

Mule-Hide Technical Bulletin

TPO FA01-2006

(Revised Feb 2009)
Issued January 1, 2006

Membrane and Insulation Fastener Spacing Requirements - Fully Adhered Systems

Membrane Attachment:

- A. TPO membrane attachment at the base of all walls, parapet walls, curbs and penetrations unless otherwise specified in the published details shall be 12" o.c. using the Mule-Hide HD Fastener and 2" Seam Plate or HD Seam Plate (2.4" dia.). This is based on attachment into the deck. Vertical attachment at the base of vertical surfaces shall be as specified in the published details.
- B. Fasteners installed in steel decks and plywood decks must penetrate through the deck a minimum 1/2 inch. Fasteners installed in wood plank decks must penetrate into the deck a minimum of 1-1/2 inches. Fasteners installed into concrete decks must penetrate into the deck a minimum of 1 inch. **Contact Mule-Hide for specific fastener type needed for attachment of the insulation and membrane into various deck types.**
- C. Mechanical attachment of the membrane in the field is not required for fully adhered roofing systems. The membrane is adhered directly to the approved insulation, cover board or other approved substrate.

Insulation Attachment:

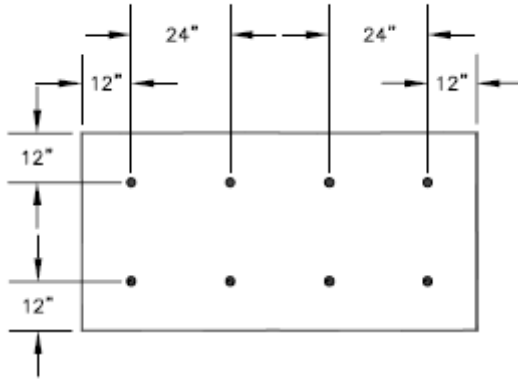
- A. Mule-Hide minimum standard insulation attachments: Individual project requirements may require more fasteners per sheet size than what is listed below. It is the contractor's sole responsibility to ensure the system being installed is in compliance with the State and local building code.
 - 1. For approved insulation measuring 2' x 4', the minimum attachment is 4 fasteners per board.
 - 2. For approved insulation measuring 4' x 4', the minimum attachment is 8 fasteners per board.
 - 3. For approved insulation measuring 4' x 8', the minimum attachment is 16 fasteners per board for boards up to 2" thick.
 - 4. For approved polyisocyanurate insulation measuring 4' x 8', the minimum attachment is 8 fasteners per board for boards 2 inches thick or greater in the field of the roof. In wind zones designated by the IBC as being greater than 90 mph, increased attachment in the perimeter (50%) and corners (100%) shall be required. Local building code requirements shall supercede these minimums.
 - 5. When using multiple layers of insulation or combining different board types, the thickness of the top layer and type of insulation determines the minimum number of fasteners required.
- C. Buildings higher than 60 feet, located in high wind zones, located along the coastline, or projects that request wind coverage greater than that specified in the warranty (peak gust to 55 mph) shall require increased attachment rates. Contact Mule-Hide Technical Department prior to bidding projects with these requirements for project specific fastener rates.
- D. Mule-Hide defines the minimum perimeter area as 8' in from the roof edge along all exterior roof edges.
- E. Those contractors wishing to install a roof system following Factory Mutual guidelines for projects not requiring FM compliance. The perimeter areas shall have an increase of fasteners of 50% and the corner areas shall have an increase of 100%. The perimeter is defined by the lesser of the following calculations:
 - 1. 0.1 x the lesser plan dimension (building width) =
 - or
 - 2. 0.4 x the height of the building =

Contact Mule-Hide Technical Department for attachments that require compliance with Factory Mutual (FM) requirements. Requirements change with deck types, building locations, roof heights, insulation used, etc..

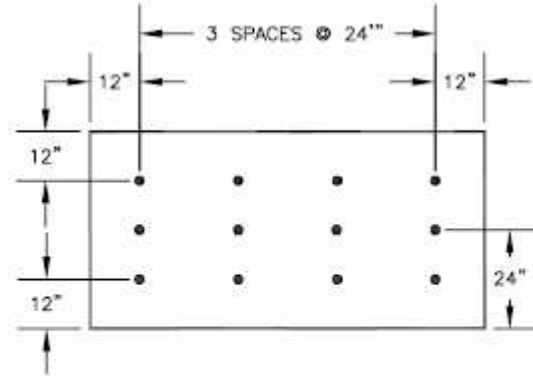
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Illustration 1, Typical Fastener layouts for 4' x 8' Boards

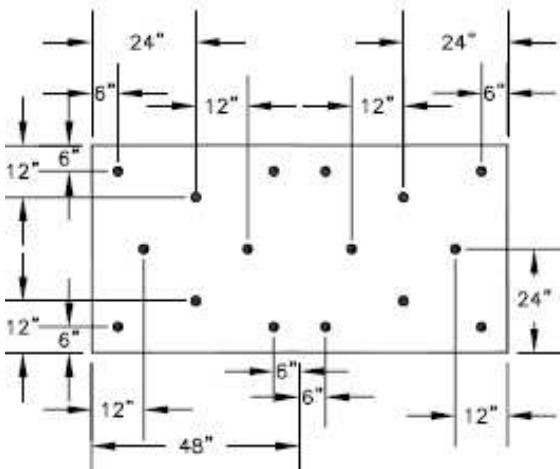
Fully Adhered



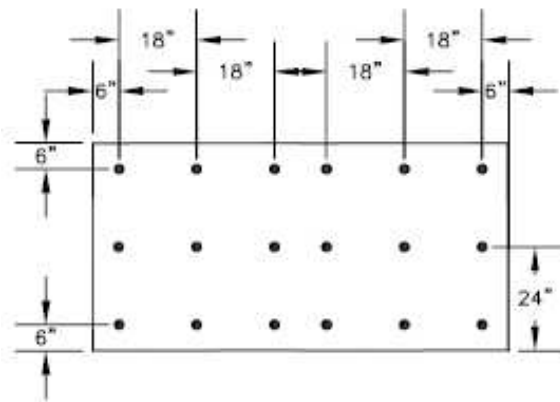
8 Fasteners per 4' x 8' board



12 Fasteners per 4' x 8' board



16 Fasteners per 4' x 8' board

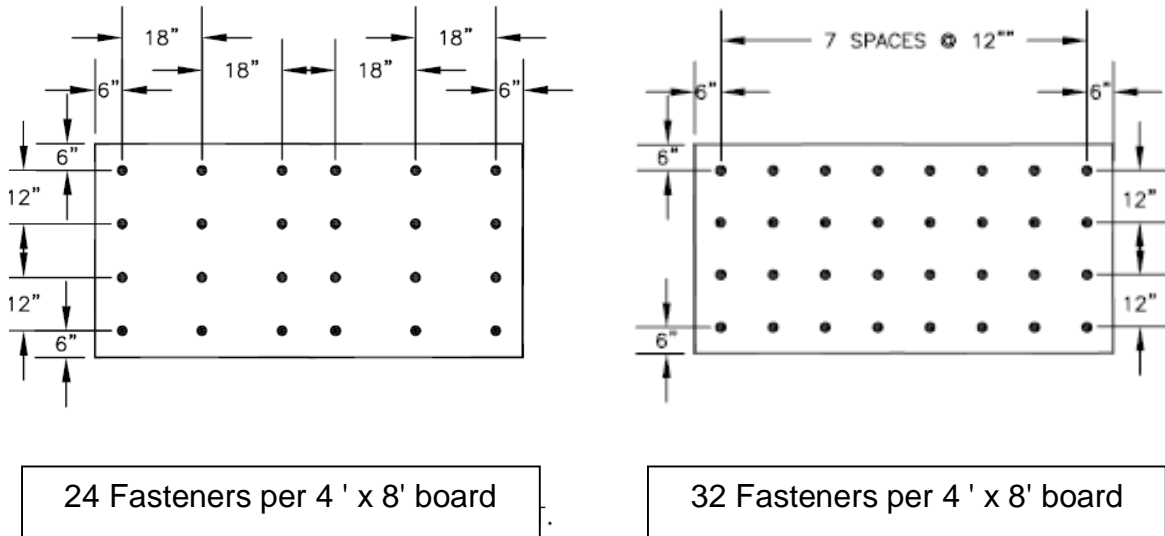


18 Fasteners per 4' x 8' board

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Illustration 1, Typical Fastener layouts for 4' x 8' Boards

Fully Adhered



Note: See attached details MHFM-208, MHFM-212, and MHFM-216 for examples of Factory Mutual attachment patterns.

Due to new changes in the FM Global Property Loss Prevention Data Sheet 1-29, new requirements for perimeter and corner attachments are in effect as of January, 2006. The new requirements cause substantial changes to fully adhered systems. To summarize the changes, for those systems requiring FM 1-90 compliance or greater shall be handled in one of two methods.

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New FM Guidelines (per FM 1-29)

Prior to January 2006, based on tested assemblies, FM permitted increasing the number of fasteners required in the perimeter and corner areas by 50% and 75% respectively.

As of January 2006, for those tested assemblies with ratings of 1-75 or less, increase of the number of fasteners is still acceptable but with the following changes:

For FM ratings of 1-75 or less:

Perimeter Areas require 50% more than the number tested in the field, but at least 1 fastener per 2 sf (this is a minimum of 16 fasteners per 4' x 8' board).

Corner Areas require 100% more than the number tested in the field, but at least 1 fastener per 1 sf (this is a minimum of 32 fasteners per 4' x 8' board).

For FM ratings of 1-90 or greater:

There are two acceptable methods to address the perimeter and corner areas on adhered systems utilizing mechanically attached insulations. This also includes multiple layers of insulation where the bottom layer is mechanically attached and subsequent layers are attached with adhesive.

Method 1

Install the field of the roof fully adhered with the required rating. Install the perimeter and corner areas with a fully adhered assembly that meets the uplift ratings as specified in Table 1 on page 5 of the FM Data sheet 1-29.

Example: All areas fully adhered

An FM 1-90 rating requires a 1-90 tested assembly to be used in the field of the roof, a 1-150 tested assembly in the perimeter areas and a 1-225 tested assembly in the corners.

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Method 2

Install the field of the roof fully adhered with the required rating. Install the perimeter and corner areas with a mechanically attached assembly following the guidelines specified in Section 2.2.7.2 of 1-29 which is the same as the previous publication of 1-29.

Example: Field is fully adhered while perimeters and corners are mechanically attached base on an equivalent rating.

Assuming the field rating for the fully adhered assembly is 1-90, the perimeter and corner layouts and attachments are determined using any mechanically attached assembly that has passed an FM 1-90 rating.

Assume a 9-1/2' row to row spacing (using a 10' wide membrane) with fasteners spaced 6" on center has passed an FM 1-90. The perimeter row-to-row spacing will be 60% of the tested spacing or a maximum of 5.7'. The corner row-to-row spacing will be 40% of the tested spacing or a maximum of 3.8'. All fastener spacing in the rows will remain at 6" on center.

The membrane may be adhered across the entire roof area, with mechanical attachments in the perimeter and corner areas through the top of the membrane. The spacing of the attachment and the fastener spacing must be based on a tested mechanically attached assembly.

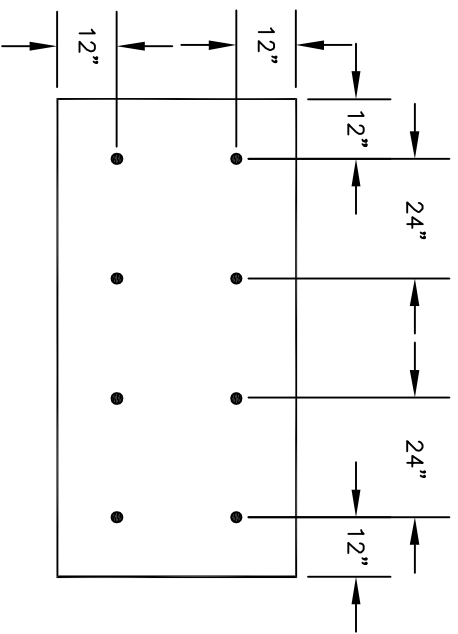
Note: FM 1-29 requirements for perimeter and corner attachment for adhered assemblies that utilize hot asphalt or cold adhesive for attachment of all insulation layers have not changed.

FM's January 2006 Loss Prevention Data Sheet 1-29 is available from FM Global. Be sure to review this document and contact Mule-Hide for assembly configurations prior to starting or bidding any projects requiring FM compliance.

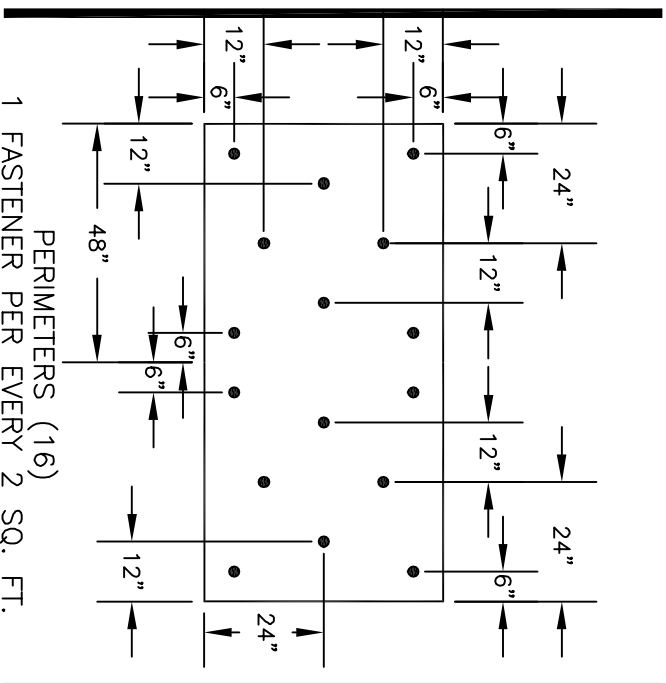
Always consult the Mule-Hide web site at www.mulehide.com for updates and most current information.

NOTES:

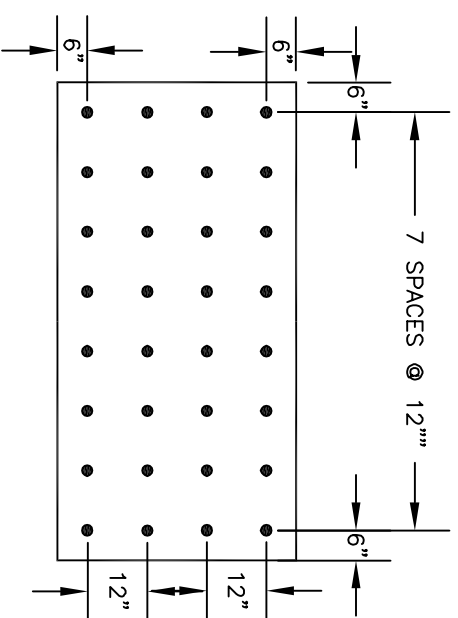
1. DETAILS TO BE USED IN CONJUNCTION WITH STANDARD GUIDE SPECIFICATIONS CONTAINING REQUIREMENTS FOR NAILERS, INSULATION, SLIPSHEETS, ETC.
2. MULE-HIDE INSULATION FASTENERS AND 3" DIAMETER PLATES MUST BE USED FOR INSULATION ATTACHMENT.
3. REFER TO MULE-HIDE WIND UPLIFT RATINGS FOR APPROPRIATE FASTENER DENSITY REQUIRED.
4. FASTENER DENSITY INCREASES BASED ON THE FOLLOWING:
 - 50% FOR PERIMETERS WITH A MINIMUM OF 1 FASTENER EVERY 2 SQUARE FEET NOT TO EXCEED 1 FASTENER EVERY 1 SQUARE FEET
 - CONSTANT DENSITY OF 1 FASTENER EVERY 1 SQUARE FEET FOR CORNERS.



FIELD (8)
1 FASTENER PER EVERY 4 SQ. FT.



PERIMETERS (16)
1 FASTENER PER EVERY 2 SQ. FT.



CORNERS (32)
1 FASTENER PER EVERY 1 SQ. FT.

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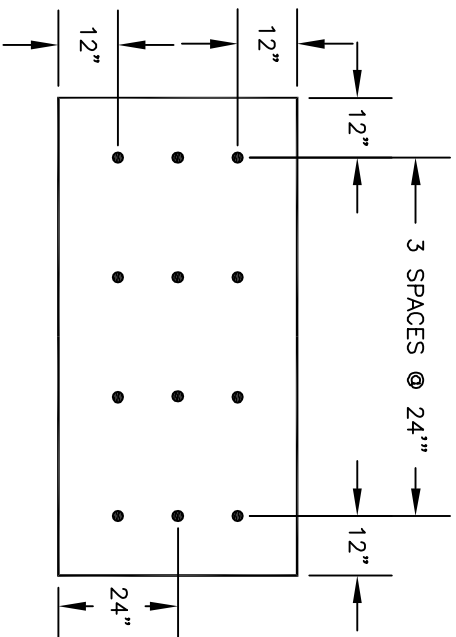
FM - 8 FIELD FASTENERS
PER 4' X 8' BOARD PATTERN LAYOUT
SYSTEMS:

ALL SYSTEMS

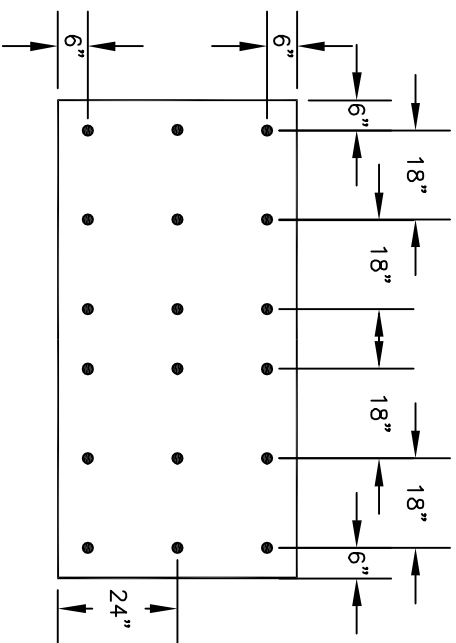
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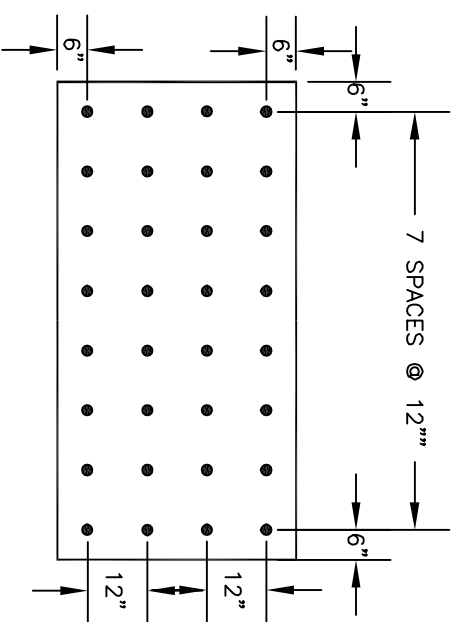
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FIELD (12)
1 FASTENER PER EVERY 2.66 SQ. FT.



PERIMETERS (18)
1 FASTENER PER EVERY 1.77 SQ. FT.



CORNERS (32)
1 FASTENER PER EVERY 1 SQ. FT.

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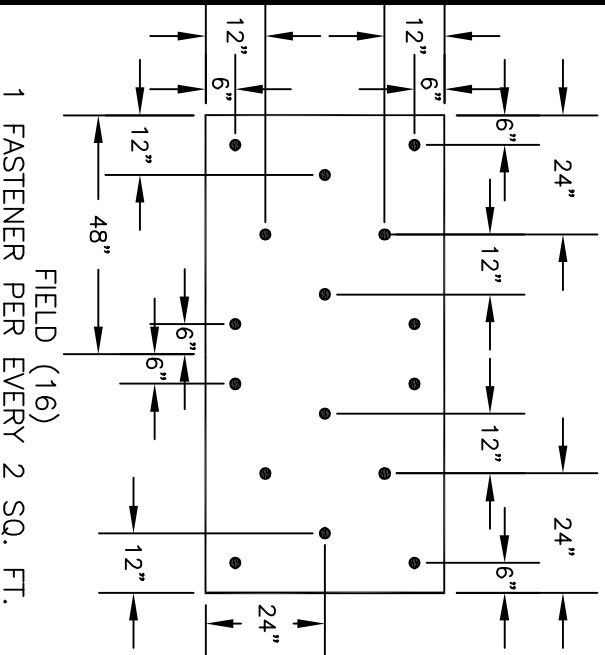
FM - 12 FIELD FASTENERS
PER 4' X 8' BOARD PATTERN LAYOUT
SYSTEMS:

ALL SYSTEMS

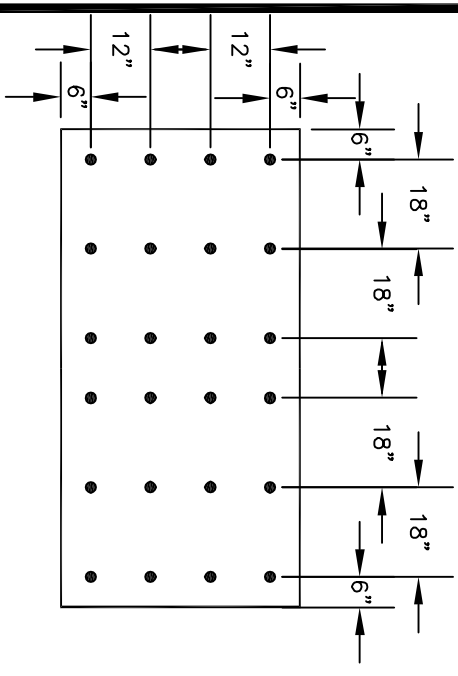
DETAIL NO:
MHF-M-212

NOTES:

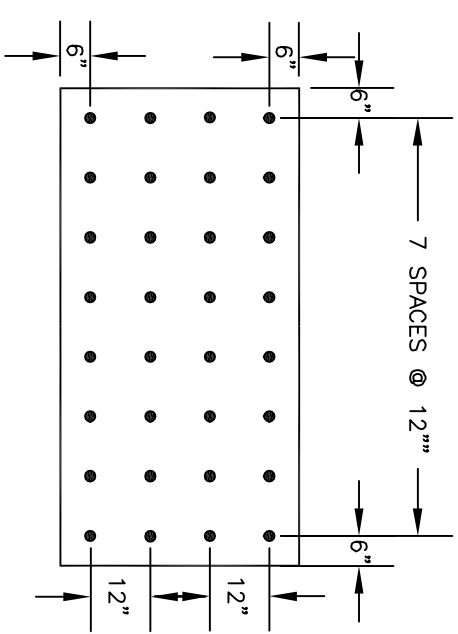
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FIELD (16)
1 FASTENER PER EVERY 2 SQ. FT.



PERIMETERS (24)
1 FASTENER PER EVERY 1.33 SQ. FT.



CORNERS (32)
1 FASTENER PER EVERY 1 SQ. FT.

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FM - 16 FIELD FASTENERS
PER 4' X 8' BOARD PATTERN LAYOUT

SYSTEMS:
ALL SYSTEMS

DETAIL NO:
MHF-M-216