



Fastening Patterns

FM 1-90 Reduced Requirements for Securock® Roof Boards

Reduced Fastening Rates for Fully Adhered Assemblies

USG has performed testing with Mule-Hide membranes and achieved Factory Mutual (FM) I-90 ratings on its Securock® Brand Gypsum-Fiber Roof Board products with fewer fasteners.

The following chart illustrates the reduction:

| Securock Board Thickness | FM Rating (Uplift) | Old Field Requirements | | New Field Requirements | |
|--------------------------|--------------------|---------------------------|-----------------------------|---------------------------|-----------------------------|
| | | Fasteners per 4'x8' board | Overall Sq.Ft. per Fastener | Fasteners per 4'x8' board | Overall Sq.Ft. per Fastener |
| 1/4" | 1-90 | 16 | 2.00 | 10 | 3.20 |
| 3/8" | 1-90 | 16 | 2.00 | 8 | 4.00 |
| 1/2" | 1-90 | 10 | 3.20 | 8 | 4.00 |
| 1/2" | 1-75 | N/A | N/A | 6 | 5.33 |
| 5/8" | 1-90 | 8 | 4.00 | 6 | 5.33 |

Technical Breakdown

FM sets all uplift ratings based on pressures measured in the field of the roof.

FM has increased uplift requirements for perimeters and corners to compensate for the increased pressures experienced at those parts of the building. The widths of the perimeter and corner areas are set by either:

(A) 1/10 the width of the building or (B) 4/10 the height of the roof, whichever is smaller.

Example – 100' x 100' wide roof, 30 feet tall using 1/4" Securock

- A) .1 x 100' width = 10' perimeter measurement
- B) .4 x 30 feet height = 12' perimeter measurement

The perimeter width on the building in this example is 10' and the corner areas measure 10' x 10'.

FM fastening requirements (see 3 detail pages attached):

- Field – Base design listed for that particular rating
- Perimeter – Increase field fasteners by 50%, but never less than 1 fastener every 2 square feet
- Corner – 1 fastener every 1 square foot

Old Way: Field fastened at 1 fastener every 2 square feet

- Field = 16 fasteners per 4' x 8' board
- Perimeter = 24 fasteners per 4' x 8' board
- Corners = 32 fasteners per 4' x 8' board

New Way: Field fastened at 1 fastener every 3.20 square feet

- Field = 10 fasteners per 4' x 8' board
- Perimeter = 16 fasteners per 4' x 8' board
- Corners = 32 fasteners per 4' x 8' board



IMPACT

The new reduced FM fastening requirements for Securock save contractors time and money in fully adhered roofing systems compared to other gypsum-fiber roof boards. Mule-Hide estimated the insulation fasteners required on a 100' x 100', 100-square roof using previous and updated fastening requirements for Securock roof boards. All required perimeter and corner enhancements were incorporated. The following chart illustrates the savings.

| Securock Board Thickness | FM Rating (Uplift) | Old Field Requirements | | New Field Requirements | | Percentage of Fasteners Saved |
|--------------------------|--------------------|------------------------|-------------------------|------------------------|-------------------------|-------------------------------|
| | | Per 4'x8' board | For 100' x 100' project | per 4'x8' board | For 100' x 100' project | |
| 1/4" | 1-90 | 16 | 6300 | 10 | 4310 | 31.59% |
| 3/8" | 1-90 | 16 | 6300 | 8 | 3968 | 37.02% |
| 1/2" | 1-90 | 10 | 4310 | 8 | 3968 | 7.94% |
| 1/2" | 1-75 | N/A | N/A | 6 | 3626 | N/A |
| 5/8" | 1-90 | 8 | 3968 | 6 | 3626 | 8.62% |

Fastener count based on 12' perimeter dimension

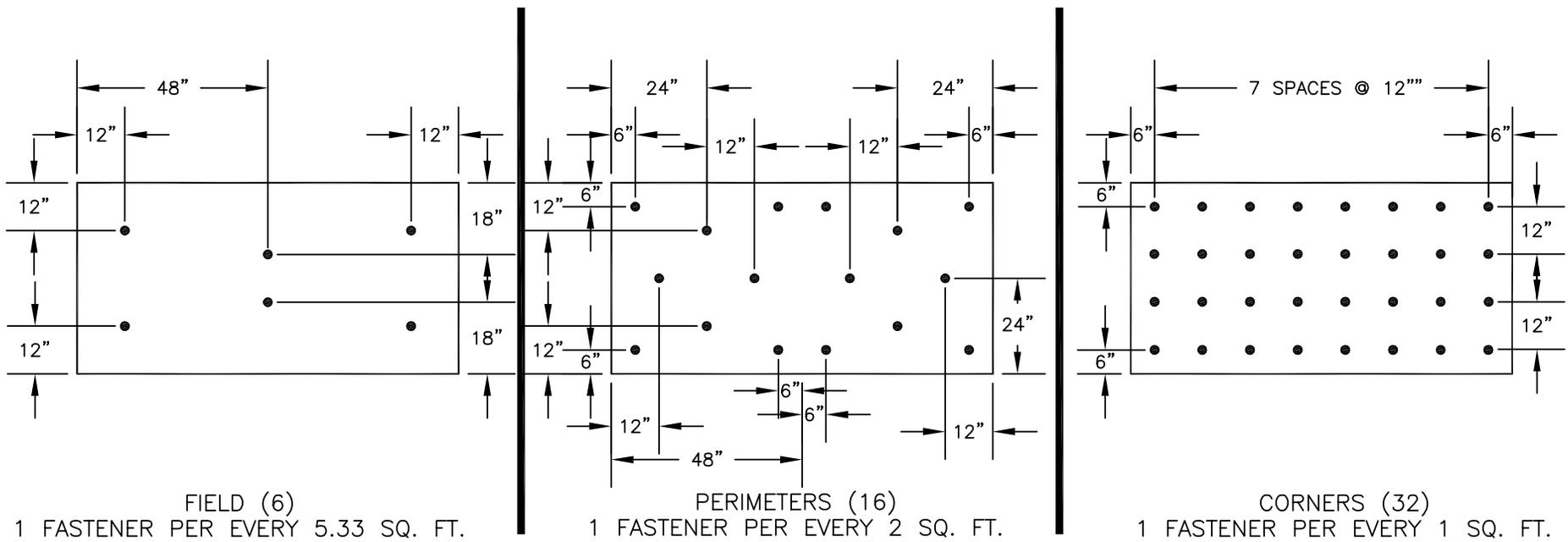
Core Fact

The new Securock FM fastening requirements for FM I-90 ratings save more than 30% in material and labor costs versus other gypsum-fiber roof boards. The new Securock FM fastening requirements for FM I-90 ratings have the greatest impact when thinner (1/4" and 3/8") thickness are utilized.



NOTES:

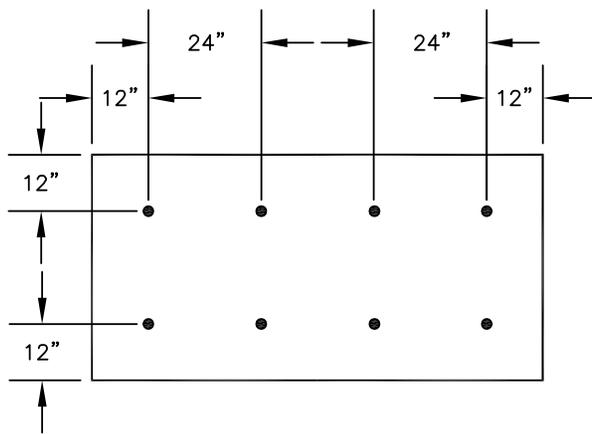
1. DETAILS TO BE USED IN CONJUNCTION WITH STANDARD GUIDE SPECIFICATIONS CONTAINING REQUIREMENTS FOR NAILERS, INSULATION, SLIPSHEETS, ETC.
2. MULE-HIDE DRILL POINT, HDP, OR EHD FASTENERS AND 3" DIAMETER PLATES MAY BE USED FOR INSULATION ATTACHMENT.
3. REFER TO MULE-HIDE WIND UPLIFT RATINGS FOR APPROPRIATE 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.



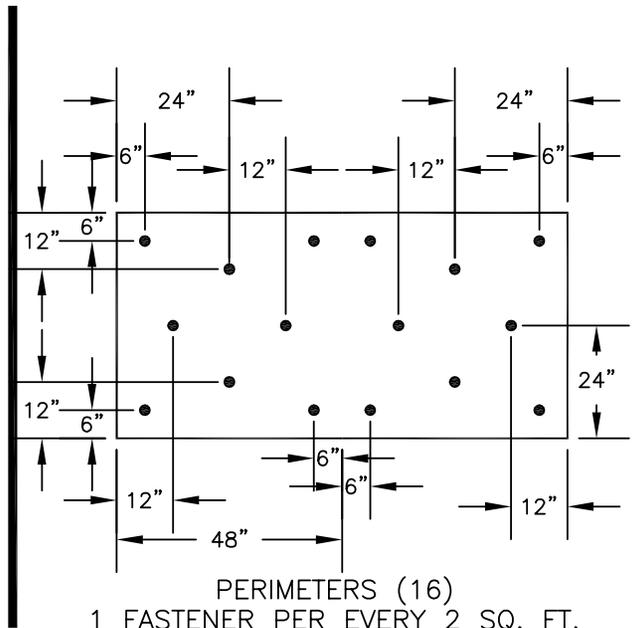
| | | |
|---|--|---------------------------------------|
| MULE-HIDE PRODUCTS CO., INC. | FM - 6 FIELD FASTENERS PER 4' X 8' BOARD PATTERN LAYOUT | DETAIL NO.: MHFM-206 |
| | SYSTEMS: ALL FULLY ADHERED SYSTEMS | REVISION DATE: 12/2017 |

NOTES:

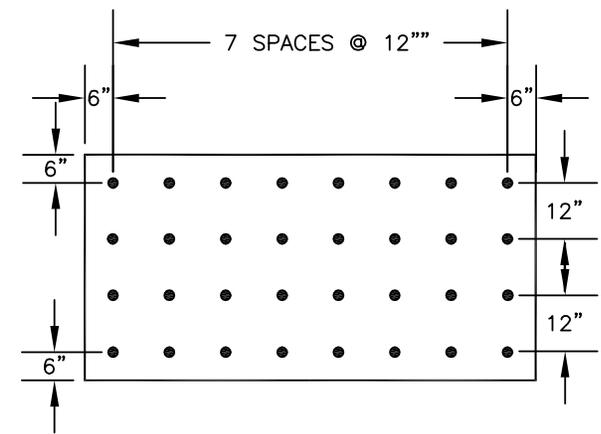
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FIELD (8)
1 FASTENER PER EVERY 4 SQ. FT.



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



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

**MULE-HIDE
PRODUCTS CO., INC.**

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

**SYSTEMS:
ALL
FULLY ADHERED SYSTEMS**

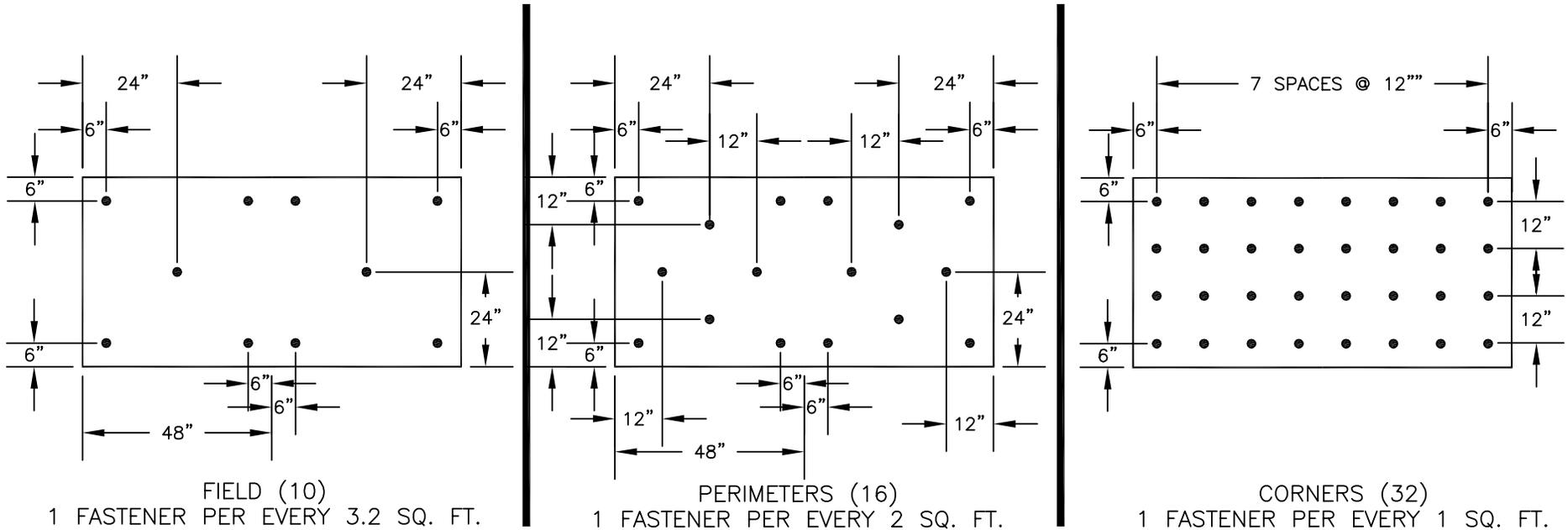
DETAIL NO.:

MHFM-208

REVISION DATE: 12/2017

NOTES:

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**MULE-HIDE
PRODUCTS CO., INC.**

**FM - 10 FIELD FASTENERS
PER 4' X 8' BOARD PATTERN LAYOUT
SYSTEMS:
ALL
FULLY ADHERED SYSTEMS**

DETAIL NO.:

MHFM-210

REVISION DATE: 12/2017