



VERSIFLEX[®]

Code Approval Guide

Underwriters Laboratories
Factory Mutual

March 2005

VERSIFLEX

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March 2005

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CODE APPROVAL GUIDE

March 2005

INTRODUCTION

This Code Approval Guide addresses both general information pertaining to Underwriters Laboratories (UL) and Factory Mutual (FM) test criteria as well as specific UL and FM code approvals achieved with Versico's Adhered and Mechanically-Attached VersiFlex (PVC) Roofing Systems. Various independent test laboratory results along with national building code approvals are also identified in this guide. Code approvals available with Versico's VersiGard, VersiWeld and VersiFleece Roofing Systems are identified in separately published Code Approval Guides.

Code ratings are categorized by roof system type (Adhered, and Mechanically-Attached) and are separated into 2 sections; UL Approvals and FM Approvals. Underwriters Laboratories rated roof assemblies are grouped according to deck type (non-combustible or combustible) and are further categorized by the severity of fire exposure (Class A, B or C). Factory Mutual approved assemblies are categorized according to deck type and the specific type of construction (new, tear-off or retrofit). In addition to the standard requirements needed to obtain specific FM ratings, various enhancements which are also required for strict FM compliance are also included in this guide (i.e., additional perimeter insulation securement for Adhered Roofing Systems and additional perimeter membrane securement for Mechanically-Attached Systems).

The listed assemblies contained in this guide are grouped generically based on deck classification. Specific substrate requirements for each Versico Roofing System can be identified in the respective Versico Specifications.

In the UL and FM Approvals throughout this guide, when multiple layers of insulation are referenced, the product listed first identifies the insulation directly below the membrane. For example; a listing of Recovery Board/Polyisocyanurate indicates the Recovery Board is installed directly under the membrane. A listing of Gypsum Board/Polystyrene indicates the Gypsum Board is installed directly under the membrane.

The Table of Contents on the following page identifies the sections contained in this publication.

VersiFlex (PVC) Mechanically-Attached Roofing System

Underwriters Laboratories Approvals

Membrane Type: .050", .060" or .080" VersiFlex PVC Reinforced Membrane (White, Gray or Tan)

UL Class "A"			
Deck Type	Insulation (1)	Thickness	Maximum Slope
Non-Combustible and Combustible (For combustible decks, gypsum board must be installed beneath the insulations listed) (2)(3)(4)	Versico Polyisocyanurate MP-H, MP-N, MP-W Atlas A.C. Foam I or II Dow Hy-Therm AP Hunter Panels H-Shield Manville E"NRG"Y 2 or 3 Manville UltraGard R-Max Multi-Max	Any	1/2"
	Versico Recovery Board Versico Recovery Board/Polyisocyanurate Versico Recovery Board/Polystyrene (5)	1/2" - 3" 1/2" Min./Any 1/2" Min./Any	1"
	Versico FR Base Sheet or Secur-Ply Slip Sheet over Western InsulFoam EPS, Insultaper or R-Tech (5) (7)	Base Sheet/Any	1/2"
	Versico FR Base Sheet or Atlas FR-10, 11 or 50 Slip Sheet over Thermapink 18 or 25 (5) (7)	Base Sheet/Any	1"
Combustible (6)	Gypsum Board Gypsum Board/Polyisocyanurate Gypsum Board/Polystyrene	1/2" (2)(4) 1/2"/Any (2)(4) 1/2"/Any (2)(4)	Unlimited
	Versico MP-WLC or Atlas A.C. Foam III over Versico FR Base Sheet or Atlas FR-10 or FR-50 Slip Sheet	Min. 1-1/2" over Base Sheet	1/2"
	Polyisocyanurate listed above over 2 layers of Versico FR Base Sheet	Any/2 layers	1/2"
	Two layers Versico FR Base Sheet or Atlas FR-50 Slip Sheet Two layers Versico FR Base Sheet or Atlas FR-50 Slip Sheet over minimum Class C Smooth BUR, mineral cap sheet or Modified Bitumen	Two layers of Base Sheet	1/2"

Notes:

- (1) When multiple insulation layers are listed (i.e., Recovery Board/Polyisocyanurate), the insulation listed first (Recovery Board) is directly under the membrane.
- (2) Minimum 1/2" thick gypsum board can be a classified or unclassified material with a minimum weight of 1.84 pounds per square foot. 1/4" thick Versico/Georgia Pacific Dens-Deck or Georgia Pacific Sound Deadening Board with a minimum weight of 1.09 pounds per square foot may be substituted for 1/2" thick gypsum board.
- (3) On Retrofit/No Tearoff projects, where the existing roof is Class A rated, gypsum board may be eliminated. Existing Class B or C rated roofs will require use of gypsum board to achieve a Class A rating, otherwise, the new roofing system will retain existing UL rating.
- (4) Insulation joints (bottom layer) are to be staggered a minimum of 6" from joints in wood deck.
- (5) Assembly not permitted on combustible decks, even with gypsum board underneath. Gypsum board must be installed over polystyrene as identified in combustible deck listing.
- (6) Combustible deck ratings can be used on non-combustible decks.
- (7) Assembly acceptable for whiteVersiFlex membrane only.

VersiFlex (PVC) Mechanically-Attached Roofing System Underwriters Laboratories Approvals

Membrane Type: .050", .060" or .080" VersiFlex PVC Reinforced Membrane (White, Gray or Tan)

UL Class "B"			
Deck Type	Insulation (1)	Thickness	Maximum Slope
Combustible (2)(3)	Versico Polyiso MP-WLC or Atlas AC Foam III	2" Min.	1/2"
	Polyisocyanurate (on Page 1) over Versico FR Base Sheet or G2 Base Sheet (4)	1-1/2" Min./ Base Sheet	1/2"
	Recovery Board/Polyisocyanurate over Versico FR Base Sheet or G2 Base Sheet (4)	1/2"/1" Min./ Base Sheet	1"
	Recovery Board/ Versico FR Base Sheet or G2 Base Sheet (4)	1" Min./Base Sheet	1"
	One Layer Versico FR Base Sheet or Atlas FR-50 Slip Sheet One Layer Versico FR Base Sheet or Atlas FR-50 Slip Sheet over minimum Class B Smooth BUR, mineral cap sheet or Modified Bitumen	One Layer of Base Sheet	1/2"
Existing UL Rating Retained			
Non-Combustible or Combustible	None – Direct to min. UL Class C rated Type III or IV Smooth Asphalt BUR, Mineral Cap Sheet Modified Bitumen or approved single-ply to remain	N/A	1/2"
	Versico FR Base Sheet, G2 Base Sheet (4), Atlas FR-10 Slip Sheet or Elk Versashield Slip Sheet over existing min. UL Class "C" rated Type III or IV Smooth Asphalt BUR, Mineral Cap Sheet, Modified Bitumen or approved single-ply to remain	Base Sheet	1/2"
	Versico FR Base Sheet, Atlas FR-10 Slip Sheet or Elk Versashield over Pactiv Amocor PB6 Fan-Folded Extruded Polystyrene over Existing Gravel Surfaced Asphalt BUR (gravel can be removed) or Mineral Cap Sheet	Base Sheet/ 3/8" Min.	1/2"

Notes:

- (1) When multiple insulation layers are listed (i.e., Recovery Board/Polyiso), the insulation listed first (Recovery Board) is directly under the membrane.
- (2) Insulation joints (bottom layer) are to be staggered a minimum of 6" from joints in wood deck.
- (3) Combustible deck ratings can be used on non-combustible decks.
- (4) **Acceptable G2 base sheets** can be one of the following; Celotex Type G2 Vaporbar GB, GAF Gafglas No. 75 Base Sheet, Manville Glasbase, Owens Corning Perma Ply No. 28 or Tamko Glass Base. Versico FR Base Sheet may also be used.
- (5) Assembly acceptable for white VersiFlex membrane only.

VersiFlex (PVC) Mechanically-Attached Roofing System Factory Mutual (FM) Approvals

A. FM Approvals - Field Sheet Securement Criteria (1)(2)(3)(4)

Membrane Type: .050", .060" or .080" VersiFlex PVC Reinforced Membrane (White, Gray or Tan)

Membrane Width (1)(3)	Fastener/Plate (4)	Fastener Spacing	FM Ratings over Min. 22 Gauge Grade C Steel (5)	FM Ratings over Min. 22 Gauge Grade E Steel (6) or Structural Concrete
81"	HPVX/HPVX Plate	6"	1-105	-
		12"	1-75	1-90
	HPV-XL/HPV-XL	12"	1-90	-
	HPVX/HPVX	18"	-	1-60
	HPV-XL/HPV-XL	18"	1-60	-
40.5"	HPVX/HPVX Plate	6"	1-165	-

Notes:

- (1) Additional membrane securement is required at perimeters and corners in accordance with FM Loss Prevention Data Sheets 1-28 and 1-29. Refer to "FM Membrane and Insulation Enhancement Requirements" at the end of this guide for requirements.
- (2) For roof deck construction (new, tearoff or retrofit), approved insulations and maximum roof slopes, refer to the following page.
- (3) Refer to Versico Specifications for minimum requirements regarding sheet widths and fastener spacing.
- (4) On steel decks, Versico HPVX Fasteners and HPVX Plates or HPV-XL Fasteners and HPV-XL Plates are required as identified in the above chart. On structural concrete decks, CD-10, or MP 14-10 Fasteners are used with HPVX Plates.
- (5) Specific information concerning structural deck requirements (brand names, span capacity, securement criteria, etc.) must be referenced in the current FM Approval Guide and FM Loss Prevention Data Sheet 1-28.
- (6) Testing conducted on FM approved 22 gauge Grade E steel decking meeting ASTM Designation A611 or A653 Grade 80. The decking is secured to minimum 1/4" thick steel structural supports (spaced a maximum 6' on center) with ITW Buildex Tek 5 fasteners spaced a maximum 6" on center at supports. Deck side laps are secured with ITW Buildex Tek 1 Fasteners spaced a maximum of 30" on center. Additional deck securement is required at perimeters and corners. Refer to FM Loss Prevention Data Sheet 1-29.

VersiFlex (PVC) Mechanically-Attached Roofing System Factory Mutual (FM) Approvals

B. FM Class 1 Roof Deck Construction and Insulation Approvals (1)

Membrane Type: .050", .060" or .080" VersiFlex PVC Reinforced Membrane (White, Gray or Tan)

Deck Type (2)	Insulation (3)	Insulation Thickness	Maximum Slope for ASTM E-108 Class "A" Rating
New Construction/Tearoff: Steel (Minimum 22 gauge) Structural Concrete	Versico Recovery Board or FM App'd High Density Wood Fiberboard	1/2" Min.	1" (with Fiberboard overlay) 5" (with Dens-Deck overlay)
	Versico Recovery Board (min. 1/2") or Dens-Deck (min. 1/4") Over: Polyisocyanurate UCI ThermaPink 18 or 25 (4) DOW Styrofoam (4) Pactiv Amocor or Amofoam (7) FM Approved EPS (4)(5)	See Below 3/4" - 12" 3/4" - 10.5" 6" Max Refer to FM Approval Guide	
	Retrofit (No Tearoff) (6): Structural Concrete	Versico Polyisocyanurate MP-H Versico Polyisocyanurate MP-N Versico Polyisocyanurate MP-W Atlas A.C. Foam II Dow Hy-Therm AP Hunter Panel H-Shield Manville E"NRG"Y 2 or 3 Manville UltraGard R-Max Multi-Max	1.4" - 12" 1" - 12" 1" - 12.5" 1" - 12.5" 1.2" - 12" 1.4" - 12" 1" - 12" 1" - 12.5" 1.25" - 4"
Retrofit (No Tearoff) (6): Steel (Minimum 22 gauge)	Versico Recovery Board	1/2" - 1"	1"
	Versico Polyisocyanurate MP-N and MP-W Atlas A.C. Foam II Manville E"NRG"Y 2 or 3 Manville UltraGard	1" Max.	1"

Notes:

- (1) **The fastener spacing for membrane securement** is dependant on the deck type, desired wind uplift rating and the Versico Fastening Plate and Fastener utilized **as identified on page 3. Additional perimeter membrane securement is also required** in accordance with FM Loss Prevention Data Sheets 1-28 and 1-29 (April 1998) as identified on pages 15 & 16.
- (2) Specific information concerning structural deck requirements (brand names, span capacity, securement criteria, etc.) must be referenced in the current FM Approval Guide and FM Loss Prevention Data Sheet 1-28 (April 1998).
- (3) Insulation shall be fastened in accordance with Versico Specifications.
- (4) On steel decks, a thermal barrier of FM approved gypsum board (Type X or Type C) is required under these insulations. For specific thermal barrier requirements, refer to the current published FM Approval Guide or contact the respective manufacturer.
- (5) EPS insulation must be supplied by FM approved AFM, ARCO, BASF or Huntsman bead manufacturer.
- (6) Existing roof must be FM Class 1 rated.
- (7) Minimum 1/2" Dens-Deck must be installed over steel decks beneath the Pactiv insulation.

VersiFlex (PVC) Adhered Roofing System Underwriters Laboratories Approvals

Membrane Type: .050", .060" or .080" VersiFlex PVC Reinforced Membrane (White, Gray or Tan)

UL Class "A"				
Deck Type	Insulation (1)(2)	Thickness	Maximum Slope	
			VersiFlex Bonding Adhesive	Aqua Base 120 Bonding Adhesive
Non-Combustible and Combustible (For combustible decks, gypsum board must be installed beneath the insulations listed) (3)(4)(5)	Versico Polyiso MP-H, MP-N or MP-W Atlas A.C. Foam II or III Dow Hy-Therm AP Hunter Panels H-Shield Manville E"NRG"Y 2 or 3 Manville UltraGard	Any	3/4"	3/4"
	APA Rated Oriented Strand Board (OSB)	7/16" Min.	1-1/2"	1-1/2"
	Versico Recovery Board Versico Recovery Board/Polyiso Versico Recovery Board/Polystyrene (8)	1/2" - 3" 1/2" Min/Any 1/2" Min/Any	Unlimited	1-1/2"
	Dens-Deck Prime (6) Dens-Deck Prime/Polyiso Dens-Deck Prime/Polystyrene	1/4" (6) 1/4"/Any 1/4"/Any	3/4"	3/4"
Combustible (5)(7)	Polyiso listed above over 2 layers of Versico FR Base Sheet (from next page)	Any/2 layers	3/4"	3/4"
	Versico MP-WLC or Atlas A.C. Foam III over Versico FR Base Sheet or Atlas FR-10 or FR-50 Slip Sheet or	Min. 1-1/2"/ Base Sheet	3/4"	3/4"
	2 Layers of Versico FR Base Sheet or Atlas FR-50 Slip Sheet	2 layers	1/2"	1/2"
Structural Concrete or Approved Ltwt. Ins. Conc.	None	N/A	Unlimited	1-1/2"

Notes:

- (1) When multiple insulation layers are listed (i.e., Recovery Board/Polyisocyanurate), the insulation listed first (Recovery Board) is directly under the membrane.
- (2) Insulation may be mechanically fastened, attached with FAST Adhesive, OlyBond 500 BA, VersiGrip Insulation Adhesive or Type III or IV asphalt or UL approved cold adhesive.
- (3) Minimum 1/2" thick gypsum board can be a classified or unclassified material with a minimum weight of 1.84 pounds per square foot. 1/4" thick Versico/Georgia Pacific Dens-Deck or Georgia Pacific Sound Deadening Board with a minimum weight of 1.09 pounds per square foot may be substituted for 1/2" thick gypsum board.
- (4) On **Retrofit/No Tearoff** projects, where the **existing roof is Class A** rated, the **gypsum board may be eliminated**. Existing Class B or C rated roofs will require the use of gypsum board to achieve a Class A rating, otherwise, the new roofing system will retain existing UL rating.
- (5) Insulation joints (bottom layer) are to be staggered a minimum of 6" from joints in wood deck.
- (6) Dens-Deck Prime cannot be installed directly over an existing roofing membrane.
- (7) Combustible deck ratings can be used on non-combustible decks.
- (8) Assembly not permitted on combustible decks, even with gypsum board underneath. Dens-Deck Prime glass faced gypsum board must be installed over insulation as identified in combustible deck listing.

VersiFlex (PVC) Adhered Roofing System Underwriters Laboratories Approvals

Membrane Type: .050", .060" or .080" VersiFlex PVC Reinforced Membrane (White, Gray or Tan)

UL Class "B"				
Deck Type	Insulation (1)(2)	Thickness	Maximum Slope	
			VersiFlex Bonding Adhesive	Aqua Base 120 Bonding Adhesive
Combustible (3)(5)	Versico Polyiso MP-WLC or Atlas AC Foam III	2" Min.	3/4"	3/4"
	Polyiso listed on previous page/G2 Base Sheet (4)	1-1/2" Min./ G2 Base	3/4"	3/4"
	Recovery Board/Polyiso/G2 Base Sheet (4)	1/2" Min./ 1" Min./G2 Base	1-1/2"	1-1/2"
	Recovery Board/G2 Base Sheet (4)	1" Min./G2 Base		
	One layer of Versico FR Base Sheet or Atlas FR-50 Slip Sheet	1 layer	1/2"	1/2"

Notes:

- (1) When multiple insulation layers are listed (i.e., Recovery Board/Polyisocyanurate), the insulation listed first (Recovery Board) is directly under the membrane.
- (2) Insulation may be mechanically fastened, attached with FAST Adhesive, OlyBond 500 BA, VersiGrip Insulation Adhesive or Type III or IV asphalt or UL approved cold adhesive.
- (3) Insulation joints (bottom layer) are to be staggered a minimum of 6" from joints in wood deck.
- (4) **Acceptable G2 base sheets** can be one of the following; Celotex Type G2 Vaporbar GB, GAF Gafglas No. 75 Base Sheet, Manville Glasbase, Owens Corning Perma Ply No. 28 or Tamko Glass Base. **Versico FR Base Sheet may also be used.**
- (5) Combustible deck ratings can be used on non-combustible decks.

VersiFlex (PVC) Adhered Roofing System Factory Mutual (FM) Approvals

Membrane Type: .050", .060" or .080" VersiFlex PVC Reinforced Membrane (White, Gray or Tan)

Adhesive Type: VersiFlex Bonding Adhesive*

FM Class 1A-60 and 1A-90 Ratings Mechanically Attached Insulation				
Deck Type (1)	Insulation (2) (3) (4)	FM Class 1A-60 Thickness	FM Class 1A-90 Thickness	Maximum Slope
New Construction/Tearoff: Steel (Min. 22 gauge) Structural Concrete Wood (5) Tectum (6) Gypsum (Tearoff only) (7)	Versico Polyisocyanurate MP-H	1.4" - 12"	1.4" - 12"	1"
	Versico Polyisocyanurate MP-N	1.4" - 12"	1.4" - 12"	
	Versico Polyisocyanurate MP-W	1.5" - 12.5"	1.5" - 12.5"	
	Dow Hy-Therm AP	1.2" - 12"	1.4" - 12"	
	Hunter Panels H-Shield	1.4" - 12"	1.4" - 12"	
	Manville E"NRG"Y 2 or 3	1.4" - 12"	1.4" - 12"	
	Manville UltraGard	1.3" - 12.5"	1.3" - 12.5"	
Retrofit (No Tearoff) (8) Structural Concrete Gypsum (7)	R-Max Multi-Max FA	1.25" - 4"	-----	

* FM Approvals with Aqua Base 120 Bonding Adhesive are pending.

Notes:

- (1) Specific information concerning structural deck requirements (brand names, span capacity, securement criteria, etc.) must be referenced in the current FM Approval Guide and FM Loss Prevention Data Sheet 1-28.
- (2) Additional insulation fastening is required at perimeters and corners in accordance with FM Loss Prevention Data Bulletin 1-28 and 1-29. For Versico insulation fastening criteria, refer to "FM Membrane and Insulation Enhancement Requirements" at the end of this Guide.
- (3) In lieu of mechanical securement, insulation may be attached with **Carlisle FAST Adhesive, OlyBond 500 BA or VersiGrip Insulation Adhesive** to new/tearoff structural concrete, FM approved Tectum (excluding VersiGrip) decks or over a mechanically fastened base layer of approved insulation (refer to page 10). Insulations may also be attached to existing FM approved built-up roof coverings over FM Approved concrete decks to retain the existing wind uplift classification (maximum FM 1-90 rated). Multiple layers of approved insulation are acceptable.
- (4) For FM approvals using hot asphalt for insulation attachment, refer to page 12 for applicable requirements.
- (5) On FM approved wood decks, minimum 1/4" thick gypsum board must be installed beneath the insulation listed.
- (6) FM approved Tectum decks must be minimum 2" thick. Insulation fasteners must penetrate the deck a minimum of 1-1/2" for Class 1-60 and 2" for Class 1-90.
- (7) Existing gypsum decks must be FM approved. Insulation fasteners must penetrate the deck a minimum of 1-1/2" for Class 1-60 and 1-90.
- (8) Existing roof must be FM Class 1 rated.

VersiFlex (PVC) Adhered Roofing System Factory Mutual (FM) Approvals

Membrane Type: .050", .060" or .080" VersiFlex PVC Reinforced Membrane (White, Gray or Tan)
Adhesive Type: VersiFlex Bonding Adhesive*

FM Class 1A-90 Ratings Mechanically Fastened Insulation			
Deck Type (1)	Insulation (2)(4)(5)(13)	Insulation Thickness	Maximum Slope
New Construction/Tearoff: Steel (Minimum 22 gauge) Structural Concrete Wood (8) Tectum (9) Gypsum (10) (Tearoff only) Retrofit (No Tearoff): (11) Structural Concrete Gypsum (10)	Versico Recovery Board (3) Versico Recovery Board (min. 1/2"), OSB (5) or Dens-Deck Prime (1/4" Min.) Over: Polyisocyanurate (3) UCI Thermapink 18 or 25 (6) DOW Styrofoam (6) Pactiv Amocor or Amofoam (12) Contour Taper Tile EPS (6)(7) Perform 1,2 or Plus EPS (6)(7) Arcor FM-1 or MB EPS (6)(7) Dylite EPS (1 lb.) (6)(7) Dylite EPS (1.25 lb.) (6)(7) Styropor EPS (1 lb.) (6)(7) Styropor EPS (1.25 lb) (6)(7) Huntsman EPS (6)(7)	1/2" Min See Page 7 3/4" - 12" 3/4"-10.5" 6" Max. 1/2" – 8" 1" – 8" 2" – 4.5" 1" – 8" 1" – 6.5" 2" – 6.25" 2" – 5" 1" – 8"	1-1/2" **
Retrofit (No Tearoff) (11): Steel (Minimum 22 gauge) Wood (8) Tectum (9)	Versico Recovery Board (No additional insulation permitted)	1/2" - 1"	1-1/2"

* FM Approvals with Aqua Base 120 Bonding Adhesive are pending.

** ASTM E108 Class B fire rating (Class 1B-90) available up to a maximum slope of 3" in 12" when Dens-Deck Prime is used as the membrane underlayment.

Notes:

- (1) Specific information concerning structural deck requirements (brand names, span capacity, securement criteria, etc.) must be referenced in the current FM Approval Guide and FM Loss Prevention Data Sheet 1-28.
- (2) Additional insulation fastening is required at perimeters and corners in accordance with FM Loss Prevention Data Bulletin 1-28 and 1-29. For Versico insulation fastening criteria, refer to "FM Membrane and Insulation Enhancement Requirements" at the end of this Guide.
- (3) In lieu of mechanical securement, insulation may be attached with **Carlisle FAST Adhesive, OlyBond 500 BA or VersiGrip Insulation Adhesive** to new/tearoff structural concrete, FM approved Tectum (excluding VersiGrip) decks or over a mechanically fastened base layer of approved insulation (refer to page 10). Insulations may also be attached to existing FM approved built-up roof coverings over FM Approved concrete decks to retain the existing wind uplift classification (maximum FM 1-90 rated). Multiple layers of approved insulation are acceptable.
- (4) For FM approvals using hot asphalt for insulation attachment, refer to page 12 for applicable requirements.
- (5) OSB shall be minimum 7/16" thick and APA rated.
- (6) On steel decks, a thermal barrier of FM approved gypsum board (Type X or Type C) is required under these insulations. For specific thermal barrier requirements, consult the respective insulation manufacturer or refer to the current published FM Approval Guide.
- (7) EPS insulation must be supplied by FM approved AFM, ARCO, BASF or Huntsman bead manufacturer.
- (8) On FM Approved wood decks, minimum 1/4" thick gypsum board must be installed beneath the insulation listed. Polystyrene insulations must incorporate 1/4" gypsum board in addition to standard thermal barrier requirements.
- (9) FM approved Tectum decks must be minimum 2" thick. Insulation fasteners must penetrate the deck a minimum of 1-1/2" for Class 1-60 rating.
- (10) Existing gypsum decks must be FM approved. Insulation fasteners must penetrate deck a minimum of 1-1/2" for Class 1-60 rating.
- (11) Existing roof must be FM Class 1 rated.
- (12) Minimum 1/2" thick Dens-Deck must be installed over steel decks beneath the Pactiv insulation.

VersiFlex (PVC) Adhered Roofing System

Factory Mutual (FM) Approvals

Membrane Type: .050", .060" or .080" VersiFlex PVC Reinforced Membrane (White, Gray or Tan)
Adhesive Type: Sure-Flex Bonding Adhesive*

FM Class 1A-90 Ratings

Insulation Attachment to Structural Concrete with FAST Adhesive, OlyBond 500 BA or VersiGrip Insulation Adhesive (5)

Deck Type	Insulation (1)	Insulation Thickness	Maximum Slope
New Construction/ Tearoff: Structural Concrete	Versico Polyiso MP-H (4)	1.5"-12"	1"
	Versico Polyiso MP-N	1.5"-12"	
	Versico Polyiso MP-W	1.5"-12.5"	
	Atlas AC Foam II	1.5"-12.5"	
	Dow Hy-Therm AP	1.5"-12"	
	Hunter Panels H-Shield (4)	1.5" - 12"	
	Manville E"NRG"Y 2 or 3	1.5"-12"	1-1/2" **
	Versico Dens-Deck Prime over Polyiso	1/4" Min/See above	
	Versico Dens-Deck Prime over Extruded Polystyrene (2)	1/4" Min/FM Approved	
	Versico Recovery Board over: Polyisocyanurate EPS (3)	1/2"/FM Approved 1/2"/FM Approved	
Versico Dens-Deck Prime over EPS (3)	Min. 1/4"/FM Approved	1-1/2"	
Versico Polyisocyanurate MP-N/OSB Composite	1.5" - 4"		
Versico Polyisocyanurate MP-H/OSB Composite (4)	1.9" - 4"		
Manville Nailboard (Polyiso/OSB Composite)	1.5" - 4"		
Hunter H-Shield NB (Polyiso/OSB Composite) (4)	1.9" - 4"		

* FM Approvals with Aqua Base 120 Bonding Adhesive are pending.

** ASTM E108 Class B fire rating (Class 1B-90) available up to a maximum slope of 3" in 12" when Dens-Deck Prime used as the membrane underlayment.

Notes:

- (1) Versico 725 Vapor Retarder may be used beneath any of the insulations listed above and maintain the rating. Prior to installing Versico 725 Vapor retarder, apply CCW 702 Primer as outlined in Versico's most current Specifications.
- (2) With FAST Adhesive, extruded polystyrene must be Owens Corning Foamular, Dow Styrofoam or Pactiv GreenGuard (unfaced). OlyBond 500 BA is approved with Thermapink 25. **Approval with VersiGrip Insulation Adhesive is pending.**
- (3) When using FAST Adhesive, EPS must be FM approved and manufactured from BASF, Huntsman or Nova Beads. With OlyBond 500 BA, insulation must be FM approved, minimum 2" thick Western Insulfoam or Western EPS. When VersiGrip Insulation Adhesive is specified, insulation must be FM approved AFM Contour Taper Tile or Perform 1 EPS.
- (4) FM approval with VersiGrip Insulation Adhesive is pending.
- (5) Bead spacing for OlyBond 500 BA or VersiGrip Insulation Adhesive shall be a maximum of 12" on center in the field of the roof. Additional beads of adhesive are required at perimeters and corners as identified in this guide. Bead spacing shall not exceed 6" on center at perimeter areas and 4" on center at corners.

VersiFlex (PVC) Adhered Roofing System Factory Mutual (FM) Approvals

Membrane Type: .050", .060" or .080" VersiFlex PVC Reinforced Membrane (White, Gray or Tan)
Adhesive Type: VersiFlex Bonding Adhesive *

FM Class 1A-90 Ratings Insulation Attachment to Tectum with FAST Adhesive or OlyBond 500 BA (1)(2)

Deck Type (3)	Insulation	Insulation Thickness	Maximum Slope
New Construction/ Tearoff: Tectum (2" min. deck thickness)	Versico Polyiso MP-H	1.5" - 12"	1"
	Versico Polyiso MP-N	1.5" - 12"	
	Versico Polyiso MP-W	1.5" - 12.5"	
	Atlas AC Foam II	1.5" - 12.5"	
	Hunter Panels H-Shield	1.5" - 12"	
	Manville E"NRG"Y 2 or 3	1.5" - 12"	1-1/2"
	Versico Recovery Board	1/2" Min.	
	Versico Recovery Board over Polyiso	1/2" Min/ See above	
Dens-Deck Prime over Polyiso	1/4" Min/ See Above	1-1/2" **	

* FM Approvals with Aqua Base 120 Bonding Adhesive are pending.

** ASTM E108 Class B fire rating (Class 1B-90) available up to a maximum slope of 3" in 12" when Dens-Deck Prime used as the membrane underlayment.

Notes:

- (1) Bead spacing for OlyBond 500 BA shall be a maximum of 12" on center in the field of the roof. Additional beads of adhesive are required at perimeters and corners as identified in this guide. Bead spacing shall not exceed 6" on center at perimeter areas and 4" on center at corners.
- (2) Insulation attachment to Tectum decks with VersiGrip Insulation Adhesive is pending.
- (3) FM approved minimum 2" thick by 31" wide Tectum deck secured to minimum 1/4" thick steel supports spaced a maximum of 3' on center with two Construction Fasteners, Inc. 2" diameter metal plates and #14 Dekfast Fasteners per panel per support. Screws are driven into 7/32" diameter pilot holes and are spaced 7-1/2" from panel edges. Additional deck fastening required at perimeters and corners per FM Loss Prevention Data Sheet 1-28.

VersiFlex (PVC) Adhered Roofing System Factory Mutual (FM) Approvals

Membrane Type: .050", .060" or .080" VersiFlex PVC Reinforced Membrane (White, Gray or Tan)
Adhesive Type: VersiFlex Bonding Adhesive *

FM Class 1A-90 Ratings Base Layer Insulation Mechanically Attached; Top Layer of Insulation Attached with FAST Adhesive, OlyBond 500 BA or VersiGrip Insulation Adhesive(1)		
Deck Type (2)	Insulation	Maximum Slope
New Construction or Tearoff: Steel (Min. 22 gauge) Wood (3) Tectum (4) Gypsum (5) (Tearoff Only)	<p>Base layer of 1/2" thick Dens-Deck/Dens-Deck Prime (6) or FM approved Polyisocyanurate insulation (listed on page 7) mechanically fastened to the deck per standard FM Class 1-90 requirements (including enhancements at perimeters and corners).</p> <p>Top Layer of minimum 1/2" thick Versico Recovery Board, 1/4" thick Dens-Deck Prime or FM Approved Polyiso (listed on page 7) secured over base layer with FAST Adhesive, OlyBond 500 BA or VersiGrip Insulation Adhesive</p>	<p>1-1/2" with top layer of Recovery Board, OSB or Dens-Deck Prime **</p> <p>1" with top layer of Polyiso</p>

* FM Approvals with Aqua Base 120 Bonding Adhesive are pending.

** ASTM E108 Class B fire rating (Class 1B-90) available up to a maximum slope of 3" in 12" when Dens-Deck Prime used as the membrane underlayment.

Notes:

- (1) FAST Adhesive, OlyBond 500 BA or VersiGrip Insulation Adhesive shall be applied in accordance with Versico Specifications. Bead spacing for OlyBond 500 BA or VersiGrip Insulation Adhesive is a maximum of 12" o.c. in the field of the roof. Additional beads of adhesive are required at perimeters and corners as identified in this guide. Bead spacing shall not exceed 6" o.c. at perimeter areas and 4" o.c. at corners.
- (2) Specific information concerning structural deck requirements (brand names, span capacity, securement criteria, etc.) must be referenced in the current FM Approval Guide and FM Loss Prevention Data Sheet 1-29.
- (3) On FM approved wood decks, minimum 1/4" thick gypsum board must be installed beneath the insulation listed.
- (4) FM approved Tectum decks must be minimum 2" thick. Insulation fasteners must penetrate the deck a minimum 1-1/2" for FM 1-60 ratings.
- (5) Existing gypsum decks must be FM approved. Insulation fasteners must penetrate the deck a minimum of 1-1/2".
- (6) 1/2" Dens-Deck or Dens-Deck Prime must be fastened to the deck at 1 per 2 square feet (enhancements required at perimeters and corners).

VersiFlex (PVC) Adhered Roofing System Factory Mutual (FM) Approvals

Membrane Type: .050", .060" or .080" VersiFlex PVC Reinforced Membrane (White, Gray or Tan)
Adhesive Type: VersiFlex Bonding Adhesive*

FM Class 1A-90 Rating - Insulation Attachment with Hot Asphalt (1)

Deck Type (2)	Insulation	Insulation Thickness	Maximum Slope
New Construction/ Tearoff: Structural Concrete	Versico Polyiso MP-H	1.4"-12"	1"
	Versico Polyiso MP-N	1.4"-12"	
	Versico Polyiso MP-W	1.5"-12.5"	
	Atlas AC Foam II	1.5-12.5"	
	Celotex Hy-Therm AP	1.3"-12"	
	Hunter Panels H-Shield	1.4" – 12"	
	Manville E"NRG"Y 2 or 3 UltraGard	1.4"-12" 1.3"-12.5"	1-1/2" **
Versico Recovery Board	1/2" Min.		
Versico Recovery Board over Polyiso	1/2" Min/ See above		
	Dens-Deck Prime over Polyiso	1/4" Min/ See Above	

FM Class 1A-90 Rating - Insulation Attachment with Hot Asphalt (1)

Deck Type (2)	Insulation	Maximum Slope
New Construction/ Tearoff: Steel (Min. 22 gauge) Wood (3) Tectum (4) Gypsum (5) (Tearoff Only)	Base layer of FM approved Polyisocyanurate insulation (minimum thickness listed above) mechanically fastened to the deck per standard FM Class 1-90 requirements (including enhancements at perimeters and corners).	1-1/2" with top layer of HP Recovery Board or Dens-Deck Prime **
	Top Layer of minimum 1/2" thick Versico Recovery Board, minimum 1/4" Dens-Deck Prime or FM Approved Polyisocyanurate (listed above) secured over base layer with hot asphalt	1" with top layer of Polyiso

* FM Approvals with Aqua Base 120 Bonding Adhesive are pending.

** ASTM E108 Class B fire rating (Class 1B-90) available up to a maximum slope of 3" in 12" when Dens-Deck Prime used as the membrane underlayment.

Notes:

- (1) Hot asphalt must be Type III or IV applied at a temperature within 25° F of EVT at the rate of 20-25 pounds per square.
- (2) Specific information concerning structural deck requirements (brand names, span capacity, securement criteria, etc.) must be referenced in the current FM Approval Guide and FM Loss Prevention Data Sheet 1-29.
- (3) On FM approved wood decks, minimum 1/4" thick gypsum board must be installed beneath the insulations listed.
- (4) FM approved Tectum decks must be minimum 2" thick. Fasteners must penetrate the deck a minimum 2".
- (5) Existing gypsum decks must be FM approved. Insulation fasteners must penetrate the deck a minimum of 1-1/2".

Factory Mutual Membrane and Insulation Enhancement Requirements

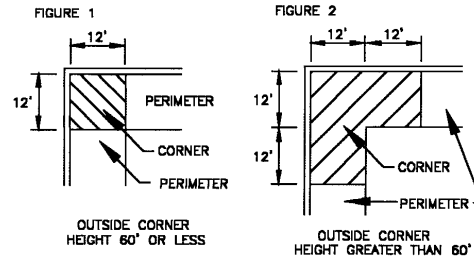
This section outlines Factory Mutual’s fastening enhancements at roof perimeters and corners as required by FM Loss Prevention Data Sheets 1-28 (Design Wind Loads) and 1-29 (Above-Deck Roof Components). To account for higher wind uplift forces at perimeters and corners, Factory Mutual requires additional membrane securement on Mechanically-Attached Roofing Systems and additional insulation fastening on Adhered Roofing Systems. Additional insulation fastening for Mechanically-Attached Systems is no longer required for assemblies not incorporating a vapor retarder or air barrier. Refer to the following pages for specific criteria.

1. **Perimeter and Corner Identification** - In accordance with the FM Data Sheets 1-28 and 1-29, the **width of roof perimeters and corners** for all FM approved roofing systems is equal to:

- **0.4 times the building height or**
- **0.1 times the buildings lesser plan dimension, whichever is smaller**

Notes:

1. The **minimum perimeter/corner** width shall be 4% of the building width but not less than 3’.
2. **For buildings over 60’ in height**, .4 x building height is not applicable for calculating perimeter/corner areas. Also, minimum corner dimension shall be 3’ (4% of building width is not applicable).

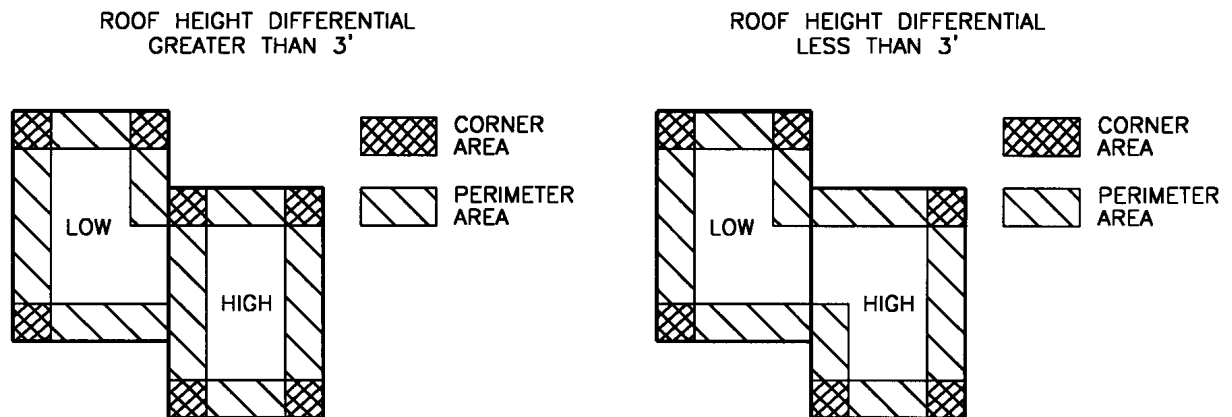


Example: A 50 foot high building has overall plan dimensions of 120' X 300':

$$50' \text{ (building height)} \times 0.4 = 20' \quad \text{or} \quad 120' \text{ (lesser plan dimension)} \times 0.1 = 12'$$

Therefore, FM defines the width of perimeter as a 12’ wide area around the entire building. For buildings 60’ high or less, outside corners are square areas equal to calculated dimensions (12’ X 12’ areas. See Figure 1 above). For buildings greater than 60’ in height, outside corners are “L” shaped with dimensions twice as long as the calculated corner area. See Figure 2 above. Inside corners are considered roof perimeters.

Note: Where multi-level roofs meet at a common wall, the adjacent edge of the upper roof is treated as a perimeter requiring enhanced fastening only if the difference in height is greater than 3 feet. FM does not require fastening enhancement at the lower roof area adjacent to the higher building wall regardless of height differential. See figures below.



2. **Perimeter/Corner Membrane Fastening Enhancements for VersiFlex Mechanically-Attached Roofing System.**

At the roof perimeter and corner areas, as identified above, additional membrane securement is required. Field sheet securement requirements are identified on page 3 in this Guide. The following indicates FM perimeter/corner enhancements required in accordance with FM Loss Prevention Data Sheet 1-28 and 1-29.

- All fasteners for membrane securement must engage the top flutes of the steel deck.
- In the field of the roof, rows of fasteners within membrane splices shall run perpendicular to the steel deck flutes.
- For systems rated above FM 1-90, fastening parallel to the steel deck flutes at perimeters and corners is not permitted. All membrane securement rows (field and perimeter) must be perpendicular to the flutes for systems rated above 1-90.
- Perimeter half sheets (40.5" wide) are used at roof perimeters. Refer to the following pages for requirements.

3. **Insulation Attachment Criteria – VersiFlex Mechanically-Attached Roofing Systems**

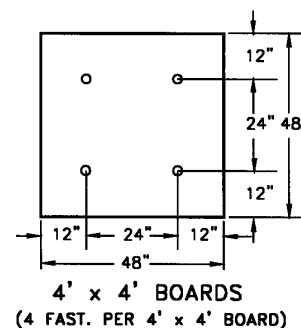
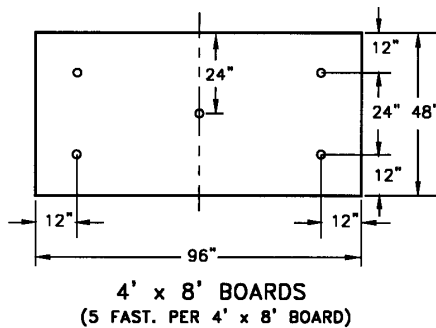
Versico insulation shall be fastened in accordance with the VersiFlex Mechanically-Attached Roofing System Specifications as shown below. Additional insulation fastening at perimeters and corners is no longer required per new FM Loss Prevention Data Sheet 1-29. Any FM approved fastener/plate assembly can be used to attach insulation on Mechanically-Attached Systems.

CAUTIONS: For insulation manufactured by others, an increased fastening density may be required by the insulation manufacturer. The respective manufacturer must be contacted to verify their minimum securement requirements.

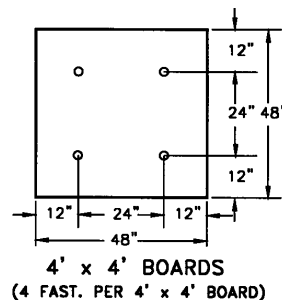
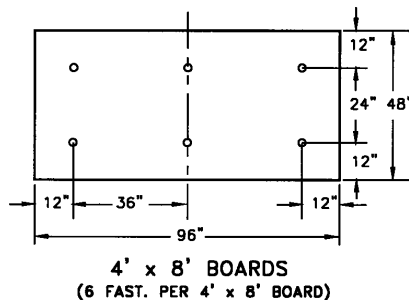
If a vapor retarder or air barrier is specified below the insulation, a minimum insulation fastening density of 1 per 2 square feet must be used in the field of the roof for strict FM compliance. Additional insulation fastening at perimeters and corners is still required as identified for adhered assemblies. If 2" thick Versico Polyisocyanurate insulation (single layer) is used, a reduced insulation fastening pattern may be utilized. Contact Versico for specific requirements.

The Factory Mutual approved insulation fastening patterns for the various Versico brand insulations are as follows:

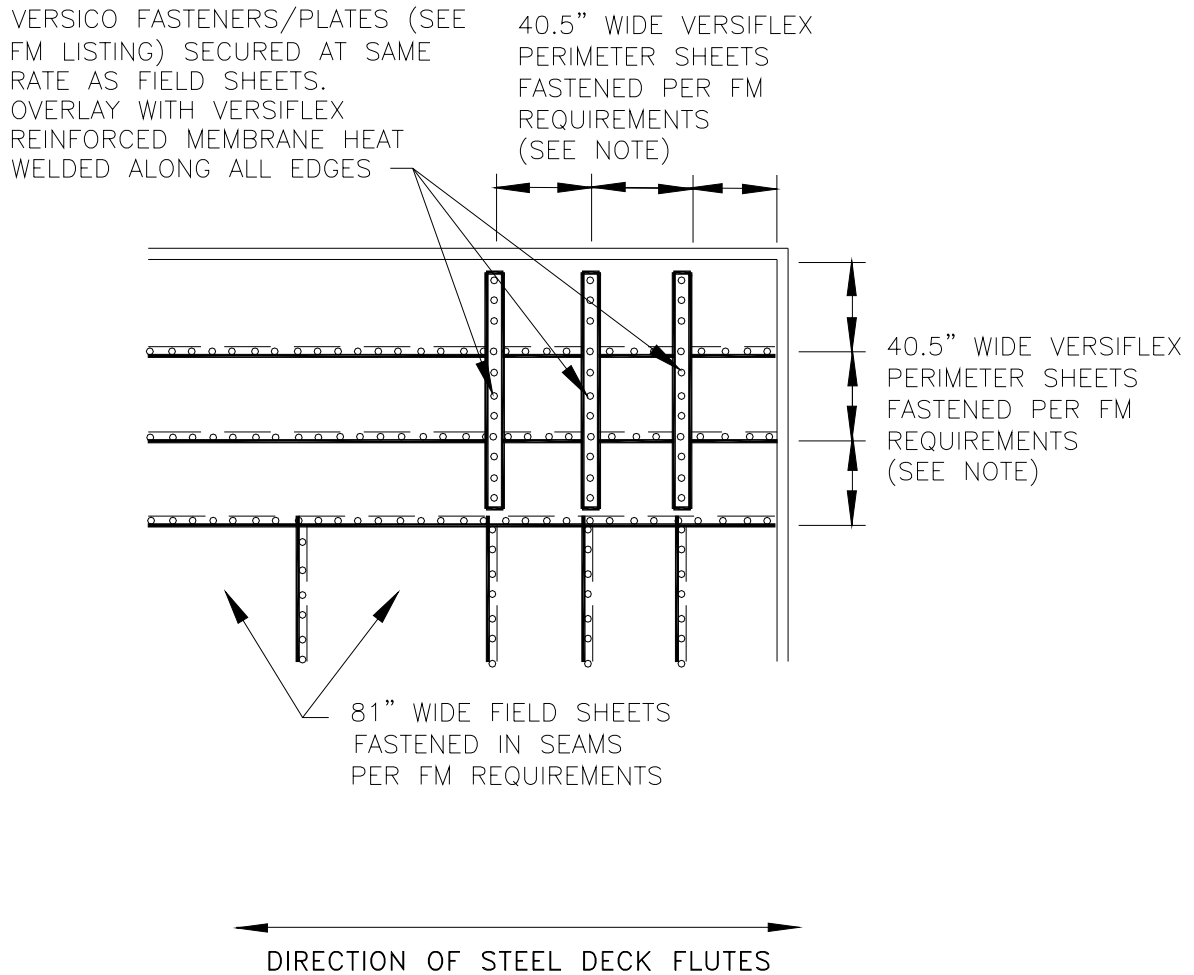
a. **Versico Recovery Board, Dens-Deck, EPS/Fiberboard Composite or minimum 1-1/2" thick Polyisocyanurate:**



b. **Versico Polyisocyanurate Insulation less than 1-1/2" thick:**



PERIMETER SECUREMENT OPTION #1 (FOR MAXIMUM FM 1-90 RATINGS)



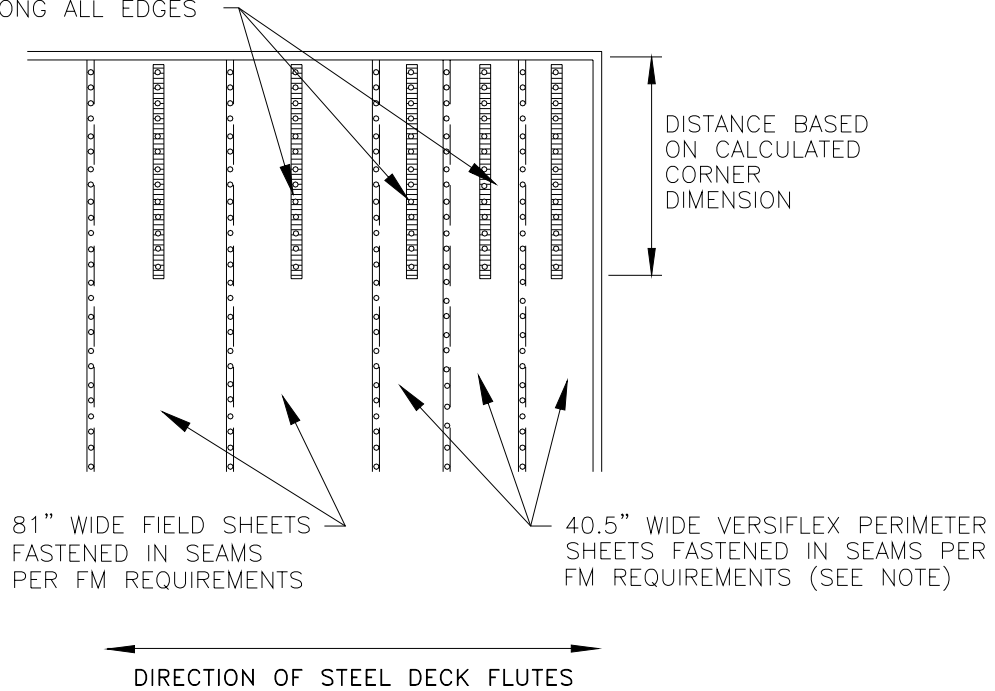
NOTE:

TO DETERMINE THE NUMBER OF PERIMETER SHEETS REQUIRED, CALCULATE THE PERIMETER DIMENSION AND DIVIDE BY 2.85 (WIDTH OF PERIMETER SHEETS MINUS SPLICE WIDTH). ROUND UP TO THE NEXT WHOLE NUMBER.

(EXAMPLE: IF 12' IS THE PERIMETER DIMENSION, DIVIDE BY 2.85: $12/2.85 = 4.2$; ROUNDED UP TO 5. 5 PERIMETER SHEETS WOULD BE REQUIRED).

PERIMETER SECUREMENT OPTION #2 (REQUIRED FOR RATINGS ABOVE FM 1-90)

VERSICO FASTENERS/PLATES
(SEE FM LISTING) SECURED AT
SAME RATE AS FIELD SHEETS.
OVERLAY WITH VERSIFLEX
REINFORCED MEMBRANE HEAT
WELDED ALONG ALL EDGES



NOTE:

TO DETERMINE THE NUMBER OF PERIMETER SHEETS REQUIRED, CALCULATE THE PERIMETER DIMENSION AND DIVIDE BY 2.85 (WIDTH OF PERIMETER SHEETS MINUS SPLICE WIDTH). ROUND UP TO THE NEXT WHOLE NUMBER.

(EXAMPLE: IF 12' IS THE PERIMETER DIMENSION, DIVIDE BY 2.85: $12/2.85 = 4.2$; ROUNDED UP TO 5. 5 PERIMETER SHEETS WOULD BE REQUIRED).

4. **Insulation Attachment Criteria – Fastening Enhancements for VersiFlex Adhered Roofing Systems**

At the calculated perimeter and corner areas, insulation fastening on Adhered Roofing Systems must be increased over the rate approved in the FM Approval Guide. Any whole or partial insulation board which is located within the calculated perimeter and corner areas must have the increased fastening applied over the entire board width.

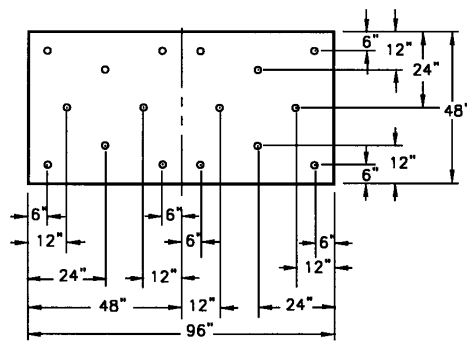
- **At roof perimeters, a 50% increase in insulation fasteners** (1.5 times as many fasteners) is required.
- **At roof corners, a 75% increase in insulation fasteners** (1.75 times as many fasteners) is required for buildings with a parapet height less than 3'. For roofs with a 3' or higher parapet continuous around the entire building, a 50% increase in fasteners at corners is acceptable.

The Factory Mutual approved insulation fastening patterns on Mechanically-Attached and Adhered Systems in the field of the roof in addition to the enhanced fastening patterns (50% and 75% increase in fasteners) required in accordance with Factory Mutual Loss Prevention Data Sheets 1-28/1-29 for various **Versico brand insulations** are indicated on the following pages.

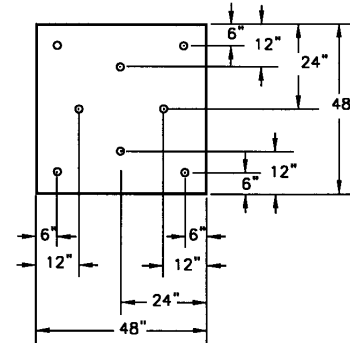
a. **Versico Recovery Board, EPS/Fiberboard Composite and Polyisocyanurate MP-H, MP-N and MP-W Insulations:**

The thickness of insulation is dependent upon the membrane type, type of construction (new or retrofit) and FM wind uplift rating. Refer to the individual FM approvals listed for specific requirements concerning deck types, insulation thickness, etc.

1) **Field Insulation Securement**



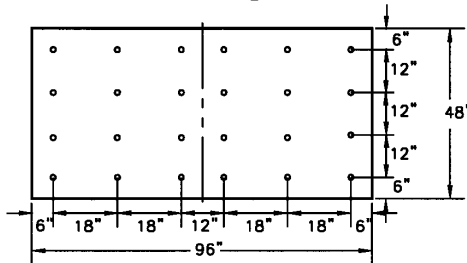
4' x 8' BOARDS
(16 FAST. PER 4' x 8' BOARD)



4' x 4' BOARDS
(8 FAST. PER 4' x 4' BOARD)

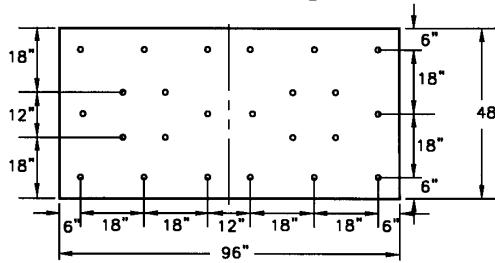
2) **50% Increase in Insulation Fasteners (at perimeters)**

Option #1



4' x 8' BOARDS
(24 FAST. PER 4' x 8' BOARD)

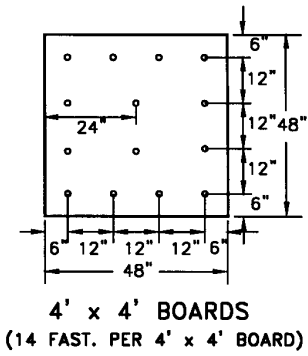
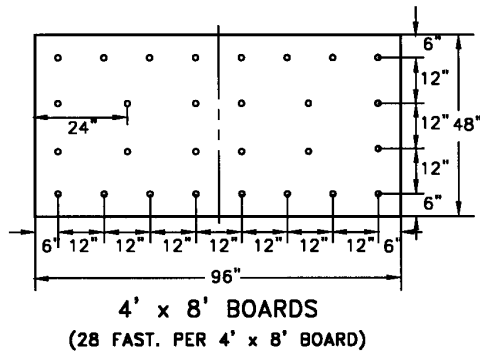
Option #2



4' x 8' BOARDS
(24 FAST. PER 4' x 8' BOARD)

Refer to the following page for corner enhancements.

3) 75% Increase in Insulation Fasteners (at corners) *



* If parapets are minimum 3' continuous around entire building perimeter, a 50% increase in fastening is acceptable at corners. Refer to fastening pattern above.

Note: A reduced fastening pattern may be used for Versico 1-1/2" or 2" thick Polyisocyanurate Insulation or Polyisocyanurate/Recovery Board Composite Insulations as indicated on the following pages.

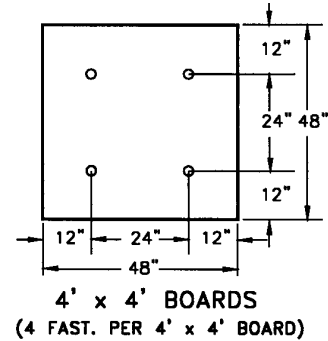
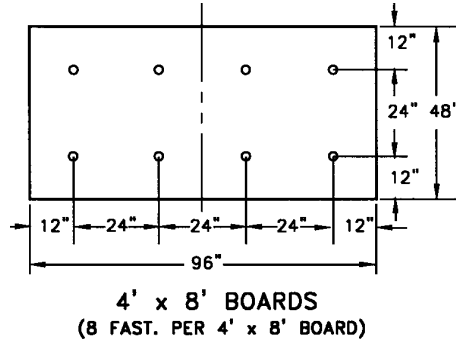
b. Reduced fastening pattern for minimum 2" thick Versico Polyisocyanurate MP-H, MP-N or MP-W Insulation or Versico Polyisocyanurate/Recovery Board Composite Insulation:

Versico has obtained FM Class 1-90 approval using one Versico Fastener and Insulation Plate for every 4 square feet of 2" thick (top layer) Versico Polyisocyanurate Insulation or 2" thick Polyisocyanurate/Recovery Board Composite Insulation. This approval is applicable for FM approved steel or wood (new or tearoff) or structural concrete decks (new, tearoff or retrofit) with the following stipulations:

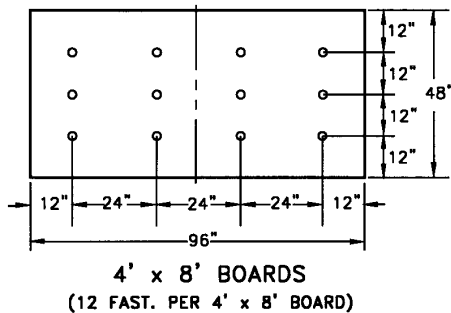
- If one layer of Polyisocyanurate insulation is specified, it must be a minimum of 2" thick. If multiple layers of insulation are to be installed, the top layer must be the minimum identified above with bottom layers a minimum of 1" thick. On FM approved wood decks, 1/4" thick gypsum board must be installed beneath the insulation.
- The maximum total thickness of insulation cannot exceed 12" with Polyisocyanurate MP-H or MP-N and 12.5" thick with Polyisocyanurate MP-W.
- **On steel and wood decks**, Versico Fasteners and Insulation Plates or Insultite Fasteners and Insulation Plates shall be used. Versico ASAP Pre-Assembled Fasteners/Plates are acceptable with Polyisocyanurate MP-N and MP-W insulations. With Polyisocyanurate MP-H insulation, maximum FM 1-75 rating is available with ASAP Fasteners/Plates.

On concrete decks, CD-10's or MP-14-10 Fasteners and Insulation Plates shall be used.

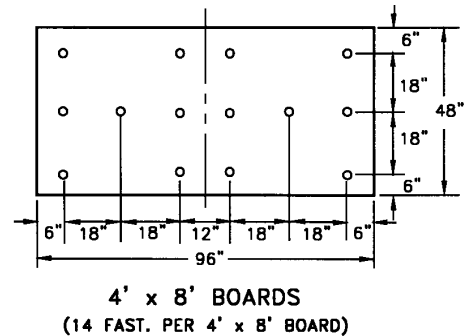
1) Field Insulation Securement



2) 50% Increase in Insulation Fasteners (at perimeters)



3) 75% Increase in Insulation Fasteners (at corners) *



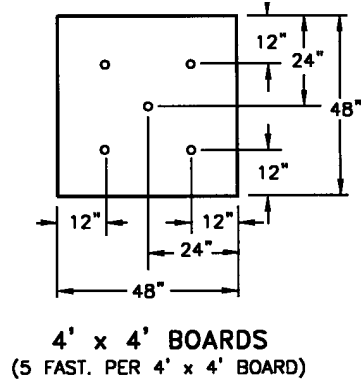
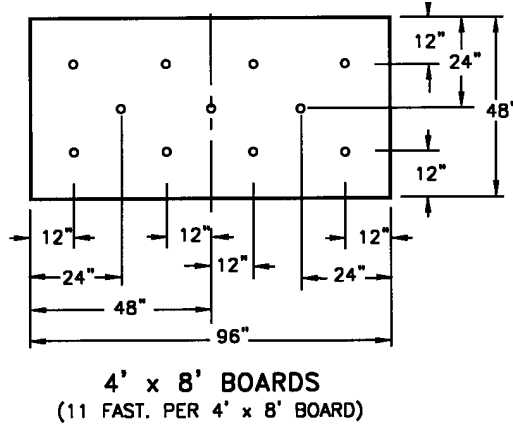
* If parapets are minimum 3' continuous around entire building perimeter, a 50% increase in fastening is acceptable at corners.

c. **Reduced Fastening Density for 1.5" thick Versico Polyisocyanurate MP-H Insulation or Versico Polyisocyanurate MP-H Recovery Board Composite Insulation.**

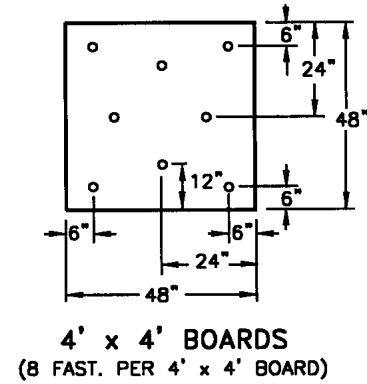
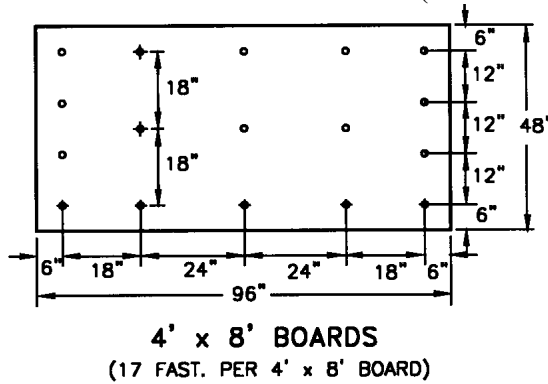
- **Top layer of Versico Polyisocyanurate MP-H Insulation or MP-H Composite must be minimum 1.5" thick.** Maximum thickness of all layers shall not exceed 12". On FM approved wood decks, 1/4" thick gypsum board must be installed beneath the insulation. If top layer of Polyisocyanurate is minimum 2" thick, a further reduction in fasteners can be utilized. Refer to previous page.
- **Versico Fasteners** – HPV Fasteners or Insultite Fasteners and Insulation Plates are used for FM approved steel or wood decks (new or tearoff); On structural concrete decks, contact Versico for options on approved fasteners and plates.

1) **FM 1-90 Ratings:**

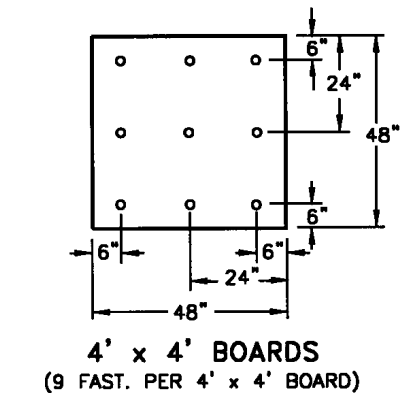
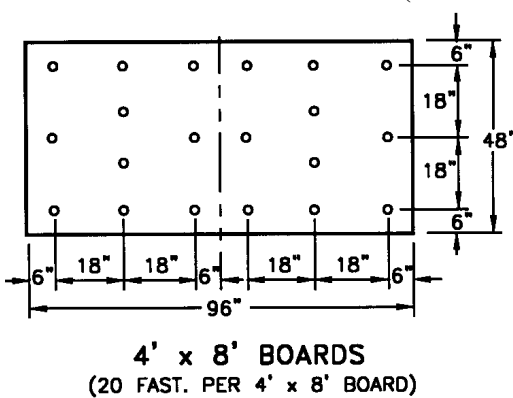
a) **Field Insulation Securement**



b) **50% Increase in Insulation Fasteners (Perimeter Areas)**



c) **75% Increase in Insulation Fasteners (Corner Areas*)**



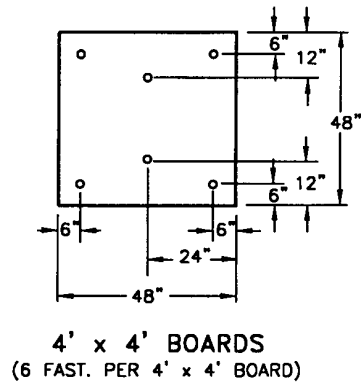
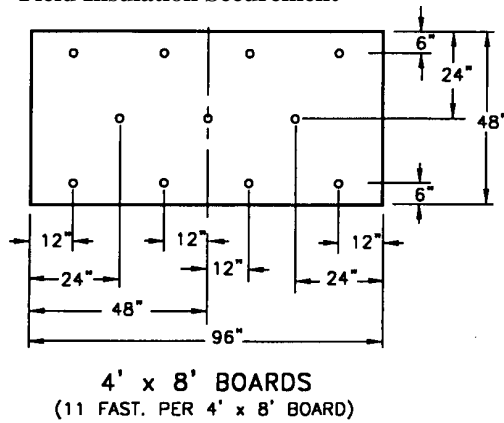
* For buildings with a 3' parapet continuous around entire perimeter, a 50% increase in insulation fastening is acceptable at roof corners areas.

d. Reduced Fastening Density for 1.5" Versico Polyisocyanurate MP-W or Versico Polyisocyanurate MP-W Recovery Board Composite Insulations:

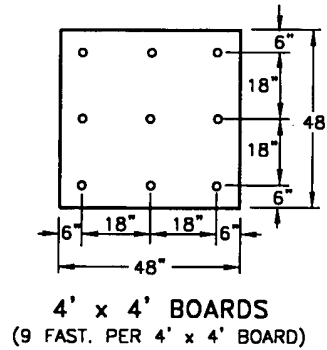
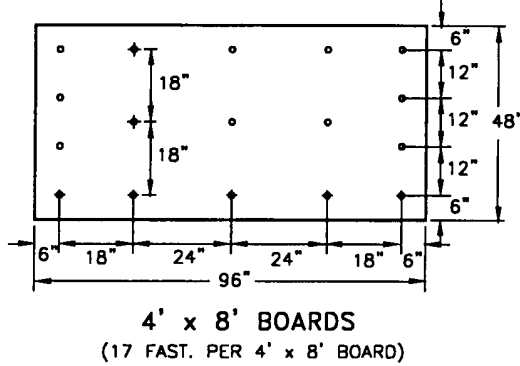
- **Top layer of Versico Polyisocyanurate MP-W Insulation or MP-W Composite must be minimum 1.5" thick.** Maximum thickness of all layers shall not exceed 12.5". On FM approved wood decks, 1/4" thick gypsum board must be installed beneath the insulation. If top layer of Polyiso is minimum 2" thick, a further reduction in fasteners can be used. Refer to page 19.
- **Versico Fasteners** – HPV Fasteners or Insultite Fasteners are used for FM approved steel or wood (new or retrofit decks); Concrete Spikes are used for structural concrete decks (new, tearoff or retrofit). Sure-Seal Insulation Fastening Plates are used with both fasteners.

1) FM 1-90 Ratings:

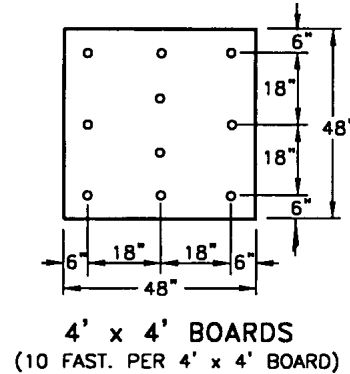
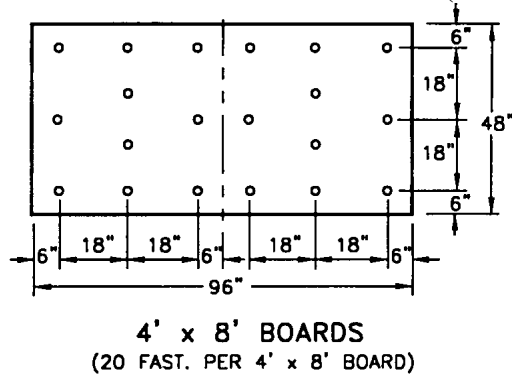
a) Field Insulation Securement



b) 50% Increase in Insulation Fasteners (Perimeter Areas)



c) 75% Increase in Insulation Fasteners (Corner Areas*)

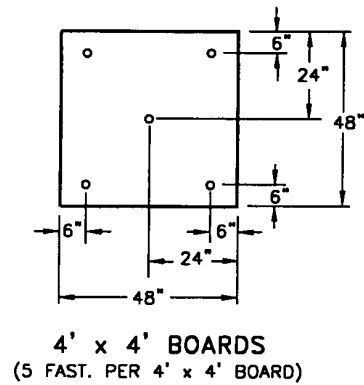
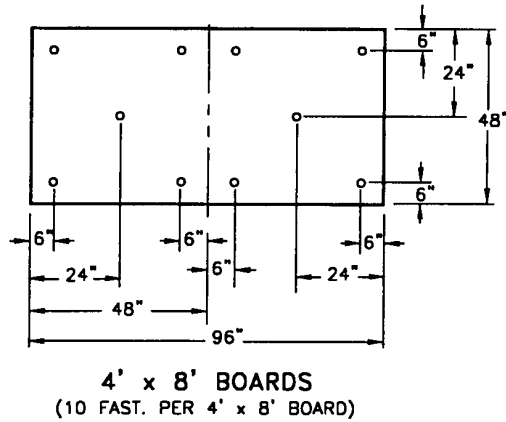


* For buildings with a 3' parapet continuous around entire perimeter, a 50% increase in insulation fastening is acceptable at roof corners areas.

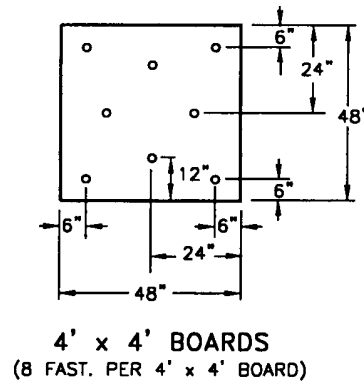
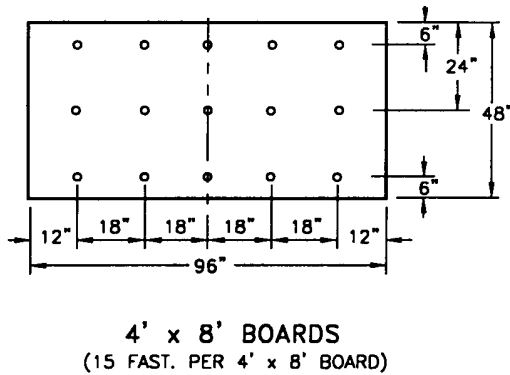
d. **Reduced Fastening Density for 1.5" Versico Polyisocyanurate MP-W or Versico Polyisocyanurate MP-W Composite):**

1) **FM 1-60 Ratings:**

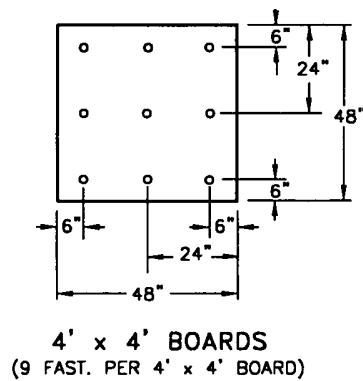
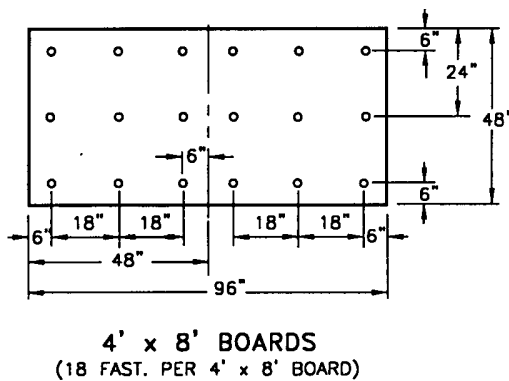
a) **Field Insulation Securement**



b) **50% Increase in Insulation Fasteners (Perimeter Areas)**



c) **75% Increase in Insulation Fasteners (Corner Areas*)**

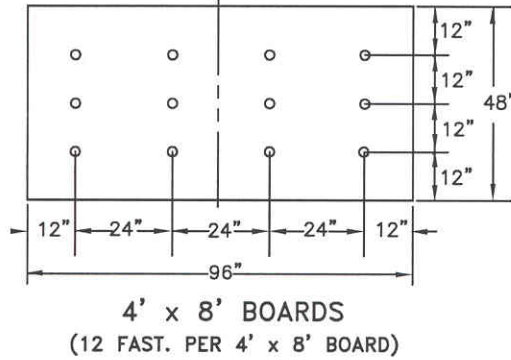


* For buildings with a 3' parapet continuous around entire perimeter, a 50% increase in insulation fastening is acceptable at roof corners areas.

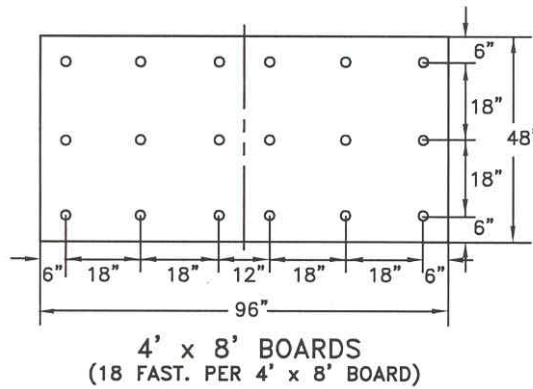
e. Dens-Deck Prime fastening criteria to conform with Factory Mutual (FM) 1-90 ratings:

- The Olympic 3” round metal insulation plate must be used for attachment.
- **Versico Fasteners** – HPV Fasteners or Insultite Fasteners are used for FM approved steel and wood decks (new or retrofit); CD-10 or MP 14-10 Fasteners are used for structural concrete decks (new, tearoff or retrofit).

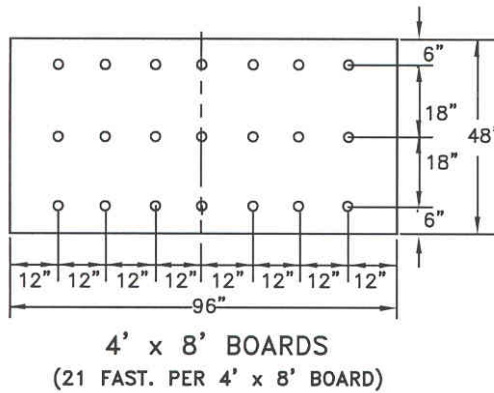
a. Field Insulation Securement



2) 50% Increase in Insulation Fasteners (Perimeter Areas)



3) 75% Increase in Insulation Fasteners (Corner Areas*)

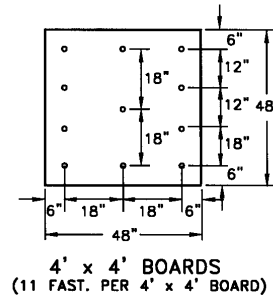
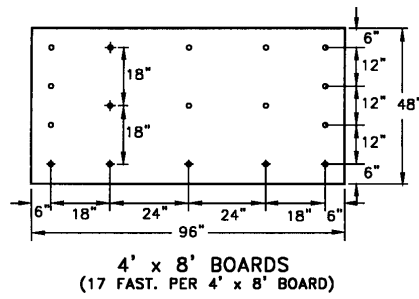


Notes:

- 1) Contact Versico for fastening density requirements for other FM ratings available.
- 2) If parapets are minimum 3 feet continuous around entire building, a 50% fastening increase is acceptable at corners. See pattern above.

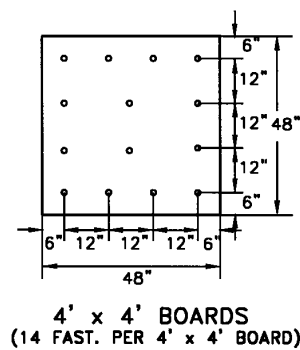
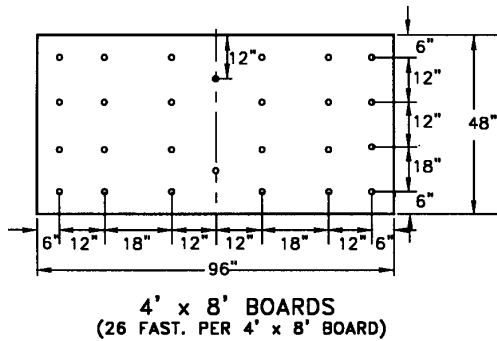
f. **7/16" thick APA rated oriented strand board (OSB):**

1) **Field Insulation Securement**

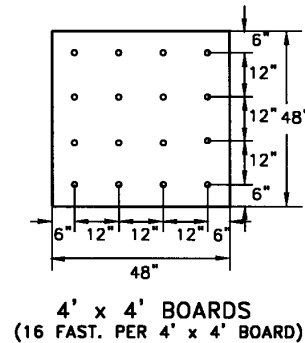
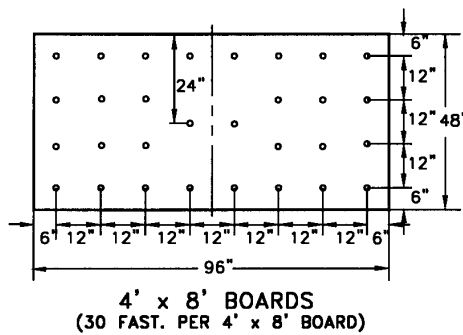


- Joints in OSB shall be staggered with joints in insulation below.
- OSB shall be positioned with approximately 1/8" gaps between boards.

2) **50% Increase in Insulation Fasteners (at perimeters)**



3) **75% Increase in Insulation Fasteners (at corners) ***



* If parapets are minimum 3' continuous around entire building perimeter, a 50% increase in fastening is acceptable at corners.

g. For **insulation manufactured by others**, contact the respective manufacturer to verify the FM fastening pattern requirements for field, perimeter and corner areas. The insulation fastening enhancements at perimeters and corners described herein are applicable for all insulation products, regardless of manufacturer.

5. Insulation/Fastener Reference - VersiFlex Adhered Roofing System

The following charts indicate which fasteners are approved with the various insulation manufacturers based on the type of roof deck.

a. Steel Decks

Insulation	Approved Fastener Manufacturer * Refer to specific brand names below
Versico Polyisocyanurate MP-H and MP-N DOW Hy-Therm AP Hunter Panels H-Shield Manville E"NRG"Y 2 or 3	Versico, Construction Fasteners, ITW Buildex, Olympic, Rawl, SFS or Tru-Fast
Versico Polyisocyanurate MP-W Atlas AC Foam II	Versico, Construction Fasteners, ITW Buildex, Olympic, SFS or Tru-Fast
Manville UltraGard	Construction Fasteners, ITW Buildex, Olympic, Rawl
R-Max Multi-Max FA	Construction Fasteners, ITW Buildex, Olympic, Rawl, SF or Tru-Fast
Versico Recovery Board	Versico, ITW Buildex, Olympic or Rawl
Dens-Deck/Dens-Deck Prime	Versico, Olympic (Round Metal Insulation Plates Only)
<p>* FM approved Fastener brand names. Versico – HPV Fasteners, Insultite Fasteners; See note below for Versico ASAP Pre-Assembled Fasteners; Construction Fasteners – Dekfast #12, #14, #15; Stainless; Omega ITW Buildex – Roofgrip #12, #14, #15; AccuTrac; Hextra</p> <p style="margin-left: 40px;">Olympic – Olympic #10, #12, #14; Stainless #12; HexHead #12, #14 Rawl – Rawl #12, #14 SFS – Insulfixx #12, #14; System ES-1 TruFast – TruFast TP, DP, Ultra, S.S., HD, DL; Pre-Assembled</p> <p>Note: Versico Pre-Assembled ASAP Fasteners (plastic plates) are approved with insulations approved with Olympic Fasteners. ASAP Fasteners cannot be used for FM 1-90 reduced insulation fastening with 2" thick Versico Polyisocyanurate MP-H Insulation; maximum FM 1-75 rating available.</p>	

b. Structural Concrete Decks

Insulation	Approved Fastener Manufacturer * Refer to specific brand names below
Versico Polyisocyanurate MP-N DOW Hy-Therm AP Manville E"NRG"Y 2 or 3	Versico, Construction Fasteners, ITW Buildex, Rawl, SFS or Tru-Fast
Versico Polyisocyanurate MP-W Atlas AC Foam II	Versico or Rawl
Carlisle Polyisocyanurate MP-H Hunter Panels H-Shield	Versico, Construction Fasteners, ITW Buildex, Olympic, Rawl, SFS or Tru-Fast
Manville UltraGard	Construction Fasteners, Olympic or Rawl
R-Max Multi-Max FA	Construction Fasteners, Olympic, Rawl, SFS or TruFast
Versico Recovery Board	Versico, Construction Fasteners, Olympic, Rawl or SFS
Dens-Deck/Dens-Deck Prime	Versico, Olympic (Round Metal Insulation Plates Only)
<p>* FM approved Fastener brand names. Versico – CD-10's, MP 14-10 Construction Fasteners – Dekfast #14, #15; Dekspike;Stainless ITW Buildex – Roofgrip #14, #15 Olympic–Olympic #14; HexHead #12, #14; CD-10; Fluted Nail</p> <p style="margin-left: 40px;">Rawl – Spike; T-Spike SFS – Insulfixx #12, #14; System ES-1 TruFast – TruFast HD,DL, CF, CF Tap Grip; Ultra</p>	

c. Tectum or Gypsum Decks

Insulation	Versico Fastener Type
All Insulations Listed in FM Approval Section	Versico Lightweight Deck Fasteners Olympic NTB Magnum or GTL or Rawl Rawlite

UNDERWRITERS LABORATORIES

EXTERNAL FIRE TEST CRITERIA

Most Building Code agencies require flat roofs to have minimum performance requirements when exposed to external fire situations. The most recognized test procedure for evaluating this performance is the Underwriters Laboratories UL 790 procedure (Tests for Fire Resistance of Roof Covering Materials). This test is judged to be equivalent to the ASTM E108 procedure which is referenced in most building codes.

Under the UL 790 Test, roof coverings are rated Class "A", "B", or "C". Class "A" is the highest rating and is defined as being "effective against severe fire exposures". The type of roof deck upon which the membrane and insulation is to be applied determines the number and type of tests required under the UL 790 procedures.

Non-Combustible Decks - Steel, Concrete, Gypsum or Fibrous Cement/Tectum (minimum 2 " thick) - Require only Spread of Flame Tests.

Combustible Decks - Wood Planks (minimum 3/4" thick), Plywood (minimum 15/32" thick), Oriented Strand Board - OSB (minimum 7/16" thick) or Fibrous Cement (less than 2" thick) - Require Spread of Flame Tests plus Intermittent Flame and Burning Brand penetration tests.

The basic criteria for determining the performance rating under each of these tests are as follows:

SPREAD OF FLAME TEST

Class A (10 minutes exposure) - 6'-0" maximum flame spread.
Class B (10 minutes exposure) - 8'-0" maximum flame spread.
Class C (4 minutes exposure) - 13'-0" maximum flame spread.

In all cases, there can be no significant lateral flame spread (burning off the sides of the deck) and the deck must not be exposed upon completion of the test.

INTERMITTENT FLAME TEST

Class A - (15 cycles, 2 minutes on, 2 minutes off)
Class B - (8 cycles, 2 minutes on, 2 minutes off)
Class C - (3 cycles, 1 minute on, 2 minutes off)

BURNING BRAND TEST

Class A Brand – 2000 grams (approximately 4.5 pounds)
Class B Brand - 500 grams (approximately 1.1 pounds)
Class C Brand - 9.25 grams (approximately 0.3 ounces)

At no time during or upon completion of the test can there be any sustained flaming on the underside of the deck and the deck must not be exposed.

It is important to remember that it is the complete assembly that is being evaluated including the deck type, insulation type and thickness, membrane type and surface treatment, if any. Mixing components which have not been tested together will void the rating. Assemblies classified for use over combustible decks may be used over non-combustible decks to achieve the same rating.

UNDERWRITERS LABORATORIES

INTERNAL FIRE RESISTANCE TEST CRITERIA AND RATINGS

The **P-Series/Hourly Construction** ratings identify the length of time a certain building construction, consisting of specified materials, will contain a fire and retain its structural integrity. The ratings are given in hours and are identified in the current published *UL Fire Resistance Directory*.

The test method used is UL 263 (ASTM E119) "Fire Test of Building Construction and Materials". In this test, the roof-ceiling assembly is exposed to fire from the inside for the stipulated time period.

TEST CRITERIA	
Internal steel temperature	1100 F Average Maximum 1300 F at any location
External surface temperature	250 F Average Increase Maximum 350 F Maximum at any one location

Listed below are the general groups of numbers in the **P-Series** constructions and what the **internal fire protection** consists of. The type of interior protection is used to determine what P-Series number is applicable:

P-SERIES NUMBER	TYPE OF INTERIOR PROTECTION
000 – 099	Concealed Grid Systems (drop ceilings)
100 – 199	For Future Use
200 – 299	Exposed Grid Systems (drop ceilings)
300 – 399	For Future Use
400 – 499	Metal Lathe (plaster ceilings)
500 – 599	Gypsum Board Ceiling Systems
600 – 699	Direct Applied Protection - Miscellaneous
700 – 799	Direct Applied Protection - Cementitious
800 – 899	Direct Applied Protection - Sprayed Fiber
900 – 999	Precast Concrete or Steel/Concrete Decks (unprotected deck)

**Underwriters Laboratories
Internal Fire Ratings**

P # Approvals for VersiFlex Mechanically-Attached and Adhered Roofing Systems

P#	P#	P#	P#
P215	P709	P738	P906
P216	P710*	P739*	P907
P224	P711	P741*	P908
P225	P712	P742*	P909
P227	P713*	P801*	P910
P230	P715	P802	P911
P231	P717*	P803	P912
P232	P718*	P804	P913
P233	P719*	P805	P914
P242	P720*	P810	P915
P246	P721	P814*	P916
P251	P722*	P815*	P917
P252	P723 *	P816	P918
P257	P724	P817	P919
P259	P725	P818*	P920
P405	P726	P819*	P921
P406	P727*	P822	P922
P407	P728*	P823	P923
P410	P729*	P824*	P924
P508	P730*	P825	P925
P510	P731	P826	P926
P511	P732*	P827*	P927
P513	P733	P828*	P928
P514	P734*	P902	P929
P519	P735*	P903	P930
P701*	P736	P904	P931
P708	P737	P905	

Constructions approve the use of 1/2" thick Recovery Board, approved high density wood fiberboard, Dens-Deck/Dens-Deck Prime or 7/16" thick non-veneer, APA rated oriented strand board (OSB) over whatever insulation is required without affecting the rating.

* These constructions allow the use of Carlisle's FAST 100 Adhesive for insulation attachment (or gypsum board). The maximum hourly rating is 2 hours.

- For 1 hour ratings, the thickness of sprayed-on fireproofing (underside of steel deck) referenced in the UL Fire Resistance Directory is acceptable.
- For 1-1/2 hour ratings, the thickness of fireproofing referenced in the UL Fire Resistance Directory must be increased by 1/16".
- For 2 hour ratings, the thickness of fireproofing referenced in the UL Fire Resistance Directory must be increased by 1/4".

The current published *UL Fire Resistance Directory* must be referenced for specific criteria (insulation and thermal barrier requirements, ceiling protection, etc.) needed to obtain these fire ratings.

FACTORY MUTUAL APPROVAL TEST CRITERIA

Factory Mutual approval for a roof construction requires that the system pass tests related to combustibility, wind resistance, hail resistance, water leakage, resistance to foot traffic and corrosion resistance (FM Approval Standards 4450 and 4470). All of these tests must be successfully completed and will result in a roofing assembly being classified as a 1-60, 1-75, 1-90, 1-105, 1-120, 1-135, 1-150, 1-165, 1-180, etc. (in 15 psf increments) rated assembly. The assembly must also be tested for external fire resistance, in accordance with ASTM E-108 test procedures, and is issued a Class A, B or C rating.

Briefly, the test criteria consists of the following:

Combustibility

A. Above the deck - External

The test method utilized is the ASTM E-108 and results in a Class A, B or C external fire rating. The description can be found under the "UL External Fire Test Criteria" in this guide. The minimum combustible deck thickness FM approves is 3/4" thick tongue and groove FR treated plywood (refer to the current published FM Approval Guide for specific deck requirements).

B. Below the deck - Fuel Contribution (Calorimeter)

The complete roof assembly is exposed to an internal fire source for a period of 30 minutes. The heat input is carefully controlled such that fuel contribution from the roof assembly itself can be accurately measured at 3, 5, 10 and 30 minute intervals. At no time can this additional fuel contribution exceed certain predetermined levels.

Wind Resistance

A. Fully Adhered Roofing Systems

For maximum FM 1-90 ratings, a test panel approximately 5' X 9' comprising a roof deck, insulation, fasteners (at selected spacings) and roof covering is exposed to air pressure from below. To achieve an FM Class 1-60 rating, the assembly must withstand the effect of 60 psf of uplift pressure for a period of 1 minute. For an FM Class 1-75 or 1-90 rating, a pressure of 75 or 90 psf respectively must be withstood for 1 minute.

B. Mechanically Attached Roofing Systems

Effective July 1, 1993, Factory Mutual revised their test procedures with respect to wind uplift resistance. As a result, all mechanically attached roofing systems (with field membrane securement exceeding 4 feet) had to be tested on a 12' X 24' uplift table to retain their FM approval.

C. "Enhanced Wind Uplift Resistant Roof Classifications" (greater than 1-90 ratings) Adhered and Mechanically-Attached Roofing Systems resisting the noted pressures when tested on the 12' X 24' Table.

To determine the wind uplift rating (1-60, 1-90, etc.) appropriate for a given building, refer to FM Loss Prevention Data Sheets 1-28 and 1-29, dated January 2002.

Hail Resistance

A simulated test to evaluate the performance of the roof covering and substrate against damage by hail. Failure results if cracking, puncturing or tearing of the membrane and/or substrate occurs. Factory Mutual rates systems as either meeting SH (severe hail) or MH (moderate hail) criteria. All of Versico's FM approved roofing systems are rated SH and are approved for use anywhere in the United States. Refer to FM Loss Prevention Data Sheet 1-34, Hail Damage (May 1998) for additional information.

Factory Mutual Approval Test Criteria continued...

Water Leakage

A simulated test to evaluate the performance of a field applied seam when subjected to ponded water for a 7-day period. Failure results if any sign of leakage is observed.

Resistance to Foot Traffic

A simulated test to evaluate the performance of the roof covering when subjected to a 200 pound load a minimum of 5 times over the same area. Failure results if cracking, puncturing or tearing occurs.

Corrosion Resistance (Kesternich Test)

A simulated test to evaluate the corrosion resistance of metal components when exposed to sulfurous acid (acid rain) over a 15 day (cycle) period. Failure results if more than 15% rust develops.

Additional Information

In addition to the above referenced test criteria, **Factory Mutual** also references numerous **Loss Prevention Data Sheets** which include recommendations for items such as deck securement, perimeter nailer attachment methods, additional insulation fastening for adhered systems and additional insulation and membrane fastening for mechanically fastened systems at roof perimeters and corners. **These sheets must be referenced when Factory Mutual is the insuring agent or when a strict FM rating is required.** Some of the necessary Loss Prevention Data Sheets include:

1-7	Wind Forces on Buildings and Other Structures
1-22	Criteria for Maximum Foreseeable Loss Fire Walls
1-28	Wind Loads to Roof Systems and Roof Deck Securement
1-29	Above Roof Deck Components
1-28R/1-29R	Roof Systems - Reference Document
1-30	Repair of Wind Damaged Roof Systems
1-31	Metal Roof System - Applicable for Metal Retrofit Systems
1-34	Hail Damage
1-49	Perimeter Flashing
1-52	Field Uplift Tests
1-54	Roof Loads for New Construction

Code Body Summary

BOCA – Building Officials & Code Administrators

Territory	East of Mississippi River and North of Mason Dixon Line
Code Reference	BOCA National Building Code
Wind Uplift Requirement	Calculate per code or follow ASCE 7
Minimum Slope	1/4" (1/8" for Coal Tar Pitch)
Foam Plastic Insulation Requirement for Roofing	Thermal Barrier requirement based on UL 1256 or FM 4450
External Fire Requirement	Class A, B or C (dependent upon type of construction)

ICBO – International Conference of Building Officials

Territory	West of Mississippi River
Code Reference	International Building Code
Wind Uplift Requirement	Follow ASCE 7
Minimum Slope	1/4"
Foam Plastic Insulation Requirement for Roofing	Thermal barrier requirement on test requirements for insulate roof desks
External Fire Requirement	Class A, B or C (dependent upon type of construction)

SBCCI – Southern Building Code Congress International

Territory	West of Mississippi River and South of Mason Dixon Line
Code Reference	Standard Building Code
Wind Uplift Requirement	Calculate per code for maximum 60' or follow ASCE 7 for any height
Minimum Slope	1/4" (1/8" for Coal Tar Pitch)
Foam Plastic Insulation Requirement for Roofing	Thermal Barrier requirement based on UL 1256 or FM 4450
External Fire Requirement	Class A, B or C

ICC – International Code Council

Territory	United States
Code Reference	International Building Code
Wind Uplift Requirement	Calculate per code for maximum 60' or follow ASCE 7 for any height
Minimum Slope	1/4" (1/8" for Coal Tar Pitch)
Foam Plastic Insulation Requirement for Roofing	Thermal barrier requirement based on UL 1256 or FM 4450
External Fire Requirement	Class A, B or C (dependent upon type of construction)

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