is the use of 22 gauge metal straps (minimum 3 in. wide) secured a maximum of 12 in. on center. (Fig. 5)

2) Internal penetrations greater than or equal to 12 ft. in any direction must be secured in the same manner as the perimeter.

3.5 Perimeter Securement

The installed system must be secured at all perimeters. The securement system must restrain any movement of the roof insulation at termination points.

There are two methods used in securing Hydroguard Insulation panels at the perimeter:

- 1) The use of concrete pavers.
- 2) Fabricated metal counter flashing/gravel stop securement piece or an extruded aluminum factory fabricated metal securement piece.

A. Paver Perimeter Securement
The amount of paver ballast required depends on whether multiple insulation layers are installed. The following minimum ballast requirements must be met.

1) MM6125 /Hydroguard Installations. For roofs in 90 mph wind range only, securement shall be a single row of nominal 2 in. x 8 in. x 16 in. or 2 in. x 2 ft. x 2 ft. pavers laid with their long edge perpendicular to the roof perimeter. (Fig 9A.)

2) MM6125 /Hydroguard with multiple layer foam installations. For roofs in 90 mph wind range only, securement shall be a single row of nominal 2 in. x 2 ft. x 2 ft. or two rows of nominal 2 in. x 8 in. x 16 in. pavers laid with their long edge perpendicular to the roof perimeter.

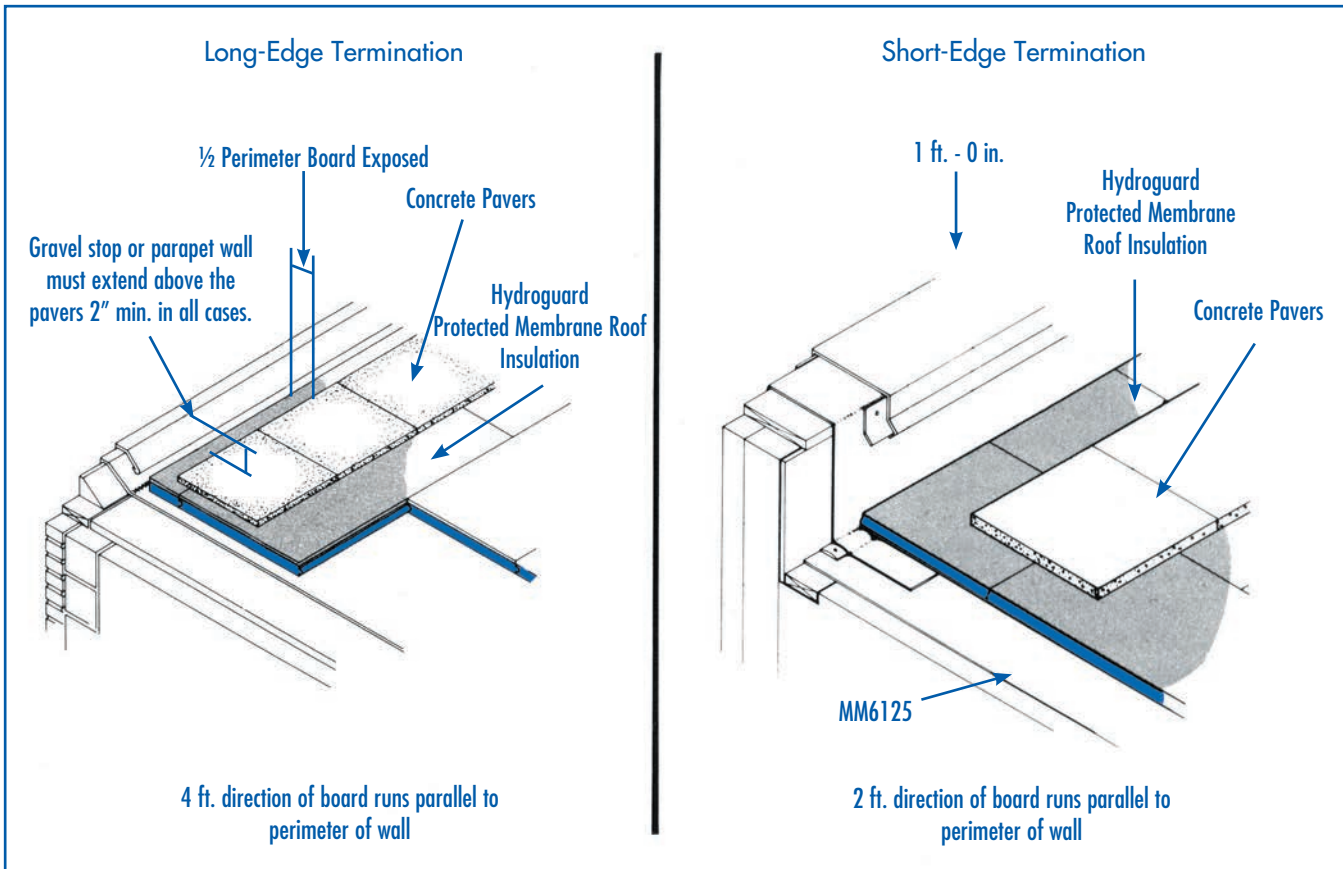
3) Paver Placement

3a) The height of gravel stop or parapet shall extend above the paver in all cases (Fig. 6).

3b) Pavers shall be placed in continuous rows butted together at all perimeters and openings or penetrations greater than 4 ft. long (See section 3.4 B for securement at internal penetration).

3c) When the 4 ft. long direction of the board runs parallel to the perimeter, pavers shall be placed with their outside edge centered on the perimeter board covering the first board joint (Fig.6, Long-Edge Termination). When the 2 ft. long direction of the board runs parallel to the perimeter, pavers shall be placed in from the perimeter at least 12 in. covering the first board joint (Fig. 6, Short-Edge Termination).

Figure 6. Long-Edge and Short -Edge Perimeter Termination



B. Metal Perimeter Securement

As an alternative to the preferred system of using pavers for perimeter securement, metal securement may also be employed.

1) Metal Perimeter Edge Securement

1a) Metal counter flashing/gravel stop securement. The metal counter flashing/gravel stop securement shall extend a minimum of 6 in. onto the surface of the Hydroguard Insulation panel and be attached 18 in. on center using approved fasteners. Fasteners must be 3 in. minimum from any board edge (Fig. 7 and 8).

1b) Factory fabricated metal counter flashing/gravel stop securement. Install [L-shape] [J-shape] metal securement in accordance with the manufacturer's instructions.

2) The metal perimeter edge securement shall be securely attached to the perimeter edge wood nailer or wall a maximum of 12 in. on center using appropriate fasteners, providing minimum 100 lb. per ft. pull resistance.

3) The metal perimeter edge securement shall not run for continuous lengths over 12 ft. Proper considerations for coefficient of expansion/contraction and corrosion must be incorporated in the design of the metal and fasteners.

4) The metal perimeter edge securement must be attached to a terminating board that has tongue and groove integrity and is equal to or greater than 6 in. wide. If the termination board is less than 6 in. wide, the metal perimeter securement must be extended a minimum of 6 in. onto the surface of the next whole board in and be attached a maximum of 18 in. on center (Fig. 3).

5) When perimeter drainage is used (i.e. gutter edge detail) the perimeter securement must be perforated and constructed from minimum 18 gauge stainless steel.

Figure 7. Gravel Stop Perimeter Securement Long-Edge Perimeter Termination

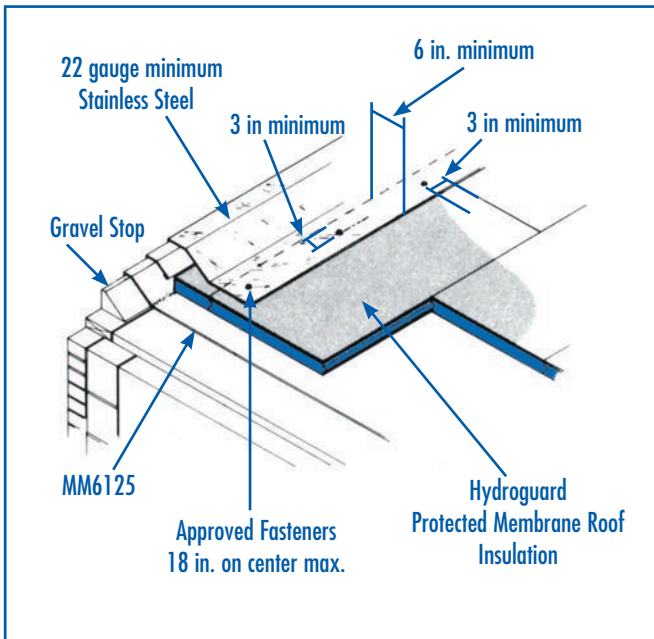
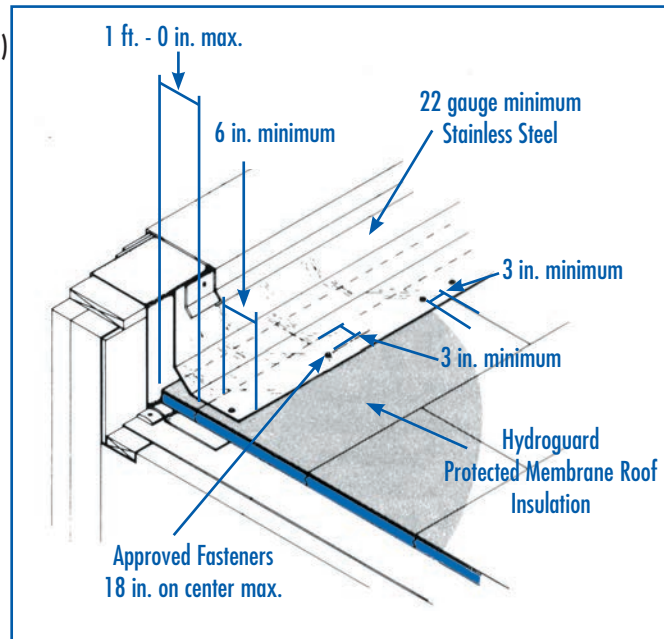


Figure 8. Wall Counter Flashing Perimeter Securement Long-Edge Perimeter Termination



3.6 Securement System Designs (Fig. 9)

Please refer to section 2.0 to determine which securement system is required for your installation.

A. Securement System 1 (Fig. 9A)

Securement System 1 only requires securement at the perimeters. Please refer to Section 3.5 Perimeter Securement for necessary procedures.

B. Securement System 2 (Fig. 9B)

1) Install 2 in. x 2 ft. x 2 ft. pavers weighing a minimum of 88 lbs. (40kg) following the requirements as described in Section 3.5 Perimeter Securement. (Metal edge securement as described in Section 3.5, B may be utilized to replace the first row of pavers.) A second row of similar pavers shall be installed as above centered 6 ft. from the perimeter.

All pavers shall be adhered to the surface of the boards by applying two parallel 3/8 in. continuous beads of Vulkem Sealant 116, or approved equal, to the surface of the Hydroguard boards before placing the pavers.

C. Paver Securement System 3 (Fig. 9C)

1) Install 2 in. x 2 ft. x 2 ft. pavers weighing a minimum of 88 lbs. (40kg) following the requirements as described in Section 3.5 Perimeter Securement. (Metal edge securement as described in Section 3.5, B may be utilized to replace the first row of pavers.) A second row of similar pavers shall be installed as above adjacent to the first row. A third row of similar pavers shall be installed as above centered at 9 ft. from the roof perimeters. A fourth row of similar pavers shall be installed as above centered at 13 ft. from the roof perimeters.

2) All pavers shall be adhered to the surface of the boards by applying two parallel 3/8 in. continuous beads of Vulkem Sealant 116, or approved equal, to the surface of the Hydroguard boards before placing the pavers.

4.0 PRODUCTS

4.1 Manufacturers

A. Insulation

Hydroguard Insulation Panels as sold by American Hydrotech, Inc. utilizing extruded polystyrene ASTM D 578, Type VI.

B. Fasteners

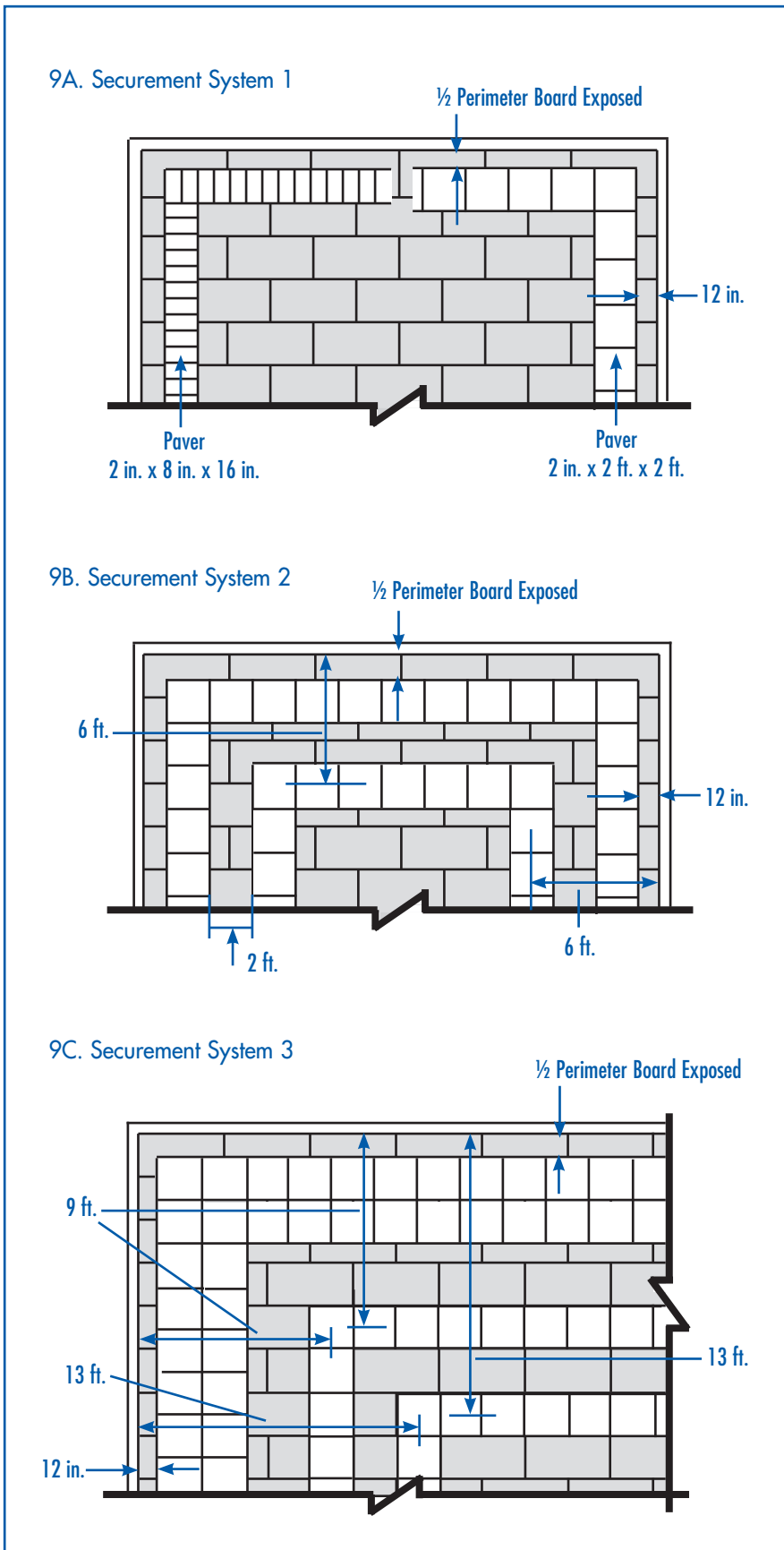
1) Bulb Tite Fasteners, T. Clear Corp., Hamilton, OH.

2) Fab Lok Fasteners, West Camcar Textron, Stanfield, NC.

3) Peel Rivet (standard) SFS Stadler, Valley City, OH.

4) TRP 2 (heavy), T. Clear Corp.

Figure 9. Roof Plan of Paver Layout



C. Factory-fabricated Perimeter Metal Securement

1) "Anchor-Tite[®]" PMR/lock version fascia system, Metal Era, Inc., Waukesha, WI.

2) "The Eliminator" PMR/lock version compression/retainer bar, Metal Era, Inc., Waukesha, WI.

3) Anchor-Tite[®] PMR/lock Type 1 compression/retainer bar, Metal Era, Inc., Waukesha, WI.

4) "The Leading Edge", Hickman, Ashville, NC.

4.2 Materials

A. Cementitious Surfaced Foam Insulation

1) The insulation shall be Hydroguard Insulation panels.

1a) The size shall be 24 in. x 48 in. x [] inches (foam thickness) in thickness to achieve the desired U-factor through the complete roof system. Both Hydroguard Standard and Heavy come in 2 in. and 3 in. thicknesses.

1b) The foam component of the Hydroguard Insulation panels shall have the following physical properties:

- Typical 5-year aged R-value of 5.0 per sq. ft.-h-°F/Btu per in. of thickness when tested at 75°F mean temperature in accordance with ASTM C518-76.

- Minimum compressive strength of the foam insulation shall be 40 lbs. per sq. in. when tested in the vertical direction (at 10% deformation or yield, whichever occurs first) in accordance with ASTM D 1621-73.

- The foam insulation component shall meet the physical property requirements given in ASTM specification C 578-85, Type VI.

2) The composite insulation shall have the following properties:

2a) Withstand freeze/thaw conditioning for a minimum of 750 freeze/thaw cycles in accordance with ASTM C 666 procedure B.

2b) Minimum weight of 4 lbs. per sq. ft.

B. Precast Pavers

1) Pavers shall have compressive strength of 3000 lbs. per sq. in. and be of appropriate quality for roofing application.

2) Pavers shall be nominal 2 in. x 8 in. x 16 in and weigh a minimum of 19 lbs. or nominal 2 in. x 2 ft. x 2 ft. and weigh a minimum of 88 lbs.

C. Factory Fabricated Perimeter Metal Securement

1) L-shape perimeter securement shall be "Anchor-Tite[®]" PMR/lock version fascia system or "Anchor-Tite[®]" PMR/lock type 1 compression/retainer bar.

2) J-shape perimeter securement shall be "The Eliminator" PMR/lock version compression/retainer bar.

3) Hickman "The Leading Edge"

D. Field/Shop Fabricated Metal Securement

1) Counter flashing/gravel stop perimeter metal securement detail must be fabricated to extend a minimum of 6 in. onto the surface of the Hydroguard Insulation panels and meet all material requirements stated in this section.

2) Metal securement shall be minimum 22 ga. (0.0284-0.0314) ASTM grade 304 stainless steel [ASTM AZ55, Galvalume or Zinalume

3) Metal securement shall have a maximum continuous length of 12 ft. A longitudinal crimp or break in the metal securement is recommended to achieve stiffening.

E. Fasteners

Fastener length will depend on the type of perimeter securement system specified. Factory fabricated perimeter metal securement systems require fasteners with a longer grip

range. The fastener specified for factory fabricated perimeter metal securement may be used with other securement systems.

1) Fasteners for metal attachment to Hydroguard Insulation panels shall be:

1a) FABCO FAB-LOK 10-12

1b) Olympic BULB-TITE blind rivet 6604-8-10

1c) PEEL RIVET minimum 1/4 in. diameter 1-1/4 in. length

1d) TPR-2 for HG.

2) Fasteners for attachment of metal securement to structure shall be non-corroding fasteners with minimum pull out of 200 lbs.

Hydroguard Insulation panels should be installed, and remain, unadhered since flotation may occur.

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