Date: April 28, 2021
Subject Property Address: 255 Anglers Drive
PIN: 197500022
Permit Number: TB-21-404
Permit Applicant Name: Larry Wall

Design information:
Occupancy Classification: B, A-2
Number of Stories: 1
Type of Construction: VB
Occupant Load: N/A
Fire Sprinklers: No

Dear Larry Wall,

This Permit Application is being reviewed under the 2018 ICC Adopted Codes, and the State Adopted 2020 NEC.

✓**Items noted below do not require a response or comment back during the Plan Review in order for us to approve this permit. The Items below are required and will be checked by field inspectors or will need to be submitted to the Building Department. Please take time to review these items in advance of starting any work to ensure your project is ready for inspection.**

1. Separate Electrical Plumbing Permits must be applied for and obtained prior to any work being done within these trades. Note Electrical and Plumbing trades are protected by the State, Licensed Contractors must apply and perform this work on all Commercial Properties, and additionally their employees working on these projects must be registered or licensed with the State of Colorado and work directly under Licensed Individual managing the project. If applies

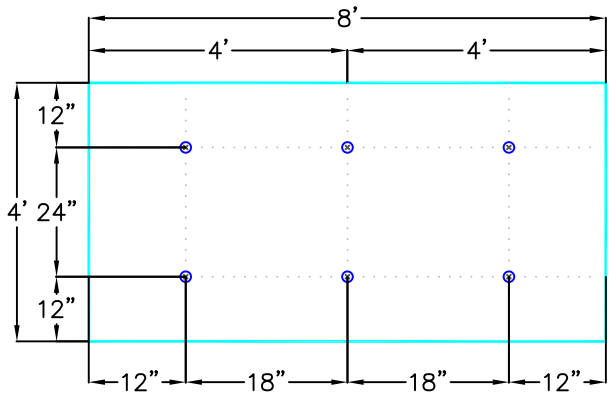
2. Separate Mechanical Permits must be applied for and obtained prior to any work being done within this trade. Mechanical Contractors must be registered and approved by the Routt County Regional Building Department If applies

3. **Roof coverings should meet the requirements of section 1507 of the 2018 IBC**

4. 1507.1 Scope

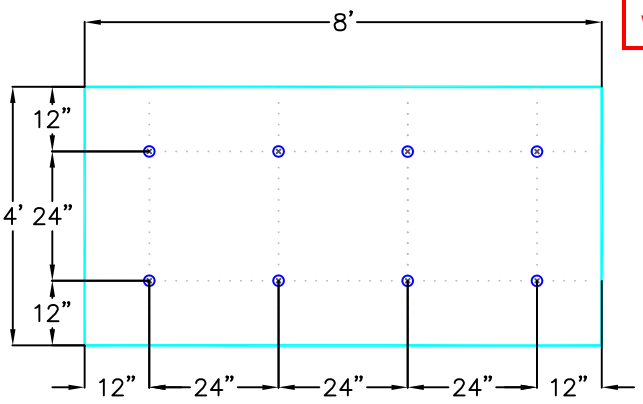
Roof coverings shall be applied in accordance with the applicable provisions of this section and the manufacturer's installation instructions.

Reviewed by: Don Marchbanks Date: April 28, 2021



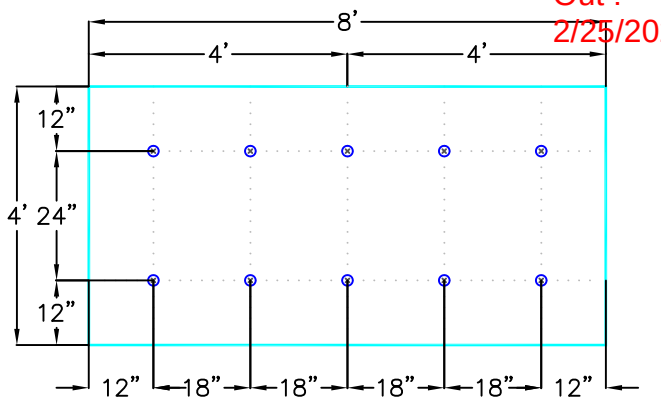
6 FASTENERS PER 4'X8' BOARD

FM 1–90 (FIELD)



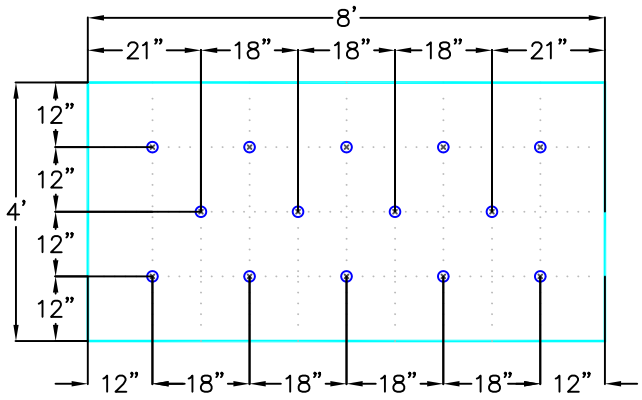
8 FASTENERS PER 4'X8' BOARD

FM 1–105 (FIELD) GRADE 'C' STEEL DECKS
FM 1–120 (FIELD) GRADE 'E' STEEL DECKS



10 FASTENERS PER 4'X8' BOARD

FM 1–90 (PERIMETER) ENHANCEMENT PATTERN



14 FASTENERS PER 4'X8' BOARD

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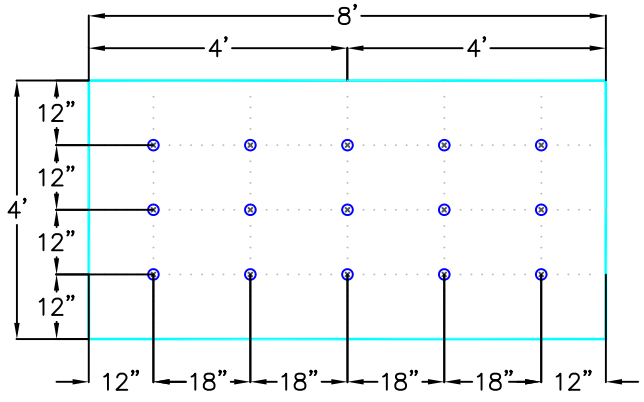
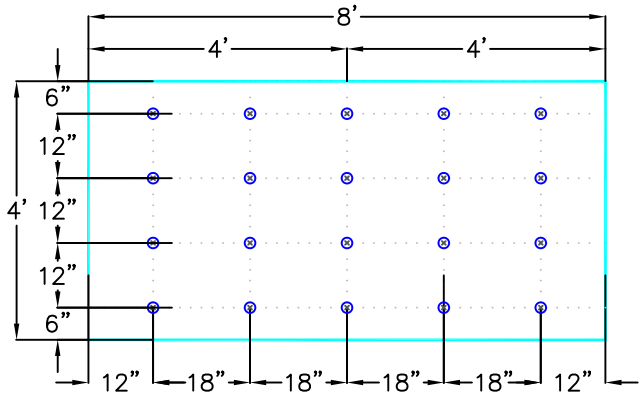


15 FASTENERS PER 4'X8' BOARD

FM 1–90 (CORNER) ENHANCEMENT PATTERN



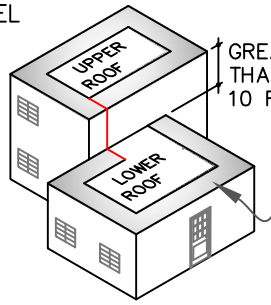
20 FASTENERS PER 4'X8' BOARD

FM 1–105 (CORNER) ENHANCEMENT GRADE 'C' STEEL DECKS
FM 1–120 (CORNER) ENHANCEMENT GRADE 'E' STEEL DECK

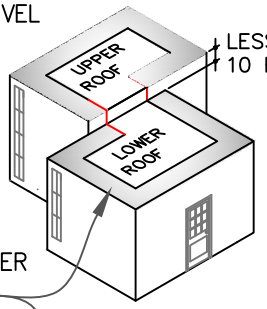
MULE-HIDE PRODUCTS	**INDUCTION WELDING PLATES** **FM FASTENING PATTERNS** **SYSTEMS:** **HEAT WELD MEMBRANE** **MECHANICALLY ATTACHED**	**DETAIL NO.:** **MHT-IWP3** REVISION DATE: 05/2020

ROOF ZONES FOR MINIMUM ONE FASTENER PER 4 SQUARE FEET

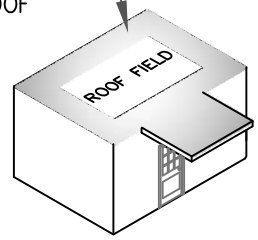
SPLIT LEVEL ROOFS



SPLIT LEVEL ROOFS

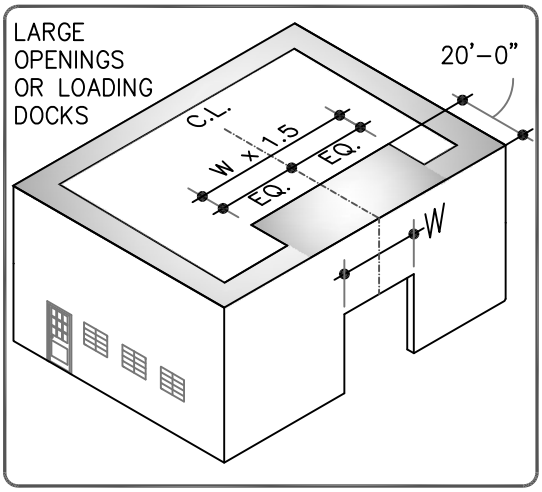


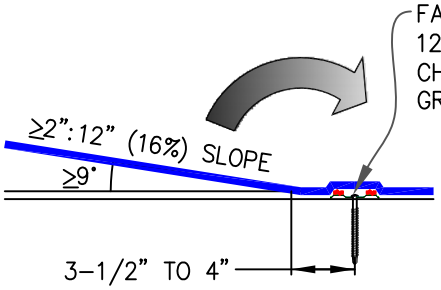
CANOPY ROOF

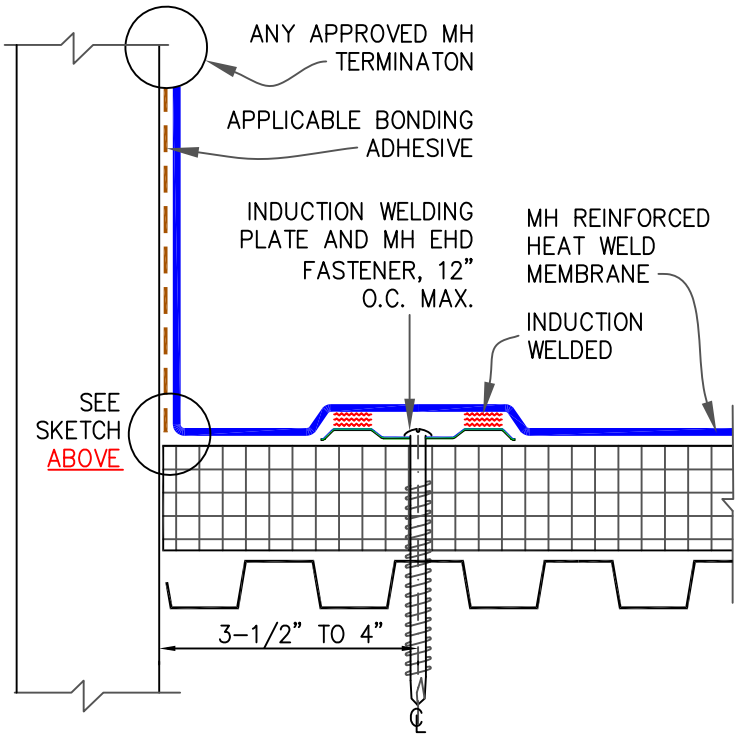


MAIN ROOF EXTENDING ON THE SAME LEVEL

LARGE OPENINGS OR LOADING DOCKS





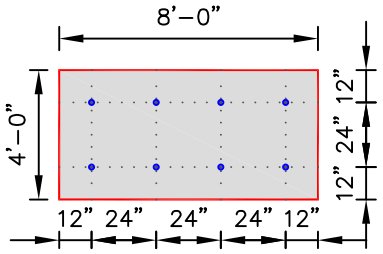


ANGLE CHANGE SECUREMENT

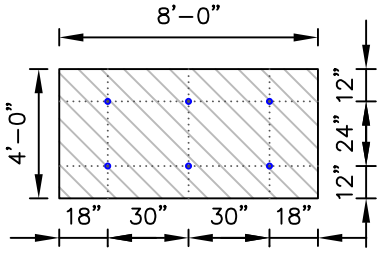
NOTES:

1. INDUCTION WELD CARDBOARD DISKS ARE REQUIRED UNDER INDUCTION WELDING PLATES WHEN USING NON–FACED EPS (EXPANDED POLYSTYRENE) OR XPS (EXTRUDED POLYSTYRENE) INSULATIONS.

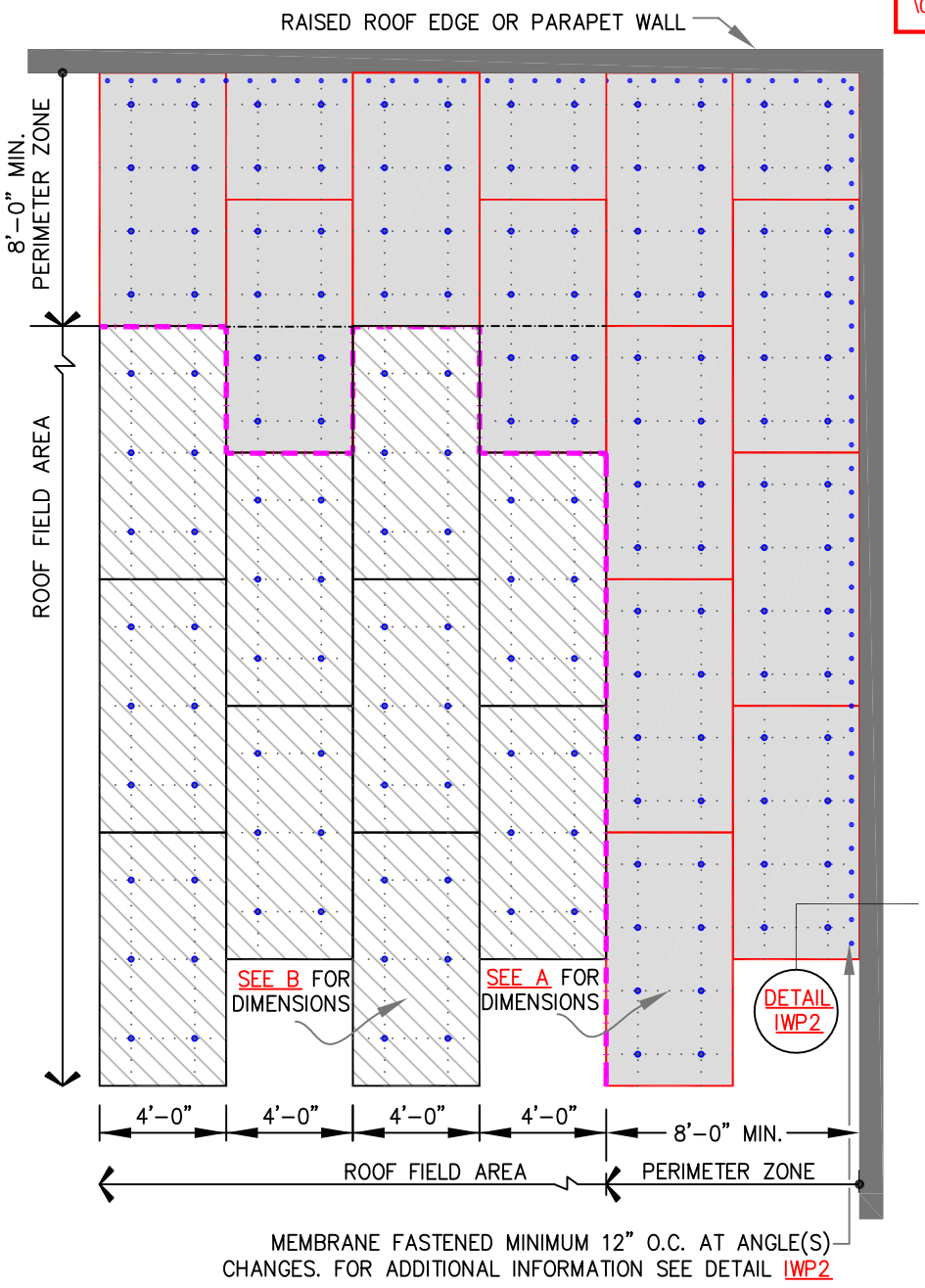
MULE-HIDE PRODUCTS	**INDUCTION WELDING PLATES BASE ATTACHMENT** **SYSTEMS:** **HEAT WELD MEMBRANE MECHANICALLY ATTACHED**	**DETAIL NO.:** **MHT-IWP2** REVISION DATE: 05/2020



Ⓐ PERIMETER ZONE
8 FASTENERS PER 4'X8' BOARD



Ⓑ FIELD OF ROOF
6 FASTENERS PER 4'X8' BOARD



NOTES:

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2. PERIMETER ENHANCEMENTS REQUIRED FOR WIND SPEED COVERAGE GREATER THAN 72MPH. CONTACT MULE–HIDE TECHNICAL DEPARTMENT FOR REQUIREMENTS.

PERIMETER AREA

FIELD AREA

MULE–HIDE FASTENER & INDUCTION WELDING PLATE

DECK TYPE	DECK THICKNESS	FASTENER	INDUCTION WELDING PLATE
STEEL	22 GAUGE	MULE–HIDE EHD FASTENER	3–1/8" DIAMETER
PLYWOOD	15/32"		
NOTE: AT IN–FILL MINOR PIECES, USE MIN. 2 FASTENERS.			

MULE-HIDE PRODUCTS

INDUCTION WELDING PLATES FASTENING REQUIREMENTS

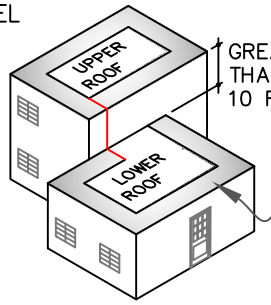
SYSTEMS:
HEAT WELD MEMBRANE MECHANICALLY ATTACHED

DETAIL NO.:
MHT-IWP1

REVISION DATE: 05/2020

ROOF ZONES FOR MINIMUM ONE FASTENER PER 4 SQUARE FEET

SPLIT LEVEL ROOFS



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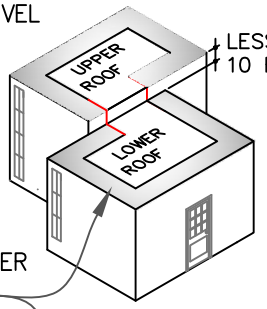
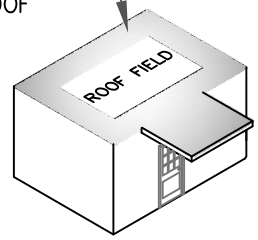


CANOPY ROOF



MAIN ROOF EXTENDING ON THE SAME LEVEL

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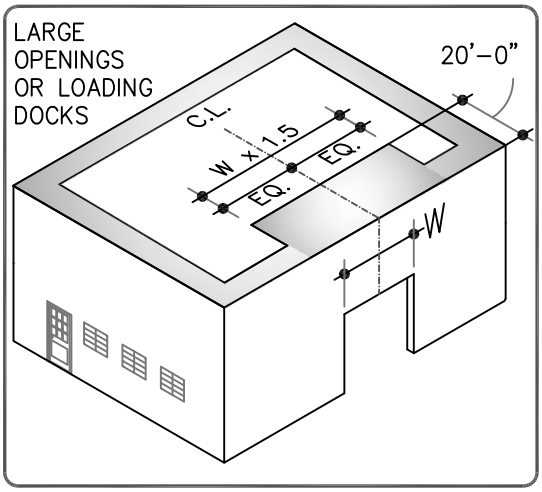

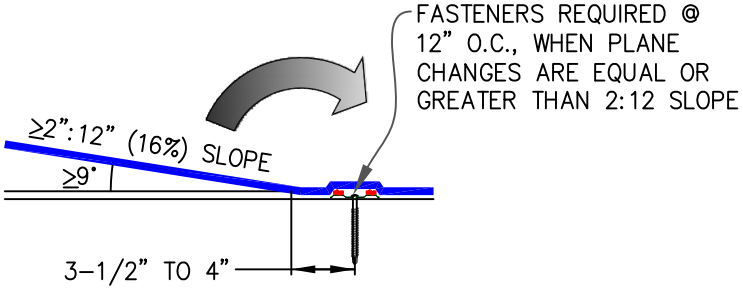

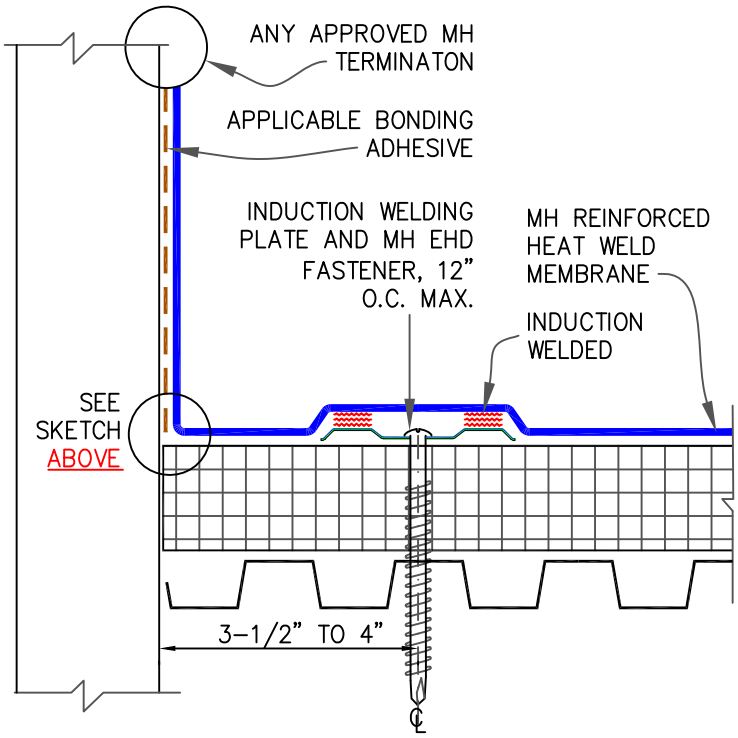

ANGLE CHANGE SECUREMENT

NOTES:

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MULE-HIDE PRODUCTS	**INDUCTION WELDING PLATES BASE ATTACHMENT** **SYSTEMS:** **HEAT WELD MEMBRANE MECHANICALLY ATTACHED**	**DETAIL NO.:** **MHT-IWP2** REVISION DATE: 05/2020

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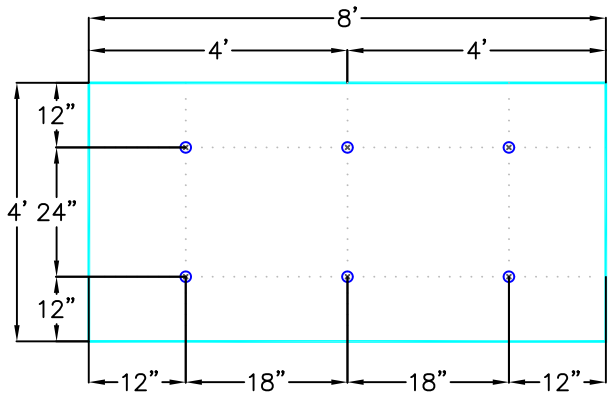
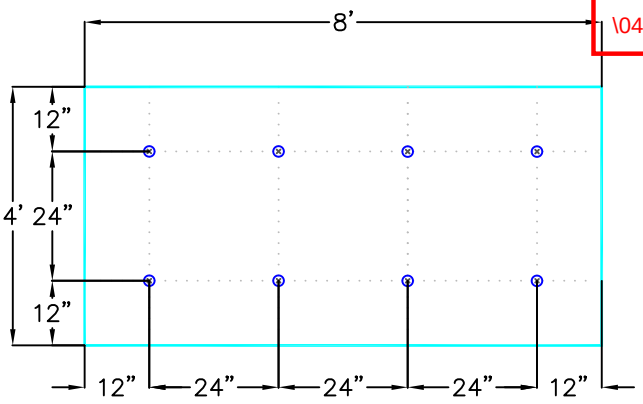


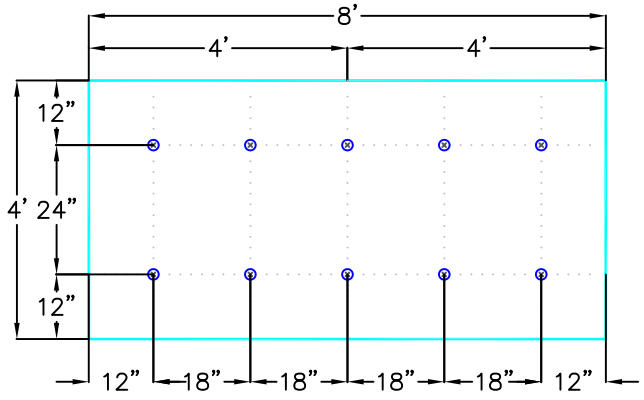
6 FASTENERS PER 4'X8' BOARD

FM 1–90 (FIELD)



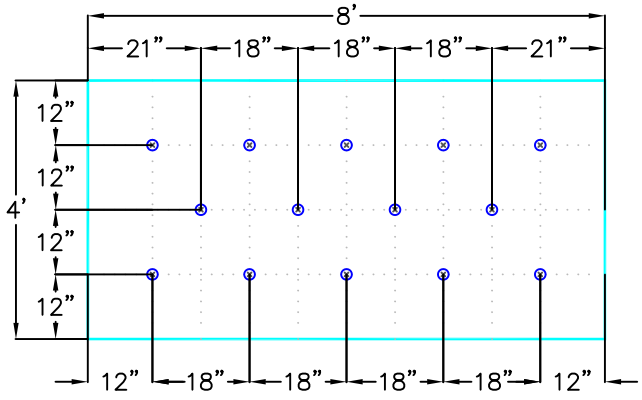
8 FASTENERS PER 4'X8' BOARD

FM 1–105 (FIELD) GRADE 'C' STEEL DECKS
FM 1–120 (FIELD) GRADE 'E' STEEL DECKS



10 FASTENERS PER 4'X8' BOARD

FM 1–90 (PERIMETER) ENHANCEMENT PATTERN



14 FASTENERS PER 4'X8' BOARD

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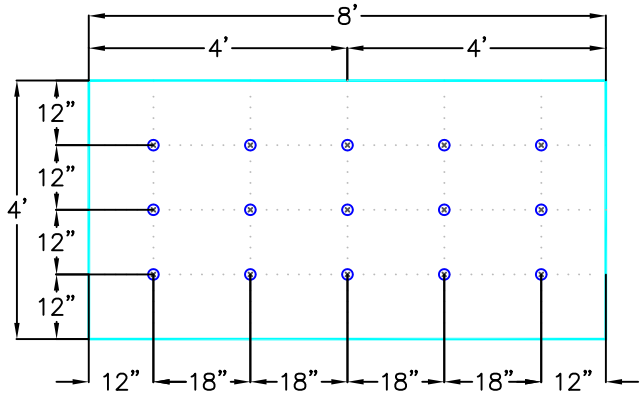

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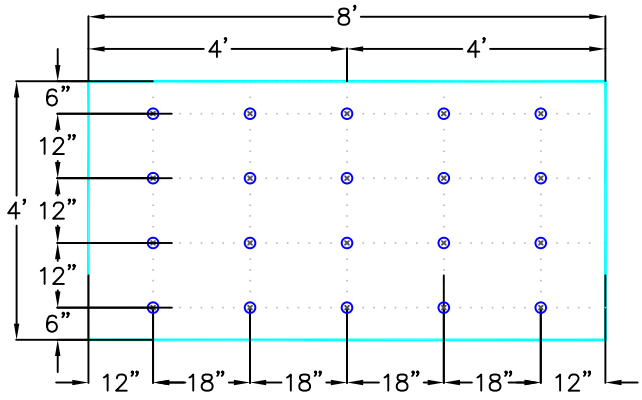

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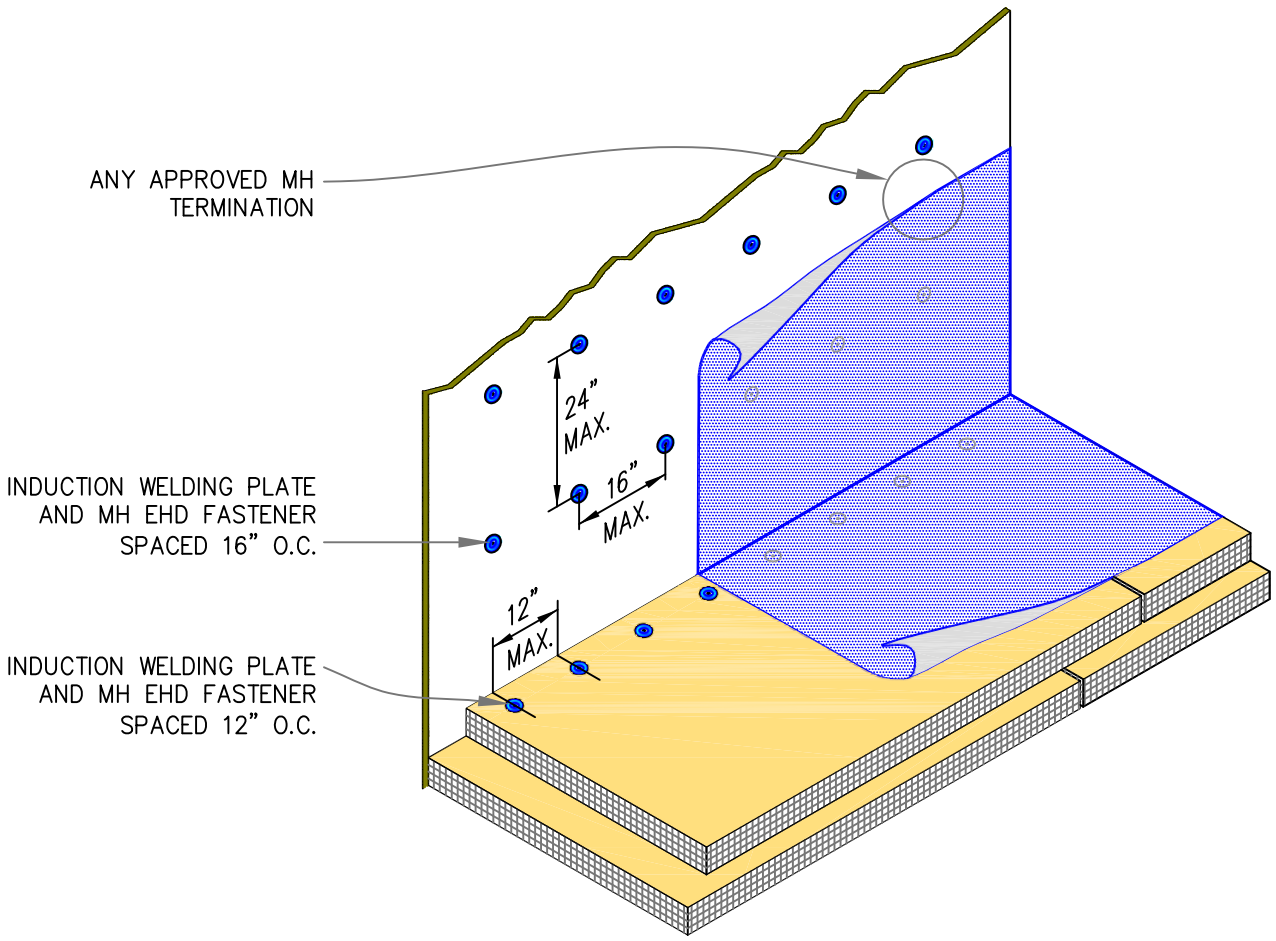
FM 1–120 (CORNER) ENHANCEMENT GRADE 'E' STEEL DECK

MULE-HIDE PRODUCTS	**INDUCTION WELDING PLATES** **FM FASTENING PATTERNS** **SYSTEMS:** **HEAT WELD MEMBRANE** **MECHANICALLY ATTACHED**	**DETAIL NO.:** **MHT-IWP3** REVISION DATE: 05/2020

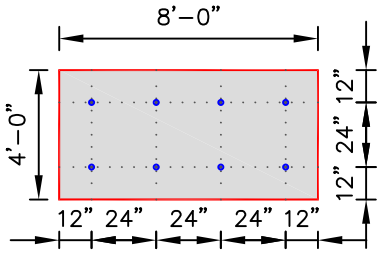


NOTES:

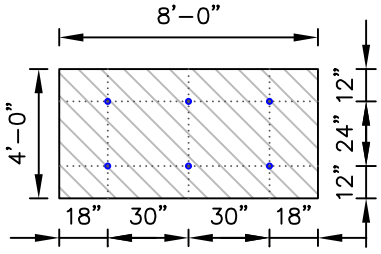
1. FASTENERS MUST PENETRATE INTO WOOD OR METAL STUDS, WHERE WALL IS BUILT WITH STUDS.
2. INDUCTION WELD CARDBOARD DISKS ARE REQUIRED UNDER INDUCTION WELDING PLATES WHEN USING NON–FACED EPS (EXPANDED POLYSTYRENE) OR XPS (EXTRUDED POLYSTRENE) INSULATIONS.
3. INSULATION FASTENING NOT SHOWN FOR CLARITY.

MULE-HIDE PRODUCTS	**INDUCTION WELDING PLATES WALL ATTACHMENT** **SYSTEMS: HEAT WELD MEMBRANE MECHANICALLY ATTACHED**	**DETAIL NO.:** **MHT-IWP5** REVISION DATE: 05/2020

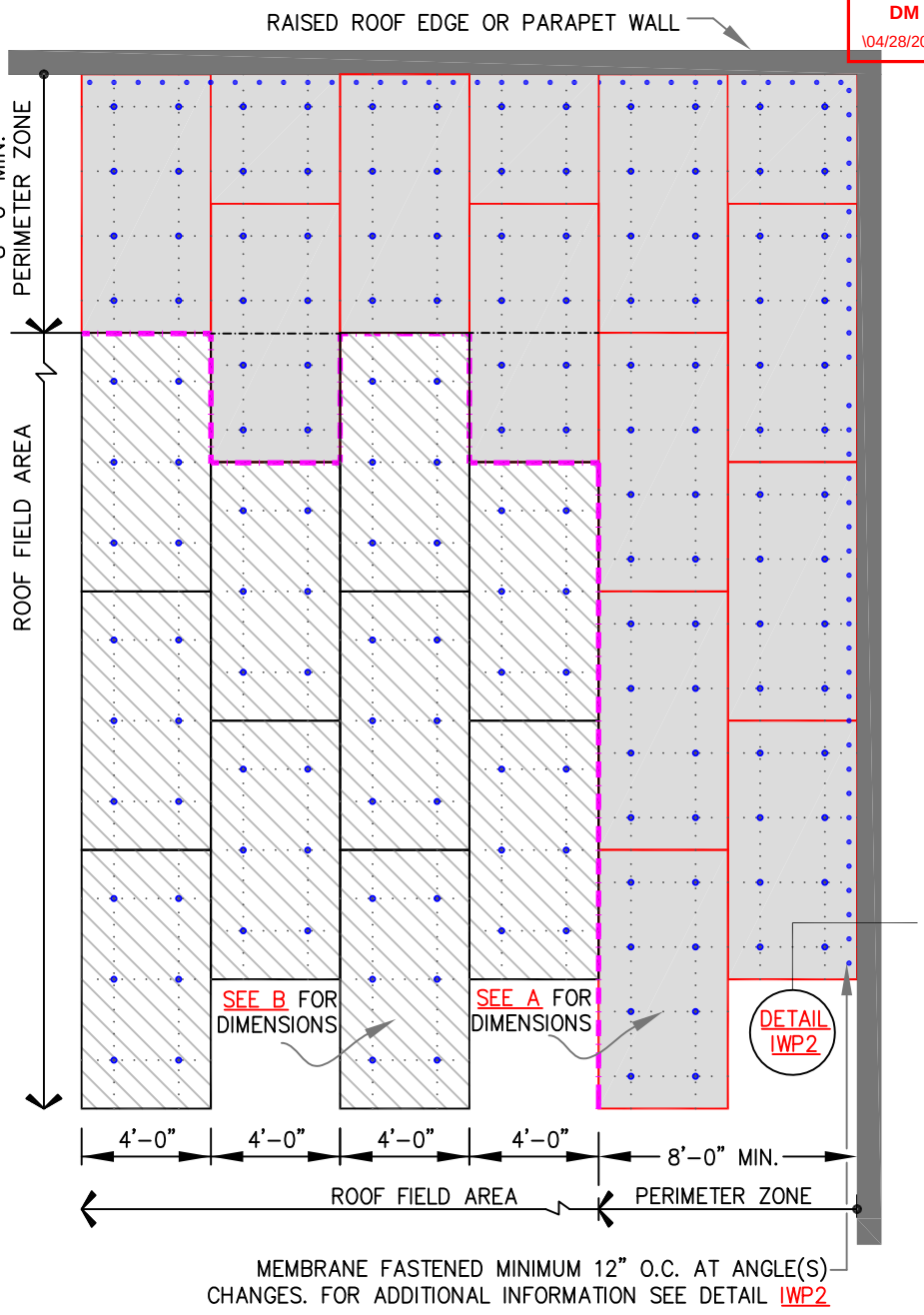
RCRBD
Record Set
DM
\04/28/2021



Ⓐ PERIMETER ZONE
8 FASTENERS PER 4'X8' BOARD



Ⓑ FIELD OF ROOF
6 FASTENERS PER 4'X8' BOARD



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PERIMETER AREA

FIELD AREA

MULE–HIDE FASTENER & INDUCTION WELDING PLATE

DECK TYPE	DECK THICKNESS	FASTENER	INDUCTION WELDING PLATE
STEEL	22 GAUGE	MULE–HIDE EHD FASTENER	3–1/8" DIAMETER
PLYWOOD	15/32"		
NOTE: AT IN–FILL MINOR PIECES, USE MIN. 2 FASTENERS.			

MULE-HIDE PRODUCTS

INDUCTION WELDING PLATES FASTENING REQUIREMENTS

SYSTEMS:
HEAT WELD MEMBRANE MECHANICALLY ATTACHED

DETAIL NO.:
MHT-IWP1

REVISION DATE: 05/2020

Product Data Sheet

INDUCTION WELDING PLATES

RCRBD
Record Set
DM
\04/28/2021

Revision Date: May-2020

PRODUCT DESCRIPTION

The Induction Weld Plates are designed to attach insulation or coverboards to the deck while providing a non-penetrating mechanical attachment of TPO or PVC single-ply membranes utilizing an induction welded bond to the Induction Weld Plate. Induction Weld Plates are approximately 3-3/8" in diameter. Plates are approved for use with steel, wood or structural concrete roof decks. The Induction Weld Plates can be installed using #15 EHD, Tru-Spike Fasteners, and PFC Purlin Drill Point Fasteners.

Product and Packaging Information			
Plate Type	Color	Weight /Box	Packaging (Fasteners/Box)
TPO Induction Welding Plate	Orange/Grey	40.6 lbs.	500/Bucket
PVC Induction Welding Plate	White/Blue	39.3 lbs.	500/Bucket
Note: Induction Welding Plate type (TPO or PVC) must match membrane type.			

BENEFITS & SUPPLEMENTAL STATEMENTS

- Plates are stacked in a weather resistant pail for ease of storage, shipping, and handling
- Reduces the number of fasteners and plates compared to conventional mechanically attached applications
- Larger sheets (up to 12') can be used which reduces field seams
- Faster dry-in time
- Non-penetrating system
- Even load-distribution across membrane reducing sheet flutter
- Engineered to be compatible with most common induction welding equipment

LEED® INFORMATION

Material	22 ga AZ-50 Galvalume® Steel
LEED® Eligible Recycled Content	49%

INSTALLATION INSTRUCTIONS

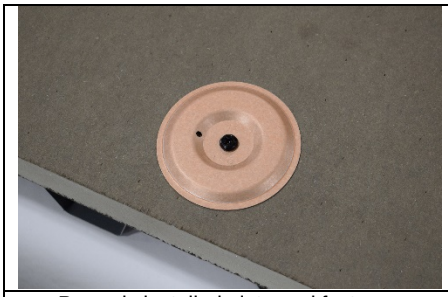
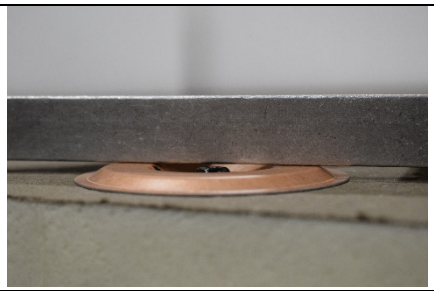
- No pre-drilling is necessary for wood and steel decks.
- Simply insert the appropriate fastener through the TPO or PVC Induction Weld Plate and install with a standard clutch drive electric screw gun (0-2500 rpm).
- Optimum fastener performance is achieved when the fastener is installed perpendicular to the deck and into the top flutes of a steel deck. Follow the Mule-Hide Induction Welding System installation instructions to attach the membrane to the installed plate using a portable induction welding tool.

Keep insulation substrate and membrane clean. Any debris on the top of the insulation substrate and/or the membrane should be removed prior to initiating the induction welding process. Use a leaf blower or broom to eliminate any debris from the membrane surface.

TPO and PVC Induction Welding Plates

REV May 2020

RCRBD Record Set DM \04/28/2021

		
Properly installed plate and fastener	Correctly installed plate and fastener (straight edge for reference only)	Incorrectly installed Plate (fastener overdriven distorting the plate downward)

Review Mule-Hide specifications and details for complete installation information.

PRECAUTIONS

- Eye protection is recommended during installation
- Use care to avoid over-torquing the fastener
- Do no expose plates to UV for extended periods

PROTECTION & SAFETY

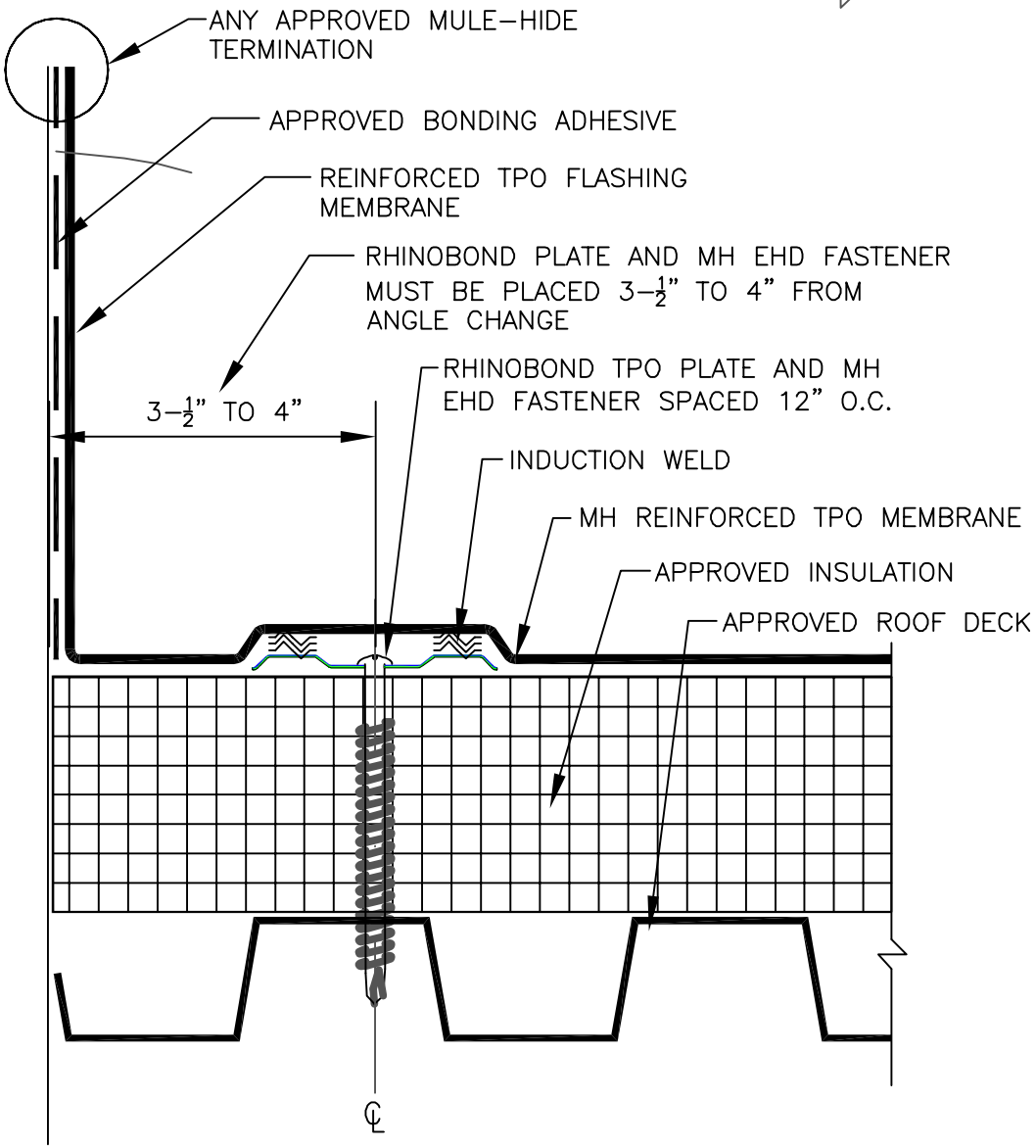
Mule-Hide maintains Safety Data Sheets on all of its non-exempt products. Safety Data Sheets contain health and safety information for your development of appropriate product handling procedures to protect your employees and customers. Mule-Hide Safety Data Sheets should be read and understood by all of your supervisory personnel and employees before using Mule-Hide products in your facilities.

ADDITIONAL INFORMATION

The information given on this PDS is subject to change without notice. Always check the Mule-Hide website at www.mulehide.com for the latest information, changes and updates or contact Mule-Hide Products Company at 800-786-1492.

DISCLAIMER

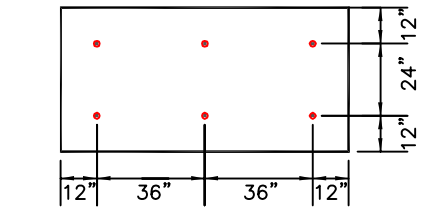
The statements provided concerning the material shown are intended as a guide for material usage and are believed to be true and accurate at the time of printing. No statement made by anyone may supersede this information, except when done in writing by Mule-Hide Products Co., Inc. Since the manner of use is beyond our control, Mule-Hide does not authorize anyone to make any warranty of merchantability or fitness for any particular purpose or any other warranty, guarantee or representation, expressed or implied, concerning this material. Buyer and user accept the product under these conditions and assume the risk of any failure, any injury person or property (including that of the user), loss or liability resulting from the handling, storage or use of the product whether or not it is handled, stored or used in accordance with the directions or specifications. Mule-Hide must be notified in writing of any claims and be given the opportunity to inspect the alleged failure before repairs are made.



NOTES:

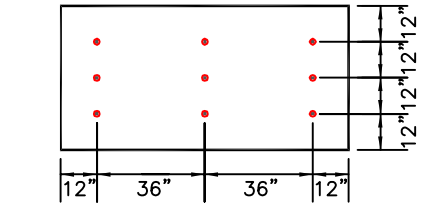
1. POSITION RHINOBOND PLATES 3–1/2" TO 4" FROM ANGLE CHANGE.
2. FLASHING MEMBRANE REQUIRES BONDING ADHESIVE.
3. MULE–HIDE EHD FASTENERS AND RHINOBOND TPO PLATES ARE REQUIRED OVER STEEL AND WOOD DECKS.
4. THIS METHOD OF MEMBRANE ATTACHMENT IS NOT FOR USE WITH NON–FACED EXPANDED POLYSTYRENE (EPS) OR EXTRUDED POLYSTYRENE (XPS) INSULATION.
5. THE USE OF 6" OR 10" PS RUSS IS NOT APPROVED WITH THIS METHOD OF ATTACHMENT.

MULE-HIDE PRODUCTS CO., INC. ®	**RHINOBOND BASE ATTACHMENT** **SYSTEMS: TPO MECHANICALLY ATTACHED**	**DETAIL NO.:** **MHT-RB2** REVISION DATE: 01/2013



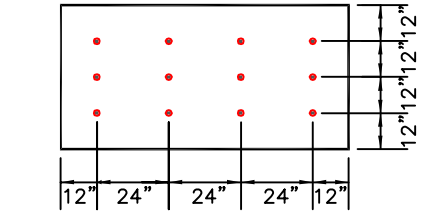
6 FASTENERS PER 4'X8' BOARD
FIELD ZONE

A



9 FASTENERS PER 4'X8' BOARD
PERIMETER ZONE

B



12 FASTENERS PER 4'X8' BOARD
CORNER ZONE

C

PERIMETER ZONE

FIELD ZONE

SEE B FOR PERIMETER ZONE FASTENER PATTERN

MINIMUM WDTH FOR PERIMETER AND CORNER ZONE IS 8'–0". BUT IF A PORTION OF A BOARD FROM ONE ZONE EXTENDS INTO ANOTHER ZONE, THE ENTIRE BOARD IS FASTENED AT THE HIGHER RATE, AS DEPICTED

SEE A FOR FIELD ZONE FASTENER PATTERN

PERIMETER ZONE

CORNER ZONE

SEE C FOR CORNER ZONE FASTENER PATTERN

CORNER ZONE

PERIMETER ZONE

ROOF EDGE OR PARAPET WALL

SEE DETAIL RB–2

12" O.C. POSITIONED $3\frac{1}{2}$"–4" FROM ANGLE CHANGE

4'–0"

8'–0"

FIELD ZONE

PERIMETER ZONE

DECK TYPE	MINIMUM DECK THICKNESS	FASTENER	THERMOPLASTIC COATED PLATE
STEEL	22 GAUGE	MULE–HIDE EHD FASTENER	3–1/8" DIAMETER
PLYWOOD	15/32"	MULE–HIDE EHD FASTENER	3–1/8" DIAMETER
NOTE: AT IN–FILL MINOR PIECES, USE MIN. 2 FASTENERS.			

MULE-HIDE PRODUCTS CO., INC.

RHINOBOND FASTENING REQUIREMENTS

SYSTEMS: TPO MECHANICALLY ATTACHED

DETAIL NO.:

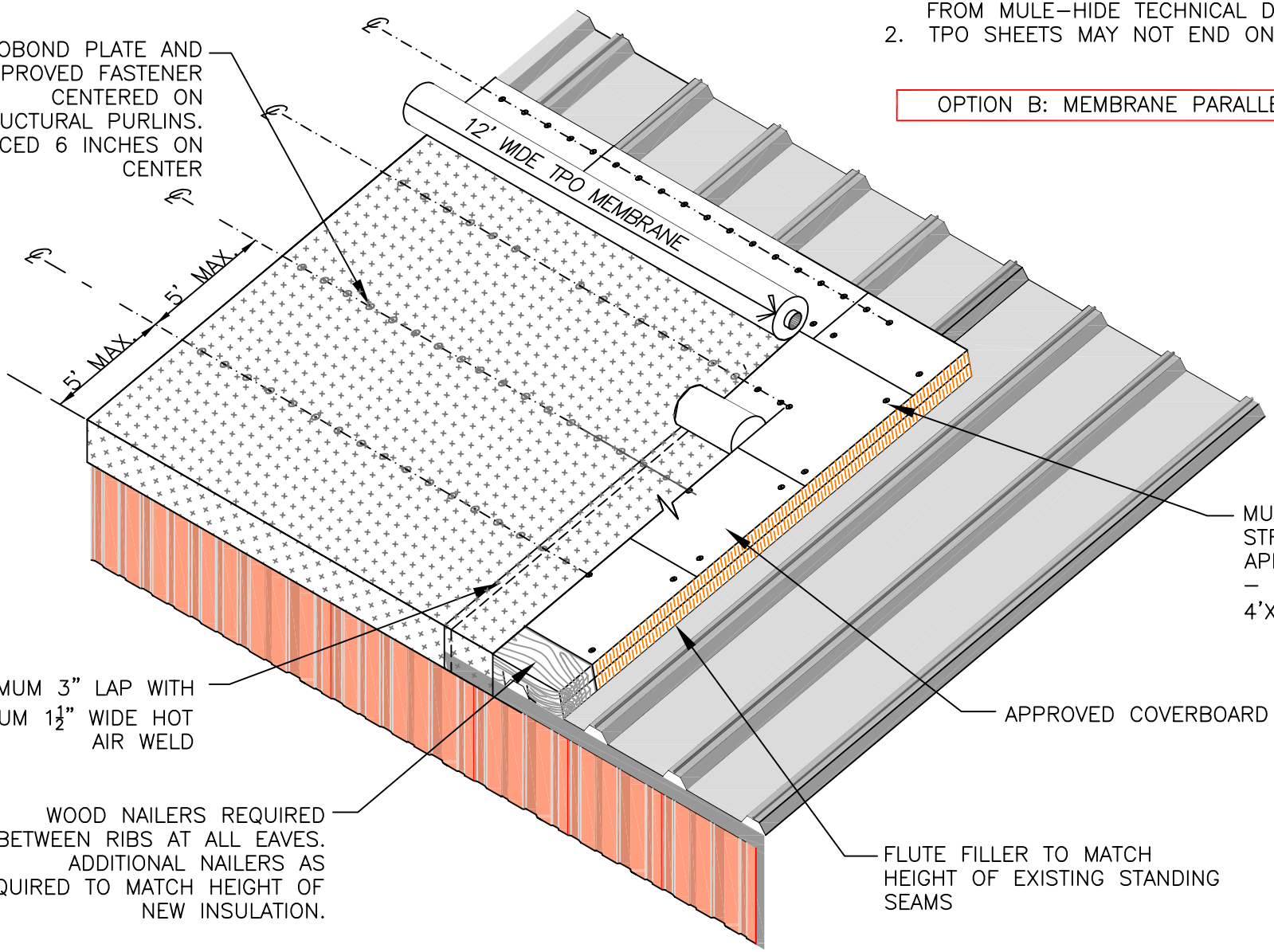
MHT-RB1

REVISION DATE: 01/2013

NOTES:

1. THIS SYSTEM MUST HAVE WRITTEN APPROVAL FROM MULE-HIDE TECHNICAL DEPARTMENT.
2. TPO SHEETS MAY NOT END ON FASTENER PLATES.

OPTION B: MEMBRANE PARALLEL TO SLOPE



MULE-HIDE PRODUCTS CO., INC.

RHINOBOND MECHANICALLY ATTACHED WINDS ZONES 101-120 MPH

SYSTEMS:
RHINOBOND METAL RETROFIT
TPO MECHANICALLY FASTENED

DETAIL NO.:

MMRR-305RT

REVISION DATE: 02/2018

®

MECHANICALLY ATTACHED TPO SYSTEM
INDUCTION WELDING ATTACHMENT METHOD
07 54 00/MUL

Revision Date: May 2020

TABLE OF CONTENTS

PLEASE CONSULT THE MULE-HIDE WEBSITE FOR THE MOST CURRENT INFORMATION AT WWW.MULEHIDE.COM

MULE-HIDE PRODUCTS

MECHANICALLY ATTACHED SYSTEM SPECIFICATION
INDUCTION WELDING ATTACHMENT METHOD

07 54 00/MUL Revision Date: May 2020

This is an alternate method for securing Mule-Hide's TPO-c or PVC membranes and is intended to be used in conjunction with the Mule-Hide's Mechanically Attached TPO or PVC Roofing System Specification.

1.01 Description

The Mule-Hide Induction Welding attachment method incorporates 3" diameter corrosion-resistant plates with either a hot melt TPO coating or a hot melt PVC coating. The Mule-Hide Induction Welding Plates (Induction Welding Plates) are installed with Mule-Hide EHD Fasteners to secure an acceptable insulation to minimum 22 gauge steel deck or minimum 15/32" thick plywood. Note that only TPO Induction Welding Plates may be used with TPO membrane, and that only PVC and PVC-KEE membranes may be used with the PVC Induction Welding Plate. This attachment method is not for use with fleece back or self-adhered membranes.

Mule-Hide's TPO-c or PVC (Heat-Weld) Reinforced membrane is positioned over the secured Induction Welding Plates and welded to the top surface of the plate with the Induction Welding Tool.

Projects utilizing the Induction Welding Plate Attachment Method will qualify for system warranties up to a maximum 20 year warranty. Contact the Mule-Hide Technical Department for warranty enhancement requirements.

1.02 Products/Heat Welding Equipment

Products listed in "Part II of the Mule-Hide Mechanically Attached TPO or PVC System Specifications can be used as part of this alternate securement method in conjunction with the Induction Welding Plates.

A. **Induction Welding Plate**: A 3" diameter, 0.028" thick, corrosion-resistant steel plate with hot melt coating of either TPO or PVC on the top surface. The plate is used in conjunction with Mule-Hide EHD fasteners to attach the roofing assembly and is activated using the Induction Welding Tool.

B. **Induction Welding Tool**: An induction heating tool is used to emit the magnetic field that activates the hot melt coating on the top

surface of the Induction Welding plate to fuse with the Heat-Weld roofing membrane. Refer to Induction Welding Tool Owner's Manual for additional information.

C. **Cooling Clamp Device**: A stand-up device that allows the weld to cool as it clamps the membrane to the heated plate. Refer to Induction Welding Tool Owner's Manual for additional information.

D. **Heavy Duty Plunger:** Used for testing bond of Induction Welding Plate to matching Mule-Hide roofing membrane.

1.03 Induction Welding Tool Calibration

A. Prior to attaching the roofing membrane to the Induction Welding Plates, the Induction Welding Tool must be calibrated with samples of the project insulation thickness and type and project specified membrane thickness. Refer to Induction Welding Tool Owner's Manual for additional information.

1. Loose lay five Induction Welding Plates in a row about 12-24 inches apart on the specified membrane substrate.

2. Place Heat-Weld membrane over the Induction Welding Plates.

3. Center the Induction Welding Tool over the Induction Welding Plates under the membrane and use the device's default setting. Weld the membrane to the first plate, and when ready, completely remove Welding Tool. Immediately place the Cooling Clamp on the membrane over the plate and leave in place for 60 seconds. Mark the Welding Tool energy setting used for that particular plate on the membrane near the fastener.

4. Place Induction Welding Tool on the next plate as previously done and increasing induction energy one level by depressing the ⏢ (UP) button once. After welding, immediately place the Cooling Clamp over the plate. Mark the Induction Welding Tool energy setting used for that particular plate on the membrane near the fastener.

5. Repeat above procedure for the remainder of the plates, increasing induction energy one level for each plate.

6. After allowing the membrane and plates to cool to ambient temperature, remove Cooling Clamps. Turn the membrane

over and use a pair of pliers to peel the Induction Welding Plates from underside of membrane to determine bonding strength. Examine the top of the plates for weld quality. A 100% bond to the top of the plate is required.

7. Repeat trial process, if needed, adjusting energy level up or down until desired results are achieved.

8. Set the Induction Welding Tool to the setting the produces a 100% bond. Several settings may yield a 100% bond. If this happens, select the energy level setting in the middle. See below for descriptions of acceptable and unacceptable bonds.

   a. **100% Bond (required)** – Total, even, consistent adhesion of membrane. Plate makes a visible impression on the top of the membrane.

   b. **Partial Bond (unacceptable)** – Uneven/incomplete adhesion of membrane. Energy setting may be too low, heat source may be off center, or plate may be overdriven.

   c. **Excessive Heat (unacceptable)** – Membrane may turn yellow, melt or become dimpled.

B. **Calibration Tips:**

1. Recalibrating the induction tool settings is necessary when ambient temperature changes more than +/- 15°F or power to device has been interrupted. This may be necessary several times a day. Do not assume that the same setting will work throughout the day.

2. If a Low Voltage message appears in the display or if you do not get a 100% weld during calibration, check power at the end of the cord and determine what else is running on the same circuit. Power may be diminished if:
   a. The cord is too long or
   b. The power source is overloaded.

1.04 Installation

A. After placement of insulation on substrate, secure the insulation at a rate of six (6) Mule-Hide EHD Fasteners and Induction Welding

Plates per 4‘ x 8‘ board in the field. Note: Avoid fastener overdrive to prevent plate from deforming.

Perimeter enhancements

To meet increased uplift requirements in the perimeters and corners of each roof area, additional insulation attachment provisions must be installed as follows:

Perimeters – insulation attachment to be increased 50% over the field attachment requirements to nine (9) fasteners per 4’ x 8’ board or 1 fastener every 3.55 square feet.

Corners – insulation attachment to be increased 100% over the field attachment requirements to twelve (12) fasteners per 4’ x 8’ board or 1 fastener every 2.66 square feet.

a. For Factory Mutual projects, the width of the roof perimeter and corner areas is defined as the smaller of 0.1 times the building lesser plan dimension or 0.4 times the eave height (mean roof height for slopes greater than 2"/12" slope), except for heights greater than 60 ft. The minimum width of the perimeter and corner areas shall not be less than three (3) feet. Contact Mule-Hide Technical Department for Factory Mutual projects exceeding 60 ft. heights.

b. For non Factory Mutual projects, the minimum width of the perimeter and corner areas shall not be less than eight (8) feet.

B. Place the Heat-Weld membrane over the appropriate Induction Welding Plates and allow membrane to relax.

C. Place Induction Welding Tool centered over the Induction Welding Plates (+/- 1”) under the roofing membrane.

D. Elevate the temperature of plate from ambient to 400-500°F using induction tool.

E. Immediately place Cooling Clamp on the membrane over the plate and leave in place for at least 60 seconds.

F. Resume process ensuring membrane is attached to all plates.

1.05 Induction Welding Plate Test Procedure

Test all Induction Welding Plates during construction. To determine if a weld has been made, place a heavy duty plunger next to a welded plate and create enough suction to lift the membrane. An acceptable weld will crease the membrane around the edge of the plate. If the assembly is not welded, the membrane will lift up off of the plate. Mark any plates that are not welded and return to complete the weld as required. Unwelded plates are not permitted anywhere in the system.

1.06 Membrane Hot Air Welding Procedures & Additional Securement

A. Join membrane sheets by overlapping and heat welding the seam following standard welding requirements as outlined in 3.09 Welding of Lap Areas of the Mule-Hide Mechanically Attached TPO Roofing System Specification.

B. Base Attachment at any area where the change of plane is equal to or exceeds 2” per foot (2:12) is required as outlined in Section 3.10 Additional Membrane Securement (Base Attachment) in Mule-Hide’s Mechanically Attached TPO or PVC Roofing System Specification and must be done using one of the following methods:

1. Utilize Induction Welding Plates and EHD fasteners placed 3-½” to 4” away from angle change as shown in Details MHT-RB1 and MHT-RB2.

2. Using 2.4” Seam Plates and EHD Fasteners placed either horizontally into the deck or vertically into the wall as depicted in Detail MHT-UN-305A.

Note: 6” or 10” RUSS or RMS products are not approved for use in Induction Welding attached systems.

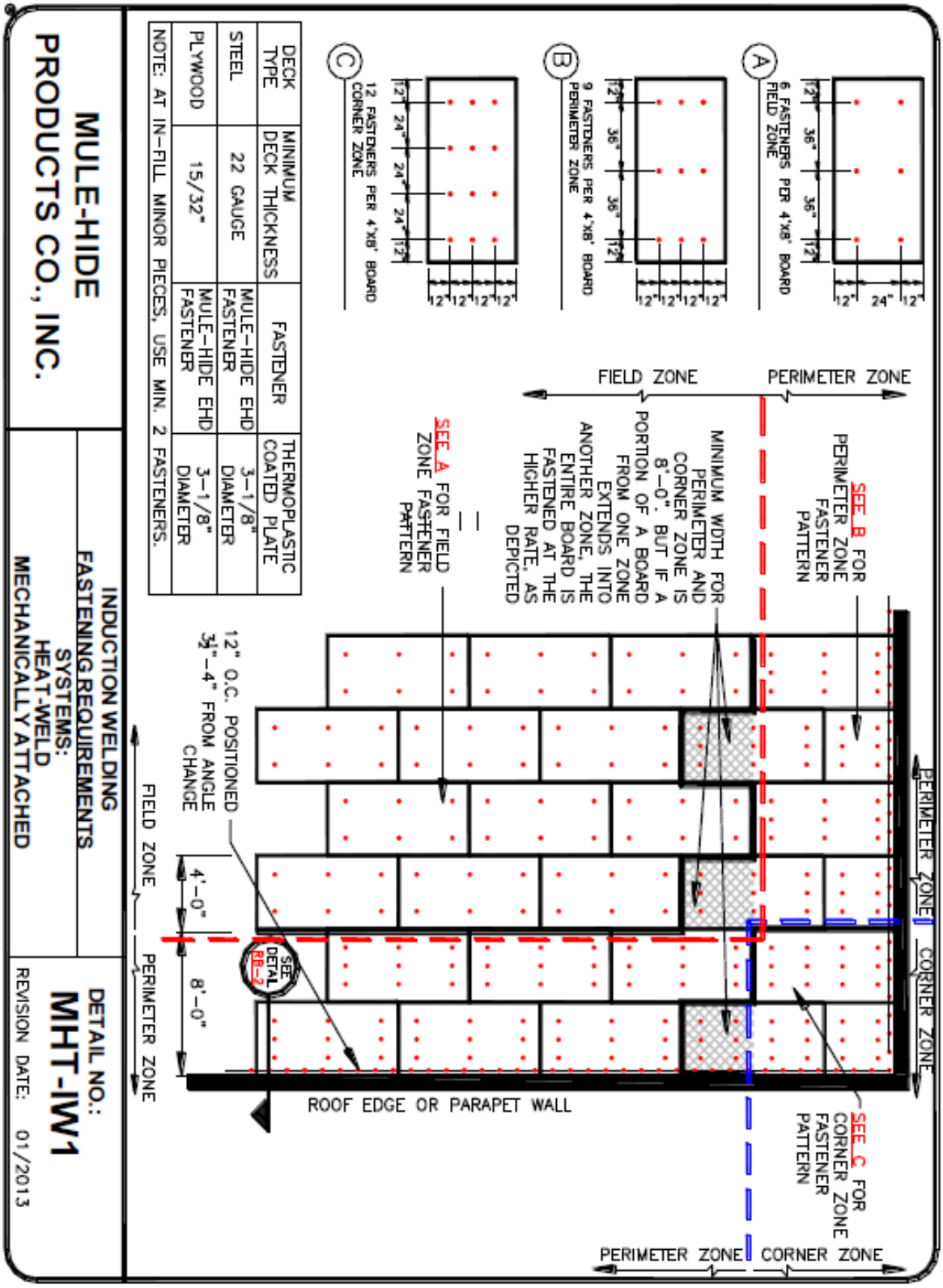
1.07 Associated Installation Details

A. Induction Welding Plate Attachment Requirements……..... MHT-IW1

B. Base Attachment with Induction Welding Plates.....MHT-IW2

End of Section

This specification represents the applicable information available at the time of its publication. Mule-Hide reserves the right to change this information at any time. Contact Mule-Hide or check the Mule-Hide website (www.mulehide.com) for the latest updates regarding changes or modifications to this specification.



DECK TYPE	MINIMUM DECK THICKNESS	FASTENER	THERMOPLASTIC COATED PLATE
STEEL	22 GAUGE	MULE-HIDE EHD FASTENER	3-1/8" DIAMETER
PLYWOOD	15/32"	MULE-HIDE EHD FASTENER	3-1/8" DIAMETER

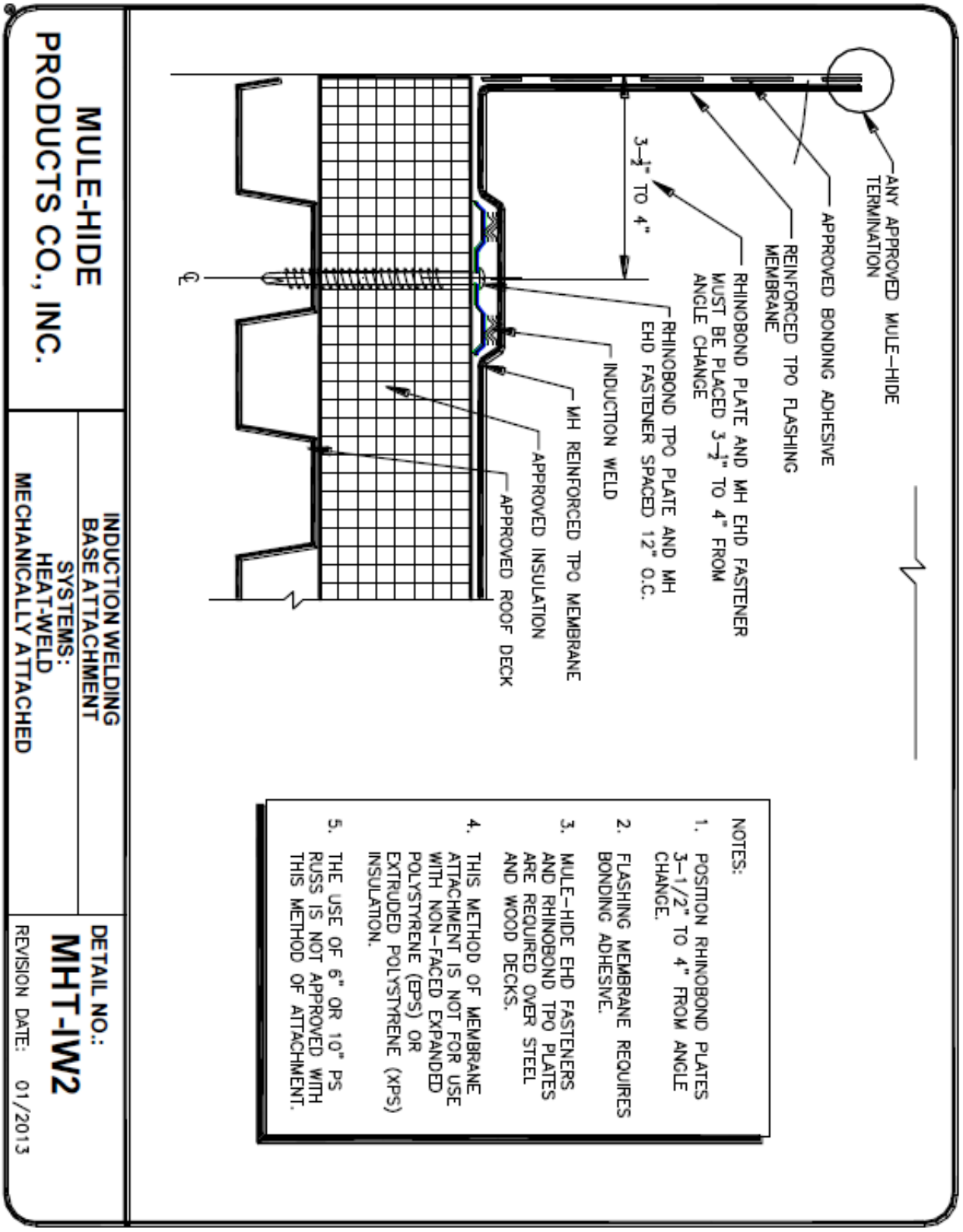
NOTE: AT IN-FILL MINOR PIECES, USE MIN. 2 FASTENERS.

MULE-HIDE PRODUCTS CO., INC.

INDUCTION WELDING FASTENING REQUIREMENTS
SYSTEMS:
HEAT-WELD
MECHANICALLY ATTACHED

DETAIL NO.:
MHT-IW1

REVISION DATE: 01/2013



MECHANICALLY ATTACHED TPO SYSTEM SPECIFICATION
RhinoBond ATTACHMENT METHOD

Revised Oct 2013
07 54 00/MUL

This is an alternate method for securing the Mule-Hide's TPO-c membrane and is intended to be used in conjunction with the Mule-Hide's Mechanically Attached TPO Roofing System Specification.

1.01 Description

The RhinoBond attachment method incorporates 3" diameter corrosion-resistant plates with a hot melt TPO coating. The RhinoBond plates are installed with Mule-Hide EHD Fasteners to secure an acceptable insulation to minimum 22 gauge steel deck or minimum 15/32" thick plywood.

Mule-Hide's TPO-c Reinforced membrane is positioned over the secured RhinoBond plates and welded to the top surface of the plate with the RhinoBond Induction Welding Tool.

Projects utilizing the RhinoBond Attachment Method will qualify for system warranties up to a maximum 20 year warranty. Contact the Mule-Hide Technical Department for warranty enhancement requirements.

1.02 Products/Heat Welding Equipment

Products listed in "Part II of the Mule-Hide Mechanically Attached TPO System System Specification can be used as part of this alternate securement method in conjunction with the RhinoBond Welding Plates.

A. **RhinoBond TPO Welding Plate**: A 3" diameter, 0.028" thick, corrosion-resistant steel plate with hot melt coating on the top surface. The plate is used in conjunction with Mule-Hide EHD fasteners to attach the roofing assembly and is activated using the RhinoBond Induction Welding Tool.

B. **RhinoBond Induction Welding Tool**: An induction heating tool is used to emit the magnetic field that activates the hot melt coating on the top surface of the RhinoBond plate to fuse with the TPO roofing membrane. Refer to RhinoBond Owner's Manual for additional information.

C. **Cooling Clamp Device**: A stand-up device that allows the weld to cool as it clamps the membrane to the heated plate. Refer to RhinoBond Owner's Manual for additional information.

D. **Heavy Duty Plunger:** Used for testing RhinoBond weld to plates

1.03 RhinoBond Induction Tool Calibration

A. Prior to proceeding with membrane attachment to the plate, the RhinoBond Induction Welding Tool must be calibrated with samples of the project insulation thickness and type and project specified membrane thickness. Refer to RhinoBond Owner's Manual for additional information.

1. Loose lay five RhinoBond Plates in a row about 12-24 inches apart on the specified membrane substrate.

2. Place membrane over the RhinoBond Plates.

3. Center the Induction Welding Tool over the RhinoBond Plate under the membrane and use the device's default setting. Weld the membrane to the first plate, and when ready, completely remove Welding Tool. Immediately place the Cooling Clamp on the membrane over the plate and leave in place for 60 seconds. Mark the Welding Tool energy setting used for that particular plate on the membrane near the fastener.

4. Place Induction Welding Tool on the next plate as previously done and increasing induction energy one level by depressing the ▲ (UP) button once. After welding, immediately place the Cooling Clamp over the plate. Mark the Welding Tool energy setting used for that particular plate on the membrane near the fastener.

5. Repeat above procedure for the remainder of the plates, increasing induction energy one level for each plate.

6. After allowing the membrane and plates to cool to ambient temperature, remove Cooling Clamps. Turn the membrane over and use a pair of pliers to peel the RhinoBond Plates from underside of membrane to determine bonding strength. Examine the top of the plates for weld quality. A 100% bond to the top of the plate is required.

7. Repeat trial process, if needed, adjusting energy level up or down until desired results are achieved.

8. Set the Induction Tool to the setting the produces a 100% bond. Several settings may yield a 100% bond. If this happens, select the energy level setting in the middle. See below for descriptions of acceptable and unacceptable bonds.

   a. **100% Bond (required)** – Total, even, consistent adhesion of membrane. Plate makes a visible impression on the top of the membrane.

   b. **Partial Bond (unacceptable)** – Uneven/incomplete adhesion of membrane. Energy setting may be too low, heat source may be off center, or plate may be overdriven.

   c. **Excessive Heat (unacceptable)** – Membrane may turn yellow, melt or become dimpled.

B. **Calibration Tips:**

1. Recalibrating the induction tool settings is necessary when ambient temperature changes more than +/- 15°F or power to device has been interrupted. This may be necessary several times a day. Do not assume that the same setting will work throughout the day.

2. If a Low Voltage message appears in the RhinoBond display or if you do not get a 100% weld during calibration, check power at the end of the cord and determine what else is running on the same circuit. Power may be diminished if:
   a. The cord is too long or
   b. The power source is overloaded.

1.04 Installation

A. After placement of insulation on substrate, secure the insulation at a rate of six (6) Mule-Hide EHD Fasteners and RhinoBond Plates per 4' x 8' board in the field. Note: Avoid fastener overdrive to prevent plate from deforming.

1. Perimeter enhancements

   To meet increased uplift requirements in the perimeters and corners of each roof area, additional insulation attachment provisions must be installed as follows:

   Perimeters – insulation attachment to be increased 50% over the field attachment requirements to nine (9) fasteners per 4' x 8' board or 1 fastener every 3.55 square feet.

   Corners – insulation attachment to be increased 100% over the field attachment requirements to twelve (12) fasteners per 4' x 8' board or 1 fastener every 2.66 square feet.

   a. For Factory Mutual projects, the width of the roof perimeter and corner areas is defined as the smaller of 0.1 times the building lesser plan dimension or 0.4 times the eave height (mean roof height for slopes greater than 2"/12" slope), except for heights greater than 60 ft. The minimum width of the perimeter and corner areas shall not be less than three (3) feet. Contact Mule-Hide Technical Department for Factory Mutual projects exceeding 60 ft. heights.

   b. For non Factory Mutual projects, the minimum width of the perimeter and corner areas shall not be less than eight (8) feet.

B. Place Mule-Hide TPO-c membrane over the appropriate RhinoBond Plates and allow membrane to relax.

C. Place RhinoBond Induction Tool centered over the RhinoBond Welding Plate (+/- 1") under the roofing membrane.

D. Elevate the temperature of plate from ambient to 400-500°F using induction tool.

E. Immediately place Cooling Clamp on the membrane over the plate and leave in place for at least 60 seconds.

F. Resume process ensuring membrane is attached to all plates.

1.05 RhinoBond Weld Test Procedure

Perform RhinoBond weld test on all plates during construction. To determine if a weld has been made, place a heavy duty plunger next to a welded plate and create enough suction to lift the membrane. An acceptable weld will crease the membrane around the edge of the plate. If the assembly is not welded, the membrane will lift up off of the plate. Mark any plates that are not welded and return to complete the weld as required. Unwelded plates are not permitted anywhere in the system.

1.06 Membrane Hot Air Welding Procedures & Additional Securement

A. Join membrane sheets by overlapping and heat welding the seam following standard welding requirements as outlined in 3.09 Welding of Lap Areas of the Mule-Hide Mechanically Attached TPO Roofing System Specification.

B. Base Attachment at any area where the change of plane is equal to or exceeds 2" per foot (2:12) is required as outlined in Section 3.10 Additional Membrane Securement (Base Attachment) in Mule-Hide's Mechanically Attached TPO Roofing System Specification and must be done using one of the following methods:

   1. Utilize RhinoBond plates and EHD fasteners placed 3-½" to 4" away from angle change as shown in Details MHT-RB1 and MHT-RB2.

2. Using 2.4” Seam Plates and EHD Fasteners placed either horizontally into the deck or vertically into the wall as depicted in Detail MHT-UN-305A.

Note: 6” or 10” RUSS products are not approved for use in RhinoBond attached systems.

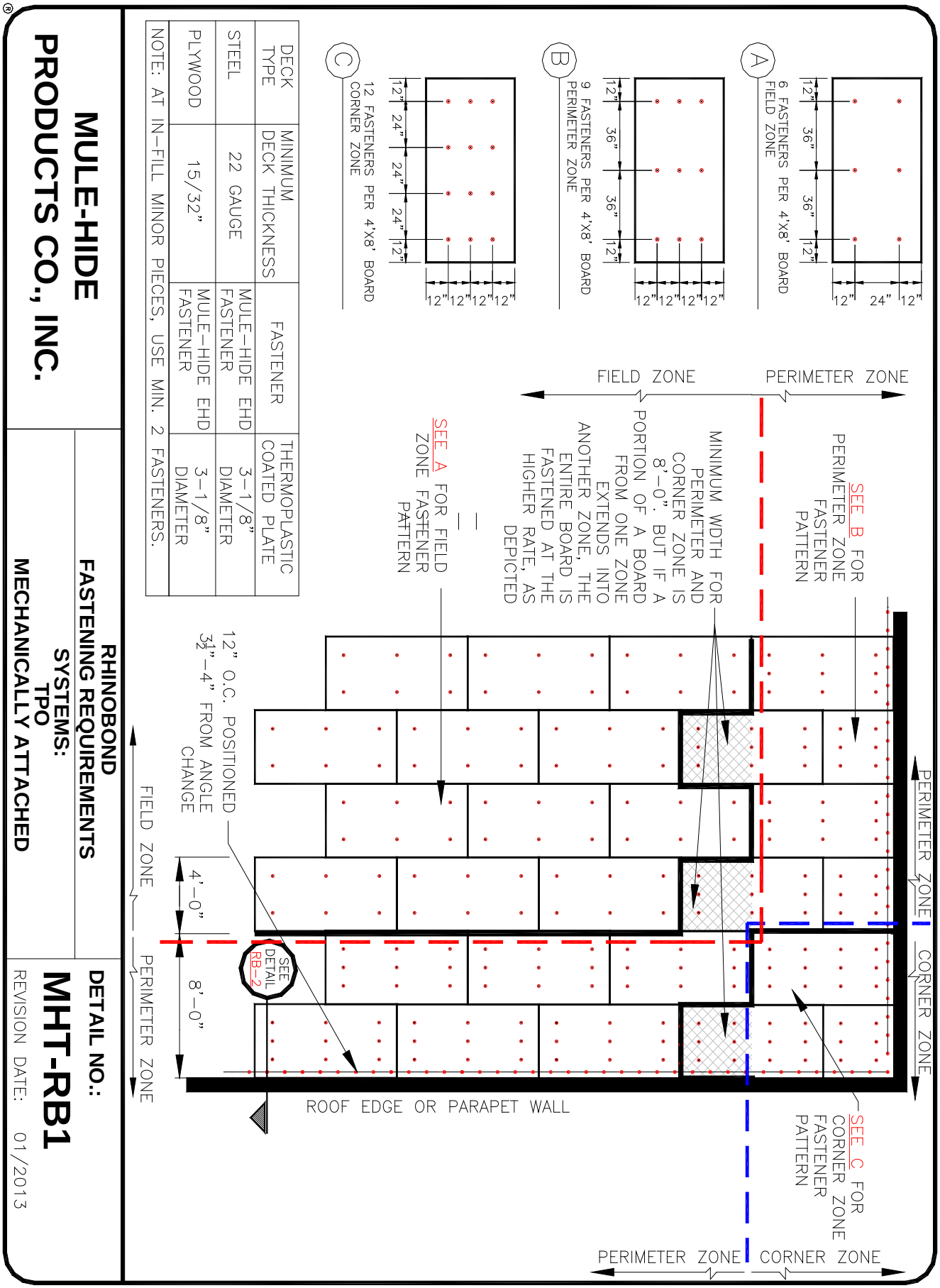
1.07 Associated Installation Details

A. RhinoBond Attachment Requirements…..……..... MHT-RB1

B. Base Attachment with RhinoBond Plates…….....MHT-RB2

End of Section

This specification represents the applicable information available at the time of its publication. Mule-Hide reserves the right to change this information at any time. Contact Mule-Hide or check the Mule-Hide website (www.mulehide.com) for the latest updates regarding changes or modifications to this specification.



DECK TYPE	MINIMUM DECK THICKNESS	FASTENER	THERMOPLASTIC COATED PLATE
STEEL	22 GAUGE	MULE-HIDE EHD FASTENER	3-1/8" DIAMETER
PLYWOOD	15/32"	MULE-HIDE EHD FASTENER	3-1/8" DIAMETER

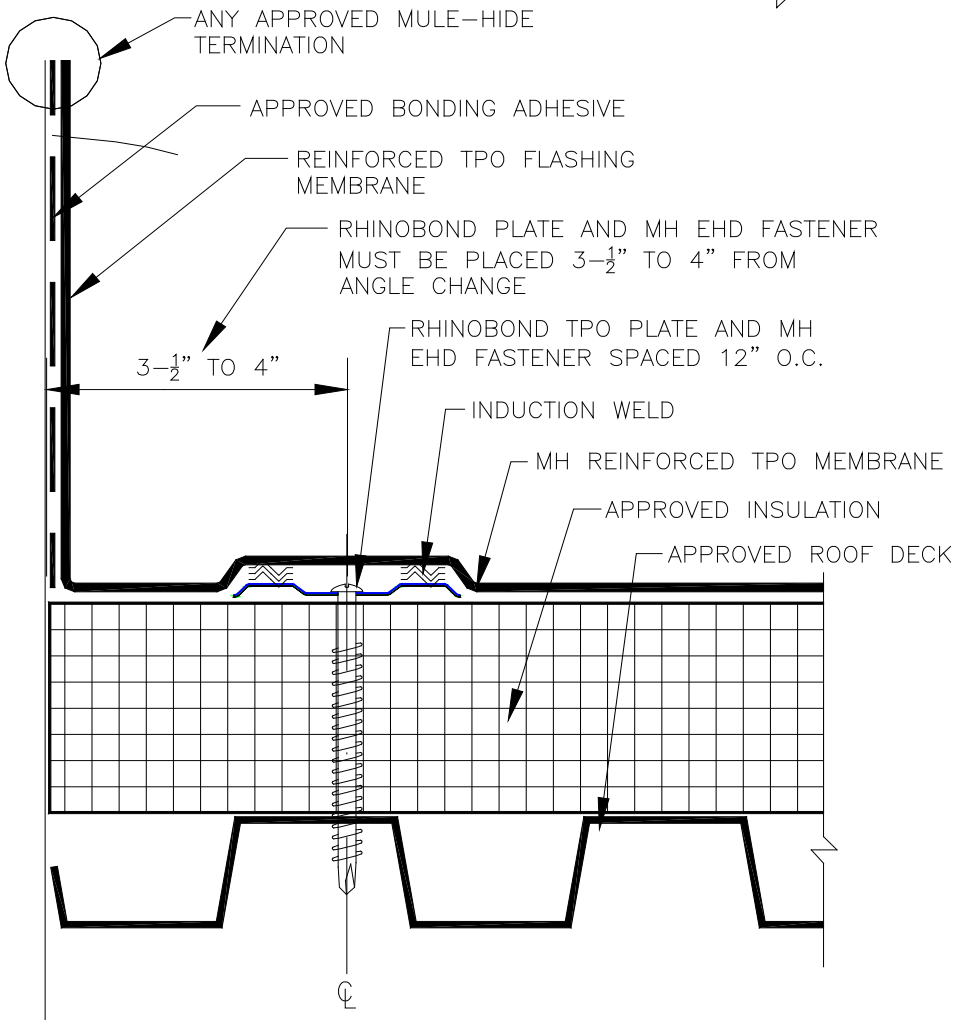
NOTE: AT IN-FILL MINOR PIECES, USE MIN. 2 FASTENERS.

MULE-HIDE PRODUCTS CO., INC.

RHINOBOND FASTENING REQUIREMENTS SYSTEMS: TPO MECHANICALLY ATTACHED

DETAIL NO.: MHT-RB1

REVISION DATE: 01/2013



NOTES:

1. POSITION RHINOBOND PLATES 3–1/2" TO 4" FROM ANGLE CHANGE.
2. FLASHING MEMBRANE REQUIRES BONDING ADHESIVE.
3. MULE–HIDE EHD FASTENERS AND RHINOBOND TPO PLATES ARE REQUIRED OVER STEEL AND WOOD DECKS.
4. THIS METHOD OF MEMBRANE ATTACHMENT IS NOT FOR USE WITH NON–FACED EXPANDED POLYSTYRENE (EPS) OR EXTRUDED POLYSTYRENE (XPS) INSULATION.
5. THE USE OF 6" OR 10" PS RUSS IS NOT APPROVED WITH THIS METHOD OF ATTACHMENT.

MULE-HIDE PRODUCTS CO., INC. ®	**RHINOBOND BASE ATTACHMENT** **SYSTEMS: TPO MECHANICALLY ATTACHED**	**DETAIL NO.:** **MHT-RB2** REVISION DATE: 01/2013

SUMMARY SPECIFICATION

INDUCTION WELDING - Grid Attachment Method

Revision Date: June 2020

This Summary Specification is a brief overview of Mule-Hide Product's specification and requirements for an Induction Welded Mule-Hide Heat-Welded Roofing System and is intended for use as a submittal in a bid package. Specifier's and Mule-Hide Warranty Eligible Applicators must comply with Mule-Hide Product's specifications and requirements prior to design or bid.

Part 1 General

1.01 Description

The Mule-Hide Induction Welding Grid Method utilizes a Mule-Hide Heat-Weld membrane (TPO or PVC) in a variety of thicknesses. Approved insulation is attached to the roof deck with Induction Welding Plates and Mule-Hide EHD (#15) fasteners. The Heat-Weld membrane is loosely laid over the prepared substrate. Adjoining sheets are overlapped approximately 3" and seamed together with a min 2" wide heat weld. The membrane is then induction welded to the appropriate Induction Welding Plates using an Induction Welder Tool.

Note: DO NOT MIX PLATES. TPO Induction Welding Plates can only be used with non-fleece backed TPO membranes. PVC Induction Welding Plates may only be used with non-fleece backed PVC membranes.

1.02 Quality Assurance

A. When a system warranty is required, the roofing system must be installed by a Mule-Hide Warranty Eligible Applicator in accordance with installation guidelines and detail drawings as approved by Mule-Hide. Prior written approval from the Mule-Hide Warranty Department is required for all deviations from Mule-Hide's published specifications and details.

B. Projects requesting a Labor and Material Warranty will be inspected by a Mule-Hide Representative to verify that Mule-Hide's installation and material requirements have been met.

C. Mule-Hide roofing systems offer a variety of Underwriters Laboratories (UL), Factory Mutual (FM) and other ratings. Consult the appropriate approval guides and Mule-Hide Products for specific code approvals.

1.03 Submittals

A. To ensure compliance with Mule-Hide's warranty requirements contact the Mule-Hide Warranty Department if any of the following conditions exist.

1. Specified wind speed warranty greater than 55 MPH.
2. Building height > 50'
3. Projects located in coastal or high wind zones.
4. Pressurized buildings
5. Cold Storage or Freezer Buildings
6. Membrane exposed to chemicals
7. OSB roof deck

B. Submit a completed Warranty Application form to Mule-Hide prior to biding. Also include fastener pullout testing results as required for non-standard substrates.

C. All projects must have a Mule-Hide warranty application number and project acknowledgement assigned prior to inspection.

1.04 Product Delivery, Storage, and Handling

A. Deliver materials to the job site in original, unopened containers, with the manufacturer's name, brand name and installation instructions.

B. Store all materials in a dry, clean area protected from the elements, as per manufacturer's recommendations.

1.05 Job Conditions

A. All existing wet or damaged roofing materials must be removed and replaced with new materials.

B. All existing phenolic insulation and sprayed-in-place urethane roofs must be removed.

C. The specifier must determine the use and placement of vapor retarders. Consult ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc.) and NRCA (National Roofing Contractors Association) publications.

E. Coordinate work between all trades to avoid traffic over completed sections of roofing.

1.06 Warranty.

Fees are required for all Labor and Material (System) Warranties. System Warranties must be obtained through a Mule-Hide Warranty Eligible Applicator. All projects requesting a System Warranty must be inspected by a Mule-Hide Representative. Components of the roofing system must be supplied by Mule-Hide. Warranty covers only Mule-Hide supplied materials. Sample warranties are available upon request. Contact Mule-Hide Warranty Department for warranty requirements.

Part 2 Products

2.01 General

The components of this roofing system are to be manufactured, supplied, or approved in writing by Mule-Hide Products.

2.02 Membrane

Mule-Hide reinforced Heat-Weld membranes are used for this system. The membrane is available in a variety of widths and lengths and thicknesses. Refer to our Product Data Sheet for physical properties and other information.

2.03 Related Materials

Mule-Hide products include: Induction Welding Plates, Reinforced and Non-Reinforced Flashings, Bonding Adhesives, Cut-Edge Sealant, Membrane Coated Metal, Membrane fasteners and discs, Thermoplastic One-Part Pourable Sealer, All-Purpose Bar, Walkway Roll, Universal Single Ply Sealant, and other components.

Part 3 Execution

3.01 General

A. Work should begin at the highest point of the roof level and proceed to the lowest point. Work should be completed on a daily bases including flashings, terminations, and daily seals.

B. Prepare the existing roof deck or substrate according to Mule-Hide design guides and full-system specifications prior to applying the new roofing system.

3.02 Roof Deck Criteria

A. A proper substrate shall be provided by the building owner. The structure shall be able to withstand normal construction loads and live loads.

B. Substrate must allow for drainage so that all water is removed within 48 hours after a rain.

3.03 Substrate Preparation

A. Re-cover projects - All wet or damaged materials must be removed and replaced with new materials.

B. Substrate must be clean, level, and smooth so that the insulation lays flat. Fresh applications of bitumen based roof cement must be removed or covered.

3.04 Installation

Refer to the applicable Product Data Sheets and Safety Data Sheets for cautions and warnings.

A. Insulation Attachment

Attach roof insulation with appropriate Induction Welding Plates and Mule-Hide EHD (#15) fasteners. **NOTE:** Induction Welding Plates must match the Mule-Hide Membrane. (TPO plates with TPO membranes, PVC plates with PVC membranes). Induction Welding Plates are not for use with fleece backed membranes.

Mule-Hide fasteners and Induction Welding Plates are installed at a rate of 6 fasteners per 4’ x 8’ board, or 1 fastener per 5.33 sq. ft. Increase fastener density in perimeters to 9 fasteners per 4’ x 8’ board or 1 fastener per 3.55 sq. ft. In the corners install 12 fasteners per 4’ x 8’ board or 1 fastener every 2.66 sq. ft. Consult Mule-Hide Technical Department for attachment requirements.

B. Membrane Installation and Hot Air Welding

Place membrane over substrate with minimum 3” overlap at lap seams and positioned so that laps will shed water. Allow membrane to relax. After membrane has relaxed, hot-air weld seams with automatic welder to achieve a min 2” wide heat weld. Weld the Mule-Hide membrane to the Induction Welding Plates with Induction Welder Tool. If expanded or extruded polystyrene insulation is the top layer RhinoBond Cardboard Disc’s must be installed between the plate and the insulation.

C. Additional Membrane Securement

The membrane must be secured at the perimeter of each individual roof area, projection, and any angle change that exceeds 2" per lineal foot. Consult Mule-Hide's published detail drawings.

D. Membrane Flashing

All existing base flashings are to be removed or covered with a suitable material. Install new membrane flashings as per manufactures details and guidelines. Flashings must be terminated along top edge as per appropriate Mule-Hide detail.

E. Other Related Work

1. Walkways should be provided in areas where regular rooftop traffic is expected. Walkways are considered a maintenance item and are excluded from the Mule-Hide warranty.

2. Mule-Hide Walkway Rolls are to be installed over clean, dry surfaces, with a minimum 6" spacing over field seams. Hot-air weld the perimeter of the Walkway Roll to the field membrane.

3. Concrete pavers may be used if installed over one layer of HP Protection Mat.

4. Copings, counter flashing and other metal work shall be fastened to resist wind uplift and prevent buckling. Metal should be sealed to prevent moisture infiltration.

This summary specification represents the applicable information available at time of publication. Mule-Hide reserves the right to change this information at any time. Contact Mule-Hide Products or visit our website at www.mulehide.com for the latest updates, changes, or modifications to this summary specification.

SUMMARY SPECIFICATION
INDUCTION WELDING – Linear Attachment Method

Revision Date: June 2020

This Summary Specification is a brief overview of Mule-Hide Product's specification and requirements for a TPO or PVC (Heat-Weld) Roofing System and is intended for use as a submittal in a bid package. Specifier's and Mule-Hide Warranty Eligible Applicators must comply with Mule-Hide Product's specifications and requirements prior to design or bid.

Part 1 General

1.01 Description

The Mule-Hide Induction Welding Linear Method utilizes a Mule-Hide Heat-Weld membrane and membrane specific Induction Welding Plates. Approved insulation is attached to the substrate with either Mule-Hide Insulation fasteners and plates or an approved insulation adhesive. Induction Welding Plates and fasteners are then installed over the roof insulation and attached to the roof deck. The Heat-Weld membrane is loosely laid over the prepared substrate. Adjoining sheets are overlapped approximately 3" and seamed together with a min 2" wide heat weld. The Heat-Weld membrane is then bonded to the Induction Welding Plates using an Induction Welding Tool.

Note: DO NOT MIX PLATES. TPO Induction Welding Plates can only be used with non-fleece backed TPO membranes. PVC Induction Welding Plates may only be used with non-fleece backed PVC membranes.

1.02 Quality Assurance

A. When a system warranty is required, the roofing system must be installed by a Mule-Hide Warranty Eligible Applicator in accordance with installation guidelines and detail drawings as approved by Mule-Hide. Prior written approval from the Mule-Hide Warranty Department is required for all deviations from Mule-Hide's published specifications and details.

B. Projects requesting a Labor and Material Warranty will be inspected by a Mule-Hide Representative to verify that Mule-Hide's installation and material requirements have been met.

C. Mule-Hide roofing systems offer a variety of Underwriters Laboratories (UL), Factory Mutual (FM) and other ratings. Consult the appropriate approval guides and Mule-Hide Products for specific code approvals.

1.03 Submittals

A. To ensure compliance with Mule-Hide's warranty requirements contact the Mule-Hide Warranty Department if any of the following conditions exist.
1. Specified wind speed warranty greater than 55 MPH.
2. Building height > 50'
3. Projects located in coastal or high wind zones.
4. Pressurized buildings
5. Cold Storage or Freezer Buildings
6. Membrane exposed to chemicals
7. OSB roof deck

B. Submit a completed Warranty Application form to Mule-Hide prior to biding. Also include fastener pullout testing results as required for non-standard substrates.

C. All projects must have a Mule-Hide warranty application number and project acknowledgement assigned prior to inspection.

1.04 Product Delivery, Storage, and Handling

A. Deliver materials to the job site in original, unopened containers, with the manufacturer's name, brand name and installation instructions.

B. Store all materials in a dry, clean area protected from the elements, as per manufacturer's recommendations.

1.05 Job Conditions

A. All existing wet or damaged roofing materials must be removed and replaced with new materials.

B. All existing phenolic insulation and sprayed-in-place urethane roofs must be removed.

C. The specifier must determine the use and placement of vapor retarders. Consult ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc.) and NRCA (National Roofing Contractors Association) publications.

E. Coordinate work between all trades to avoid traffic over completed sections of roofing.

1.06 Warranty.

Fees are required for all Labor and Material (System) Warranties. System Warranties must be obtained through a Mule-Hide Warranty Eligible Applicator. All projects requesting a System Warranty must be inspected by a Mule-Hide Representative. Components of the roofing system must be supplied by Mule-Hide. Warranty covers only Mule-Hide supplied materials. Sample warranties are available upon request. Contact Mule-Hide Warranty Department for warranty requirements.

Part 2 Products

2.01 General

The components of this roofing system are to be manufactured, supplied, or approved in writing by Mule-Hide Products.

2.02 Membrane
Mule-Hide Heat-Welded membranes are used for this system. The membrane is available in a variety of widths, lengths and thicknesses. Refer to our Product Data Sheet for physical properties and other information.

2.03 Related Materials
Mule-Hide products include: Induction Welding Plates, Reinforced and Non-Reinforced Flashings, Bonding Adhesives, Cut-Edge Sealant, Membrane Coated Metal, insulation fasteners and plates, Thermoplastic One-Part Pourable Sealer, All-Purpose Bar, Walkways, Universal Single Ply Sealant, and other components.

Part 3 Execution

3.01 General

A. Work should begin at the highest point of the roof level and proceed to the lowest point. Work should be completed on a daily bases including flashings, terminations, and daily seals.

B. Prepare the existing roof deck or substrate according to Mule-Hide design guides and full-system specifications prior to applying the new roofing system.

3.02 Roof Deck Criteria

A. A proper substrate shall be provided by the building owner. The structure shall be able to withstand normal construction loads and live loads.

B. Substrate must allow for drainage so that all water is removed within 48 hours after a rain.

3.03 Substrate Preparation

A. Re-cover projects - All wet or damaged materials must be removed and replaced with new materials.

B. Substrate must be clean, level, and smooth so that the insulation lays flat. Fresh applications of bitumen based roof cement must be removed or covered.

3.04 Installation

Refer to the applicable Product Data Sheets and Safety Data Sheets for cautions and warnings.

A. Insulation Attachment
Roof insulation is to be preliminarily secured with Manufacturer supplied roofing fasteners and plates or approved adhesive. Minimum attachment rate for the roof insulation is 6 fasteners and plates per 4’ x 8’ board.

B. Induction Welding Plates
Position appropriate Induction Welding Plates over substrate with row and fastener spacing as determined by project requirements. Consult the Mule-Hide Technical Department for attachment requirements. Note: Induction Welding Plate must match the type of Heat-Weld membrane being installed. Only TPO plates may be used with TPO membranes and only PVC plates may be used with PVC membranes. Induction Welding Plates are not for use with fleece backed membranes.

C. Membrane Installation and Hot Air Welding
Place membrane over substrate with minimum 3” overlap at lap seams and positioned so that laps will shed water. Allow membrane to relax. After membrane has relaxed, hot-air weld seams with automatic welder to achieve a min 2” wide heat weld. Bond the Heat-Weld membrane to Induction Welding Plates with Induction Welding Tool. If expanded or extruded polystyrene insulation is the top layer RhinoBond Cardboard Disc’s must be installed between the plate and the insulation.

D. Additional Membrane Securement
The membrane must be secured at the perimeter of each individual roof area, projections, and any angle change that exceeds 2" per lineal foot. Consult Mule-Hide's published detail drawings.

E. Membrane Flashing
All existing base flashings are to be removed or covered with a suitable material. Install new membrane flashings as per manufactures details and guidelines. Flashings must be terminated along top edge as per appropriate Mule-Hide detail.

E. Other Related Work
1. Walkways should be provided in areas where regular rooftop traffic is expected. Walkways are considered a maintenance item and are excluded from the Mule-Hide warranty.

2. Mule-Hide TPO Walkway Rolls are to be installed over clean, dry surfaces, with a minimum 6" spacing over field seams. Hot-air weld the perimeter of the Walkway Roll to the field membrane.

3. Concrete pavers may be used if installed over one layer of HP Protection Mat.

4. Copings, counter flashing and other metal work shall be fastened to resist wind uplift and prevent buckling. Metal should be sealed to prevent moisture infiltration.

This summary specification represents the applicable information available at time of publication. Mule-Hide reserves the right to change this information at any time. Contact Mule-Hide Products or visit our website at www.mulehide.com for the latest updates, changes, or modifications to this summary specification.

OVERVIEW OF UL LISTINGS

MULE-HIDE PRODUCTS, CO., INC.
UNDERWRITERS LABORATORIES (UL)
TGFU.R13850
ROOFING SYSTEMS - TPO

Revised Sept 2016

BALLASTED OVERVIEW

FULLY ADHERED OVERVIEWS

MECHANICALLY ATTACHED OVERVIEWS

MAINTENANCE AND REPAIR OVERVIEWS

Note: The following overviews are intended as a guide for referencing our Mule-Hide UL listings. Please refer to our UL Summary Listings or the UL website for more complete information.

CLASS A – BALLASTED

Class A - TPO – Ballasted				
Deck Type	Insulation	Membrane	Slope	Listing
Non-Combustible and Combustible*	Mule-Hide Poly ISO 1, Poly ISO 2, Poly ISO 1-WF or Poly ISO 1-NB, Any thickness	Any UL Listed	2”	12,13
Combustible (3)	Any UL Classified (any type or thickness) with gypsum cover board	TPO TPO (FR) TPO Extra TPO-FB	2”	10
(1) Thermal barrier may be 1/4” Dens Deck or 1” Atlas AC-IV				
(2) On Gypsum decking, all joints must be grouted.				
(3) Combustible Deck ratings may be used on Non-Combustible Decks				
(4) Max slope to be same as listing for membrane/insulation but can not exceed stated slope				
*(Combustible decks must have a thermal barrier installed under the listed insulations)(1)				

CLASS A – FULLY ADHERED

Deck Type	Insulation	Membrane	Slope	Listing
Class A - TPO – Fully Adhered – Solvent Based Adhesive				
Non-Combustible and Combustible* (Combustible decks must have a thermal barrier installed under the listed insulations)(1)	JM Energy 3 Plus Composite ISO or HDFB (any thickness)	TPO TPO (FR)	1.5” 1”	6 1
	Atlas AC-II, Hunter H-Panel, Dow Hy-Therm, JM Energy-3, Firestone ISO 95+ GL, GW, HF or R-Max Multi-Max-3 (any thickness)	TPO TPO (FR)	1/8” ½”	8 2
	Atlas AC-II Polyiso (any thickness)	TPO	¼”	7
	Any UL Classified (any type or thickness) with gypsum cover board	TPO TPO Extra	3” 2.5”	9 10
	Any UL Classified (any type or thickness) with FR Deck Panel as cover board	Any UL Listed	Max 2” (4)	108
Lightweight Insulating Concrete or Gypsum (2)	None	TPO TPO (FR)	1.5” 1”	6 1
Class A - TPO – Fully Adhered – WBBA-2000 Adhesive				
Non-Combustible and Combustible* (Combustible decks must have a thermal barrier installed under the listed insulations)(1)	Atlas AC-II, Hunter H-Panel, Dow Hy-Therm, JM Energy-3, Firestone ISO 95+ GL, GW, HF or R-Max Multi-Max-3 (any thickness)	TPO TPO Extra TPO (FR)	3/8” 3/8” ½”	12 12 13
	JM Energy 3 Plus Composite ISO or HDFB (any thickness)	TPO TPO Extra TPO (FR)	½” ½” 1”	14 14 15
	Any UL Classified (any type or thickness) with gypsum cover board	TPO & Extra TPO (FR)	1”	16
	Any UL Classified (any type or thickness) with FR Deck Panel as cover board	Any UL Listed	Max 2” (4)	108
Lightweight Insulating Concrete or Gypsum (2)	None	TPO Extra TPO (FR)	1”	15
Class A - TPO – Fully Adhered – Solvent Based Adhesive				
Combustible (3)	Any UL Classified (any type or thickness) with gypsum cover board	TPO (FR)	Unlimited	3
	2 layers VersaSheild underlayment, Any UL classified except EPS(any type or thickness)	TPO & Extra TPO (FR) TPO-FB	Max 2” (4)	4
	2 layers VersaSheild underlayment, Any UL classified except EPS(any type or thickness)	TPO (FR)	Unlimited	11
	Atlas FR-10, FR-50, VersaShield Underlayment or FB-2S under Atlas AC-III min 1.5" thick	TPO TPO (FR) TPO-FB	Max 2” (4)	5
FR Deck Panel A	All joints are blocked and caulked	Any UL listed	1/2:” (4)	61
Class A - TPO – Fully Adhered – WBBA-2000 Adhesive				
Combustible (3)	Any UL Classified (any type or thickness) with gypsum cover board	TPO & Extra TPO (FR)	1”	17
(1) Thermal barrier may be 1/4” Dens Deck or 1” Atlas AC-IV				
(2) On Gypsum decking, all joints must be grouted.				
(3) Combustible Deck ratings may be used on Non-Combustible Decks				
(4) Max slope to be same as listing for membrane/insulation but can not exceed stated slope				

CLASS A – FULLY ADHERED (continued)

Class A – TPO – Fully Adhered (self-adhering TPO)				
Deck Type	Insulation	Membrane	Slope	Listing
Non-Combustible and Combustible* (Combustible decks must have a thermal barrier installed under the listed insulations)(1)	HDFB (1/2" to 3"), HDFB ½" over any UL Classified Insulation (any thickness), Cellular Concrete, pre-cast concrete or structural concrete	SA-TPO	½"	26
	Any UL Classified (any type or thickness) with FR Deck Panel as cover board	Any UL Listed	Max 2" (4)	108
Combustible (3)	Any UL Classified (any type or thickness) with gypsum cover board	SA-TPO	4	27
	2 layers VersaSheild underlayment, Any UL classified except EPS(any type or thickness)	SA-TPO	Max 2" (4)	28
	Atlas FR-10, FR-50, VersaShield Underlayment or FB-2S under Atlas AC-III min 1.5" thick	SA-TPO	Max 2" (4)	29
	3 layers Carlisle FR Base Sheet 2S, VersaSheild or VersaSheild FB-2S underlayment, Any UL classified except EPS(any type or thickness)	SA-TPO	Max 2" (4)	30
FR Deck Panel A	All joints are blocked and caulked	Any UL listed	1/2" (4)	61
Class A – TPO-FB – Fleece Back TPO Fully Adhered with WBBA-2000 Adhesive				
Non-Combustible (Combustible decks must have a thermal barrier installed under the listed insulations)(1)	Atlas AC-II, Hunter H-Panel, Dow Hy-Therm, JM Energy-3, Firestone ISO 95+ GL, GW, HF or R-Max Multi-Max-3 (any thickness)	TPO-FB	½"	31
	Any classified HDFB or OSB over any UL Classified Insulation (any thickness), Cellular Concrete, pre-cast concrete or structural concrete	TPO-FB	1	32
	Any UL Classified (any type or thickness) with FR Deck Panel as cover board	Any UL Listed	Max 2" (4)	108
FR Deck Panel A	All joints are blocked and caulked	Any UL listed	1/2" (4)	61
Combustible (3)	Any UL Classified (any type or thickness) with gypsum cover board	TPO-FB	2	33
(1) Thermal barrier may be 1/4" Dens Deck or 1" Atlas AC-IV				
(2) On Gypsum decking, all joints must be grouted.				
(3) Combustible Deck ratings may be used on Non-Combustible Decks				
(4) Max slope to be same as listing for membrane/insulation but can not exceed stated slope				

CLASS B – FULLY ADHERED

Class B - TPO – Fully Adhered – Solvent Based Adhesive				
Deck Type	Insulation	Membrane	Slope	Listing
Non-Combustible and Combustible* (Combustible decks must have a thermal barrier installed under the listed insulations)(1)	JM Energy 3 Plus Composite ISO or HDFB (any thickness)	TPO Extra	¾”	1
	Any UL Classified Insulation (any type or thickness) with gypsum cover board	TPO (FR)	3”	2
Combustible (3)	Any UL Classified (any type or thickness) with gypsum cover board	TPO (FR)	3”	3
(5) Thermal barrier may be 1/4” Dens Deck or 1” Atlas AC-IV				
(6) On Gypsum decking, all joints must be grouted.				
(7) Combustible Deck ratings may be used on Non-Combustible Decks				
(8) Max slope to be same as listing for membrane/insulation but can not exceed stated slope				

CLASS C – FULLY ADHERED

Class C - TPO – Fully Adhered – Solvent Based Adhesive				
Deck Type	Insulation	Membrane	Slope	Listing
Non-Combustible and Combustible* (Combustible decks must have a thermal barrier installed under the listed insulations)(1)	Atlas AC-II, Hunter H-Panel, Dow Hy-Therm, JM Energy-3, Firestone ISO 95+ GL, GW, HF or R-Max Multi-Max-3 (any thickness)	TPO TPO Extra TPO (FR) TPO-FB	Unlimited	4
	Any UL Classified (any type or thickness) with FR Deck Panel as cover board	Any UL Listed	Max 2” (4)	9
FR Deck Panel C	None	Any UL Listed	Max 2” (4)	2
Combustible (3)	JM Energy 3 Plus Composite ISO or HDFB (min ½”)	TPO TPO Extra TPO (FR) TPO-FB	1	3
	Atlas AC-II, Hunter H-Panel, Dow Hy-Therm, JM Energy-3, Firestone ISO 95+ GL, GW, HF or R-Max Multi-Max-3 (any thickness)	TPO TPO Extra TPO (FR)	Unlimited	5
Class C – TPO – Fully Adhered (self-adhering TPO)				
Deck Type	Insulation	Membrane	Slope	Listing
Non-Combustible and Combustible* (Combustible decks must have a thermal barrier installed under the listed insulations)(1)	Poly ISO1, Poly ISO 1 DWD, Poly ISO 2, Atlas AC-II, AC-III, Hunter H-Shield, H-Shield DWD, JM Energy-2, Energy-3 Firestone ISO 95+ GL or R-Max Multi Max	TPO-SA	Unlimited	7
	Any UL Classified (any type or thickness) with FR Deck Panel as cover board	Any UL Listed	Max 2” (4)	9
Combustible (3)	Poly ISO1, Poly ISO 1 DWD, Poly ISO 2, Atlas AC-II, AC-III, Hunter H-Shield, H-Shield DWD, JM Energy-2, Energy-3 Firestone ISO 95+ GL or R-Max Multi Max Minimum 2” thick	TPO-SA	Unlimited	8
	UL labeled HDFB – ½” minimum	TPO-SA	1”	6
Class C – TPO-FB – Fleece Back TPO Fully Adhered with WBBA-2000 Adhesive				
Combustible (3)	UL labeled PolyISO – 2” minimum	TPO-FB	Unlimited	10
(1) Thermal barrier may be 1/4” Dens Deck or 1” Atlas AC-IV				
(2) On Gypsum decking, all joints must be grouted.				
(3) Combustible Deck ratings may be used on Non-Combustible Decks				
(4) Max slope to be same as listing for membrane/insulation but can not exceed stated slope				

CLASS A – MECHANICALLY ATTACHED

Class A - TPO – Mechanically Attached				
Deck Type	Insulation	Membrane	Slope	Listing
Non-Combustible and Combustible* (Combustible decks must have a thermal barrier installed under the listed insulations)(1)	Atlas AC-II, Hunter H-Panel, Dow Hy-Therm, JM Energy-3, Firestone ISO 95+ GL, GW, HF or R-Max Multi-Max-3 (any thickness)	TPO TPO Extra TPO (FR) TPO-FB	½” ½” 1.5” ½”	1 13 3 14
	JM Energy 3 Plus Composite ISO or HDFB (any thickness)	TPO TPO Extra TPO (FR)	1.5”	2 12 4
	Optional – any UL Listed, any thickness with overlay of JM Energy 3 Plus Composite ISO or HDFB (any thickness)	TPO-FB	1.5”	15
	Any UL Classified (any type or thickness) with gypsum cover board	TPO TPO-FB	3”	5 16
	Any UL Classified (any type or thickness) with FR Deck Panel as cover board	Any UL Listed	Max 2” (4)	108
	Any UL Classified Expanded or Extruded Polystyrene (any type or thickness) With Atlas FR-10 or VersaShield slipsheet	TPO TPO Extra TPO (FR) TPO-FB	1”	18
	Any UL Classified (any type or thickness) with FR Deck Panel as cover board	Any UL Listed	Max 2” (4)	108
Combustible (3)	Two layers of Atlas FR-10 with optional any UL Classified except EPS and HDFB (any type or thickness)	Any UL Classified	Max ¾”(4)	**24
	2 layers VersaSheild Underlayment or FB-S2 under Any UL classified except EPS (any type or thickness)	TPO TPO Extra TPO (FR) TPO-FB	Max 2” (4)	6 or 17
	3 layers VersaSheild FB-1S under Any UL classified except EPS (any type or thickness)	TPO TPO (FR) TPO Extra TPO-FB	Max 2”(4)	19 or 20
	Atlas FR 10 underlayment, Atlas AC-III min 1.5" thick	TPO TPO (FR) TPO-FB	See Note (4)	8
	Optional any UL Classified (any type or thickness) with gypsum cover board	TPO Extra TPO-FR	2.5” Unlimited	11 7
	Two plies of Atlas FR-50 or VersaShield Underlayment or FB-2S	TPO TPO Extra TPO (FR) TPO-FB	½”	9 10
FR Deck Panel A	All joints are blocked and caulked	Any UL listed	1/2:” (4)	61
(1) Thermal barrier may be 1/4” Dens Deck or 1” Atlas AC-IV				
(2) On Gypsum decking, all joints must be grouted.				
(3) Combustible Deck ratings may be used on Non-Combustible Decks				
(4) Max slope to be same as listing for membrane/insulation but can not exceed stated slope				

CLASS B – MECHANICALLY ATTACHED

Class B - TPO – Mechanically Attached				
Deck Type	Insulation	Membrane	Slope	Listing
Combustible (3)	One layer of Atlas FR-10	Any UL Classified	Max ½"(4)	**6
	One layer of OC Perma Ply No. 28, GAF Gafglas #75, JM Glasbase, Tamko Glass Base, Celotex Type G2 Vaporbar GB, VersaShield Underlayment or FB-2S installed under Atlas AC-II, Dow Hy-Therm, Hunter Panel H-Shield, JM Energy-3, Firestone ISO 95+GL, GW, HF, Rmax Multi-Max-3 (any thickness) or Min ½" HDFB over Min 1" thick any classified insulation	Any UL Classified	Max 1"(4)	1
	JM Energy 3 or HDFB (minimum 1.5" thick)	TPO TPO Extra TPO (FR) TPO-FB	Max 1"(4)	2
	One layer of Atlas FR-10 or VersaShield Underlayment or FB-2S	TPO TPO Extra TPO-FR TPO-FB	Max 1.5" (4)	3
	Optional Min 1" Polisocyanurate Two layers of Atlas FR-50 or VersaShield Underlayment of FB-2S	TPO TPO Extra TPO (FR) TPO-FB	½	4
	One layer of Atlas FR-50	TPO (FR)	½"	5
(1) Thermal barrier may be 1/4" Dens Deck or 1" Atlas AC-IV				
(2) On Gypsum decking, all joints must be grouted.				
(3) Combustible Deck ratings may be used on Non-Combustible Decks				
(4) Max slope to be same as listing for membrane/insulation but can not exceed stated slope				

CLASS C – MECHANICALLY ATTACHED

Class C - TPO – Mechanically Attached				
Deck Type	Insulation	Membrane	Slope	Listing
Non-Combustible and Combustible* (Combustible decks must have a thermal barrier installed under the listed insulations)(1)	Atlas AC-II, Hunter H-Panel, Dow Hy-Therm, JM Energy-3, Firestone ISO 95+ GL, GW, HF or R-Max Multi-Max-3 (any thickness)	TPO TPO Extra TPO (FR)	Unlimited	2
Combustible (3)	JM Energy 3 or HDFB (minimum 1.5” thick)	TPO TPO Extra TPO (FR) TPO-FB	1”	1
	Atlas AC-II, Hunter H-Panel, Dow Hy-Therm, JM Energy-3, Firestone ISO 95+ GL, GW, HF or R-Max Multi-Max-3 (min. 2” thickness)	TPO TPO Extra TPO-FR TPO-FB	Unlimited	3
(1) Thermal barrier may be 1/4” Dens Deck or 1” Atlas AC-IV				
(2) On Gypsum decking, all joints must be grouted.				
(3) Combustible Deck ratings may be used on Non-Combustible Decks				
(4) Max slope to be same as listing for membrane/insulation but can not exceed stated slope				

MAINTENANCE AND REPAIR - CLASS A, B and C

TPO – Mechanically Attached				
Deck Type	Insulation	Membrane	Slope	Listing
Combustible (3)	Existing Class A, B or C roofing system to retain existing rating, covered with Manniglass 1200, Atlas FR-10, VersaSheild or Type G-2 base sheet	TPO (5) TPO Extra (5) TPO (FR) (5)	½” ½” ¾”	7 7 8
	Existing Class A, B or C roofing system wit gravel to retain existing rating, covered with OC Durapink, 1”	TPO (5) TPO Extra (5) TPO (FR) (5) TPO-FB (5)	1”	9
	Existing Class A, B or C roofing system to retain existing rating, covered with one or more layers of Atlas FR-50 or VersaShield FB-2S	TPO (5) TPO Extra (5) TPO-FR (5) TPO-FB (5)	Max 1.5” (4)	10
	Existing Class A, B or C roofing system to retain existing rating, covered with Poly ISO 1-HD or Poly ISO 1-HD90	Any UL Classified	Max 2” (4)	12
	Existing Class A, B or C roofing system to retain existing rating, covered with Poly ISO 1-HD Composite	Any UL Classified	Max ½” (4)	13
(1) Thermal barrier may be 1/4” Dens Deck or 1” Atlas AC-IV				
(2) On Gypsum decking, all joints must be grouted.				
(3) Combustible Deck ratings may be used on Non-Combustible Decks				
(4) Max slope to be same as listing for membrane/insulation but can not exceed stated slope				
(5) New roofing system is mechanically fastened				

MAINTENANCE AND REPAIR SYSTEM – CLASS A

TPO				
Deck Type	Insulation	Membrane	Slope	Listing
Non-Combustible and Combustible*	Existing Class A, gravel may be maintained, covered with Tenneco AMOCOR PB-6, PG38 or PG39	TPO TPO Extra TPO (FR)	¼" (5)	17
	Existing Class A, B or C BUR or Mod Bit roofing system, covered with Atlas AC-II, Dow Hy-Therm, Hunter Panel H-Sheild, JM Energy-3, Firestone ISO 95+ GL, GW, HF, Rmax Multi-Max-3 (any combination, any thickness)	TPO (5) TPO Extra (5) TPO (FR) (5) TPO-FB	½"	19
	Existing Class A, B or C roofing system covered with minimum 3" layer or minimum 2 layers of Poly ISO 1-DWD	Any UL Classified	Max ½" (4)	21
Combustible (3)	Existing Class A, B or C roofing system to maintain existing classification, covered with two or more layers of Atlas FR-50, VersiSheild Underlayment or FB-2S	TPO (5) TPO Extra (5) TPO (FR) (5) TPO-FB (5)	½"	18
	Existing Class A, B or C roofing system covered with minimum 3" layer or minimum 2 layers of Poly ISO 1-DWD	Any UL Classified	Max ½" (4)	22
(1) Thermal barrier may be 1/4" Dens Deck or 1" Atlas AC-IV				
(2) On Gypsum decking, all joints must be grouted.				
(3) Combustible Deck ratings may be used on Non-Combustible Decks				
(4) Max slope to be same as listing for membrane/insulation but can not exceed stated slope				
(5) New roofing system is mechanically fastened				

MAINTENANCE AND REPAIR SYSTEM – CLASS B

TPO				
Deck Type	Insulation	Membrane	Slope	Listing
Non-Combustible and Combustible*	Existing Class A, B or C roofing system gravel may be maintained, covered with minimum 1.9" Poly ISO 1-DWD	Any UL Classified	Max ½" (4)	6
Combustible (3)	Existing Class B mineral or smooth surfaced BUR or Mod Bit to retain existing classification	TPO (5) TPO Extra (5) TPO (FR) (5) TPO-FB (5)	½"	5
	Existing Class A, B or C roofing system gravel may be maintained, covered with minimum 1.9" Poly ISO 1-DWD	Any UL Classified	Max ½" (4)	7
(1) Thermal barrier may be 1/4" Dens Deck or 1" Atlas AC-IV				
(2) On Gypsum decking, all joints must be grouted.				
(3) Combustible Deck ratings may be used on Non-Combustible Decks				
(4) Max slope to be same as listing for membrane/insulation but can not exceed stated slope				

MAINTENANCE AND REPAIR SYSTEM – CLASS B and C

TPO				
Deck Type	Insulation	Membrane	Slope	Listing
Combustible (3)	Existing Class B or C roofing system to retain existing classification covered with one or more layers of Atlas FR-50, VersaSheild Underlayment or FB-2S	TPO (5) TPO Extra (5) TPO (FR) (5) TPO-FB (5)	½"	1
(1) Thermal barrier may be 1/4" Dens Deck or 1" Atlas AC-IV				
(2) On Gypsum decking, all joints must be grouted.				
(3) Combustible Deck ratings may be used on Non-Combustible Decks				
(4) Max slope to be same as listing for membrane/insulation but can not exceed stated slope				
(5) New roofing system is mechanically fastened				

UL Listings - TPO

"The name trusted in roofing since 1906"

MULE-HIDE PRODUCTS

MULE-HIDE PRODUCTS, CO., INC.
UNDERWRITERS LABORATORIES (UL)
TGFU.R13850
ROOFING SYSTEMS - TPO

Revised July 2019

ANY SYSTEM

BALLASTED SYSTEMS

FULLY ADHERED

MECHANICALLY ATTACHED

MAINTENANCE AND REPAIR SYSTEMS

1195 Prince Hall Dr.
Beloit, WI 53511-5481

608-365-3111 ● Fax: 608-365-7852 ● www.mulehide.com

P.O. Box 1057
Beloit, WI 53512-1057

* Note: Assembly numbers shown in the following listings correspond to the UL Master Listing number for all Mule-Hide Products, Co., Inc.

Note: Assembly numbers shown in the following listings correspond to the UL Master Listing number for **Atlas Roofing Corp.

***Note: Assembly numbers shown in the following listings correspond to the UL Master Listing number for **GEORGIA-PACIFIC GYPSUM LLC**

Uniform thickness or tapered insulation may be used in the following systems provided they do not exceed the indicated incline or thickness.

Any system listed for use over a combustible deck can be installed over a non-combustible deck and achieve the same classification.

Unless otherwise indicated, on non-combustible decks, Mule-Hide Products "Poly ISO 1-NB", "Poly ISO 1-HD" or "Poly ISO 1-HD90" or "Poly ISO 1-HD-Composite" may replace, or be used in addition to, any Poly ISO 1 product or any UL Classified wood fiberboard, in any UL Classified insulated roofing system assembly and retain the classification of that assembly, though the max slope cannot exceed 1/2:12 if "Poly ISO 1- HD", "Poly ISO 1-HD-Composite" or " Poly ISO 1-HD90" is used directly below TPO membrane. Unless otherwise indicated, on combustible decks, "Poly ISO 1-NB","Poly ISO 1-HD", "Poly ISO 1-HD-Composite", and "Poly ISO 1-HD90" may be used in addition to any Poly ISO 1 product or any UL Classified wood fiber board, in any insulated UL Classified roofing system assembly and retain the classification of that assembly, though the max slope cannot exceed 1/2:12 if "Poly ISO 1- HD", "Poly ISO 1-HD-Composite" or " Poly ISO 1-HD90" is used directly below TPO membrane.

Mule-Hide Products "Poly ISO 1-HD", "Poly ISO 1-HD-Composite" or "Poly ISO 1-HD90" (min. 1/2 in. thickness) may be used over any UL Classified polystyrene on non-combustible decks. Max incline shall be in accordance with the Classification established for the insulation/membrane roofing system, but cannot exceed 2:12.

Unless otherwise indicated, insulation is mechanically fastened to the roof deck.

Unless otherwise indicated, when referring to gypsum board in the following Certifications, the following will be referenced: minimum ¼-in. thick Georgia-Pacific Gypsum LLC "DensDeck® Roofboard", "DensDeck Prime® Roofboard", "DensDeck DuraGuard™ Roofboard" or minimum, United States Gypsum Co. "SECUROCK™ Roof Board Type FRX-G" or "SECUROCK™ Roof Board Type SGMRX"or regular gypsum board (not Certified) laid with staggered joints (minimum of 6-in. offset) measuring 0.463 in. thick minimum and weighing a minimum of 184-lbs/100-ft.2 or Georgia-Pacific Gypsum LLC "Sound Deadening" Board, measuring minimum 0.208-in. thick and weighing a minimum of 109-lbs/100-ft.2 or minimum ¼-in. thick United States Gypsum Co. "SECUROCK™ Roof Board Type FRX-G" is limited to a maximum 3:12 slope when used as a thermal barrier over a combustible deck in a system with any UL Certified insulation except polystyrene. Minimum ½-in. thick United States Gypsum Co. "SECUROCK™ Roof Board Type FRX-G" is limited to a maximum 1:12 slope when used as a thermal barrier over a combustible roof deck in a system without insulation or with any UL Certified polystyrene insulation. Minimum ¼-in. thick Georgia-Pacific Gypsum LLC "DensDeck® Roofboard", "DensDeck Prime® Roofboard", "DensDeck DuraGuard™ Roofboard"or minimum ¼-in. thick Owens Corning "Strataguard" or minimum ¼-in. thick United States Gypsum Co. "SECUROCK™ Roof Board Type FRX-G" or "SECUROCK™ Glass-Mat Roof Board Type SGMRX" or regular gypsum board may replace Carlise Syntec Inc. "HP Recovery Board" in any

existing noncombustible deck Certification. When this is done, the resulting roofing system is acceptable for use over combustible (15/32-in. minimum) roof decks. The joints in the gypsum board are offset a minimum of 6-in. with the butt joints in the roof deck. Minimum ¼-in. United States Gypsum Co. "SECUROCK™ Roof Board Type FRX-G" is limited to a maximum 3:12 slope when used over a combustible roof deck in a system with any UL Certified insulation except polystyrene. Minimum ½-in. thick United States Gypsum Co. "SECUROCK™ Roof Board Type FRX-G" is limited to a maximum 1:12 slope when used over a combustible roof deck in a system without insulation or with any UL Certified polystyrene insulation.

Minimum ½-in. thick gypsum board or minimum ¼-in. thick Owens Corning "Strataguard" or minimum ¼-in.1 United States Gypsum Co. "SECUROCK™ Roof Board Type FRX-G" or "SECUROCK™ Glass-Mat Roof Board Type SGMRX" or minimum ¼-in. thick Georgia-Pacific Gypsum LLC "DensDeck® Roofboard", "DensDeck Prime® Roofboard", "DensDeck DuraGuard™ Roofboard" may be used in any existing noncombustible roof deck Certification. When this is done, the resulting roofing system is acceptable for use over combustible (15/32-in. minimum) roof decks. The joints in the gypsum board and overlayment board are offset a minimum of 6-in. with the butt joints in the roof deck. Minimum ¼-in. thick United States Gypsum Co. "SECUROCK™ Roof Board Type FRX-G" is limited to a maximum 3:12 slope when used as a thermal barrier over a combustible roof deck in a system with any UL Certified insulation except polystyrene. Minimum ½-in. thick United States Gypsum Co. "SECUROCK™ Roof Board Type FRX-G" is limited to a maximum 1:12 slope when used as a thermal barrier over a combustible roof deck in a system without insulation or with any UL Certified polystyrene insulation.

Unless otherwise indicated, any UL Classified wood fiber board, any oriented strand board (OSB), Mule-Hide Poly ISO 1-NB or Hunter Panels H-Shield-NB may replace "HP Recovery Board" in any of the systems mentioned below.

Straight or tapered insulation may be used in the following assemblies provided they do not exceed the indicated incline or thickness and carry a UL label.

Unless otherwise indicated in the systems described below, any adhesive splice may be overlaid with pressure-sensitive flashing in any TPO system.

A vapor barrier (non-UL Classified) may be used below the insulation in any of the following systems without affecting the Classification.

Unless otherwise indicated, the term "Referenced Insulations" will include the following: Atlas Roofing "ACFoam II" or "ACFoam III", Mule-Hide Poly ISO 2, Dow "Hy-Therm AP", Hunter Panels "H-Shield", "H-Shield ca", ","H-Shieldw", "H-Shield-CG", "H-Shield CGw", "H-Shield HD", "H-Shield HD90", "H-Shield HD Composite" or "H-Shield HD Composite CG", Mule-Hide Poly ISO 1, Poly ISO 1 DWD, Poly ISO 1-HD, Poly ISO 1-HD90, Poly ISO 1-HD-Composite, Johns Manville "ENRGY- 2", or "ENRGY-3", Firestone Building Products "ISO 95+GL", "GW" or "HF", Rmax "Multi-Max", any thickness.

Any UL Classified United Solar Systems Corp Photovoltaic (Solar) Module System may be installed over any of the following UL Classified Mule-Hide roofing membrane assemblies that utilizes gypsum board, provided that the roofing membrane is applied directly over the gypsum (either adhered to, mechanically fastened over or loosely-laid over the gypsum): TPO-c, TPO-c (FR), TPO-c Extra, TPO-c Extra (FR) and TPO-c Fleece Back.

The Module system is either self-adhered directly to the roofing membrane in the field or self-adhered to an intermediate roofing material layer in the factory and then attached to the roofing membrane in the field using liquid adhesive, tape adhesive or fasteners. The Classification applies to combustible and non-combustible decks. Any UL Classified insulation, any combination, any thickness, may be installed below the gypsum. The maximum incline and Classification (Class A, B or C) shall be in accordance with the Classification established for the membrane roofing assembly, however the incline can not exceed 1-1/2:12.

Any UL Classified Mule-Hide TPO roofing system is Classified for Class 4 Impact Resistance when the following conditions are met:

1. Minimum 80 mil (nominal thickness) Mule-Hide TPO-c, TPO-c Fleece BACK (100 or 115) or TPO-c Fleece Back Plus membrane is applied over any of the following substrates: Barrier Board, Oriented Strand Board, Plywood or Slipsheet over Plywood. These substrates may be placed over insulation or additional substrate layers as specified in the roofing systems. The substrate layer(s) are attached with fasteners and minimum 2 in. metal or plastic plates.

2. Minimum 45 mil (nominal thickness) Mule-Hide TPO-c, TPO-c Fleece BACK (100 or 115) or TPO-c Fleece Back Plus membrane is applied over any combination of substrate layers, as specified in the roofing systems, and the top substrate layer is attached with adhesives or asphalt. Lower substrate layers may be attached with fasteners and plates, adhesives or asphalt.

3. Any UL Classified Mule-Hide ballasted roofing system described below is Classified for Class 4 Impact Resistance.

ALL SYSTEMS

Class A, B or C (See Note 1)

***1. **Deck:** C-15/32 **Incline:** See Notes 1 and 4

Insulation: — Any UL Classified, any thickness.
Barrier Board: (See Note 2) — ¼-in., ½-in. or 5/8-in. thick "DensDeck ® Roofboard" or "DensDeck Prime® Roofboard" or "DensDeck Prime 2™ Roofboard" or "DensDeck DuraGuard® Roofboard" with all joints staggered a min of 6 in. from the plywood joints.
Membrane: — Any UL Classified modified bitumen system, BUR system or CPE, CSM, CSPE, EPDM, NBP, PIB, PVC, TPO or TRE membrane system suitable for use with any roof insulation.

***2. **Deck:** C-15/32 **Incline:** See Notes 1 and 4

Barrier Board: (See Note 3) — ¼-in., ½-in. or 5/8-in. thick "DensDeck ® Roofboard," or "DensDeck Prime® Roofboard" or "DensDeck Prime 2™ Roofboard"or "DensDeck DuraGuard ® Roofboard" with all joints staggered a min of 6 in. from the plywood joints.
Insulation (Optional): — Fiberglass, polyisocyanurate, perlite or wood fiber, any thickness.
Membrane: — Any UL Classified modified bitumen system, BUR system or CPE, CSM, CSPE, EPDM, NBP, PIB, PVC, TPO or TRE membrane system suitable for use with any roof insulation.

Note 1: Classification (A, B or C) and max incline will be the same as that of the Classified Roofing System (TGFU) currently limited to noncombustible deck.

Note 2: The use of the "DensDeck® Roofboard," or "DensDeck Prime® Roofboard" or (min ½ in.) DensDeck Prime 2™ Roofboard" or "DensDeck DuraGuard® Roofboard" as a barrier board over the insulation permits the use of any Classified Roofing System (TGFU) which otherwise is limited to use over noncombustible deck.

Note 3: The use of the "DensDeck® Roofboard," or "DensDeck Prime® Roofboard" or (min ½ in.) DensDeck Prime 2™ Roofbaord" or "DensDeck DuraGuard® Roofboard" as a barrier board directly over the combustible deck permits the use of any Classified Roofing System (TGFU) which otherwise is limited to use over noncombustible deck. When used, insulation must consist of one of the types specified.

Note 4: The use of ¼ in. thick "DensDeck Prime 2™" limited to a slope of 2-1/2 in. or less.

ALL SYSTEMS

Class A

For Combustible Decks - Class A: **Incline:** 1/2

1. A minimum 3 in. layer or a minimum two layers of 1.5 in. of "Poly ISO 1-DWD" or "Poly ISO 1-HD-Composite" is placed directly over a combustible deck and is covered with any UL Classified roofing membrane used in any UL Class A roofing assembly to achieve a Class A fire Classification. As an alternative, any UL Classified insulation (except expanded or extruded polystyrene), any combination, any thickness, may be used below the 3 in. minimum total thickness of "Poly ISO 1-DWD" or "Poly ISO 1-HD-Composite". The insulation may be loosely laid or attached with fasteners and plates, hot roofing asphalt or cold adhesive. A vapor barrier (non-UL classified) may also be used below the insulation. All insulation joints must be staggered a minimum of 6 in. from the deck joints or from the insulation joints directly below. The maximum incline shall be in accordance with the Classification established for the membrane/insulation roofing assembly, however the incline can not exceed 1/2:12.

2. A minimum 1.9 in. layer of "Poly ISO 1-DWD" or "Poly ISO 1-HD-Composite" is placed over a minimum 1 layer of Carlisle "FR Base Sheet 1S" or Elk "VersaShield FB-1S" over a combustible deck. The insulation is covered with any UL Classified roofing membrane used in any UL Class A roofing assembly to achieve a Class A fire Classification. As an alternative, any UL Classified insulation (except expanded or extruded polystyrene), any combination, any thickness, may be used below the 1.9 in. minimum total thickness of "Poly ISO 1-DWD" or "Poly ISO 1-HD-Composite". The insulation may be loosely laid or attached with fasteners and plates, hot roofing asphalt or cold adhesive. A vapor barrier (non-UL classified) may also be used below the insulation. All insulation joints must be staggered a minimum of 6 in. from the deck joints or from the insulation joints directly below. The maximum incline shall be in accordance with the Classification established for the membrane/insulation roofing assembly, however the incline can not exceed 1/2:12.

3. A minimum 1 in. layer of Mule-Hide Panels "Poly ISO 1-WD-Class A" is placed directly over a combustible deck and is covered with any UL Classified roofing membrane used in any UL Class A roofing assembly to achieve a Class A fire Classification. As an alternative, any UL Classified insulation (except expanded or extruded polystyrene), any combination, any thickness, may be used below the 1 in. minimum thickness of Mule-Hide Panels "Poly ISO 1-WD-Class A ". The insulation may be loosely laid or attached with fasteners and plates, hot roofing asphalt or cold adhesive. A vapor barrier (non-UL classified) may also be used below the insulation. All insulation joints must be staggered a minimum of 6 in. from the deck joints or from the insulation joints directly below. The maximum incline shall be in accordance with the Classification established for the membrane/insulation roofing assembly, however the incline can not exceed 1/2:12.

Class A – All Systems (Continued)

**** For Combustible Decks - Class A:**

4. A minimum 1 in. layer of "AC Foam IV" placed directly over a combustible deck and covered with any UL Classified roofing membrane used in any UL Class A roofing assembly to achieve a Class A fire Classification. As an alternate, any UL Classified insulation (except expanded or extruded polystyrene), any combination, any thickness, may be used above or below the 1 in. minimum total thickness of "AC Foam IV." All insulation joints must be staggered a minimum of 6 in. from the deck joints or from the insulation joints directly below. The maximum incline shall be in accordance with the Classification established for the membrane/insulation roofing assembly, however the incline cannot exceed 1:12.

ALL SYSTEMS

Class B

For Combustible Decks - Class B: **Incline:** 1/2

1. A minimum 1.9 in. layer of "Poly ISO 1-DWD", or a minimum 2 in. thick layer of Carlisle "Polyiso HP-WLC" or Atlas "AC Foam III" is placed directly over a combustible deck and is covered with any UL Classified roofing membrane used in any UL Class B roofing assembly to achieve a Class B fire Classification. As an alternative, any UL Classified insulation (except expanded or extruded polystyrene), any combination, any thickness, may be used below the 1.9 in. minimum thickness layer of "Poly ISO 1-DWD". The insulation may be loosely laid or attached with fasteners and plates, hot roofing asphalt or cold adhesive. A vapor barrier (non-UL classified) may also be used below the insulation. All insulation joints must be staggered a minimum of 6 in. from the deck joints or from the insulation joints directly below. The maximum incline shall be in accordance with the Classification established for the membrane/insulation roofing assembly, however the incline can not exceed 1/2:12.

CLASS A – BALLASTED

Unless otherwise indicated in the systems described below, the insulation and the membrane are laid loosely and surfaced with river bottom stone, nom 1-1/2 in. diameter, at 1000 lbs/sq min. Suitable alternates are size Nos. 1, 2, 24, 3 and 4 (as per ASTM D448), also at 1000 lbs/sq min. In addition, concrete pavers or crushed stone may be used. Pavers must weigh 1000 lbs/sq min and spaced no more than 1/8 in. apart and the crushed stone must beet the above size and weight requirements. Thermoplastic membrane may be adhered to the substrate with "Mule-Hide Thermoplastic Membrane Bonding Adhesive" at 1 gal/100 sq ft.

10. **Deck:** C-15/32 **Incline:** 2
Insulation (Optional): — Any UL Classified insulation, any thickness.
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c (FR)", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c Extra (FR)" or "Mule-Hide TPO-c Fleece Back", loose laid, adhered or mechanically fastened.
Surfacing: — Stone or paver ballast applied at min 10 lb/sq/ft

12. **Deck:** NC **Incline:** 2
Insulation: — "Poly ISO 1", "Poly ISO 2", "Poly ISO 1-WF" or "Poly ISO 1-NB, any thickness.
Membrane: — Any UL Classified, laid loosely.
Surfacing: — River Bottom Stone (3/4 - 1-1/2 in. diam), 1000 lbs/sq.

13. **Deck:** NC **Incline:** 2
Insulation: — "Poly ISO 1", "Poly ISO 1-NB" or "Poly ISO 1-WF", any thickness.
Membrane: — Any UL Classified, laid loosely.
Surfacing: — River Bottom Stone (3/4 - 1-1/2 in. diam), 1000 lbs/sq.

CLASS A – FULLY ADHERED

1. **Deck:** NC Incline: 1

Insulation: — Any UL Certified wood fiberboard; Johns Manville "ENRGY 3 Plus" (composite) insulation; cellular concrete, precast concrete with grouted joints or structural (poured-in-place) concrete.
Membrane: — "Mule-Hide TPO-c (FR)", fully adhered with "Mule-Hide TPO-c Bonding Adhesive", at 1-1/3 gal/100-ft.2.

2. **Deck:** NC Incline: 1/2

Insulation: — "Poly ISO 1" or "Poly ISO 2" or Atlas Roofing Corp. "ACFoam II", "ACFoam III" or Dow "Hy-Therm AP" or Hunter Panels "H-Shield" or Johns Manville "ENRGY-3" or Firestone Building Products "ISO 95+GL", "GW" or "HF" or Rmax Operating LLC "Multi-Max-3", any combination, any thickness.
Membrane: — "Mule-Hide TPO-c (FR)", fully adhered with "Mule-Hide TPO-c Bonding Adhesive", at 1-1/3 gal/100-ft.2.

3. **Deck:** C-15/32 Incline: Unlimited

Insulation (Optional): — Any UL Certified, any combination, any thickness.
Barrier Board: — Minimum ½-in. gypsum board or minimum ¼-in. thick Georgia-Pacific Gypsum LLC "DensDeck® Roofboard", "DensDeck Prime® Roofboard", "DensDeck DuraGuard™ Roofboard".
Membrane: — "Mule-Hide TPO-c (FR)", fully adhered with "Mule-Hide TPO-c Bonding Adhesive" at 1-1/3 gal/100-ft.2.

4. **Deck:** C-15/32 Incline: See Note

Slip Sheet: — Two layers GAF "VersaShield Underlayment" or "VersaShield FB-2S".
Insulation: — Any UL Certified (except EPS), any combination, any thickness.
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c (FR)", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c Extra (FR)" or "Mule-Hide TPO-c Fleece Back".

Note: Maximum incline shall be in accordance with Certification established for the insulation/membrane roofing system, but cannot exceed 2:12.

5. **Deck:** C-15/32 Incline: See Note

Slip Sheet: — One layer Atlas Roofing Corp. "FR-10" or "FR-50" or GAF "VersaShield Underlayment" or "VersaShield FB-2S".
Insulation: — Atlas Roofing "ACFoam III", minimum 1.5-in. thick with joints staggered minimum 6-in. from the deck joints.
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c (FR)", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c Extra (FR)" or "Mule-Hide TPO-c Fleece Back".

Note: Maximum incline shall be in accordance with Certification established for the insulation/membrane roofing system.

Class A – Fully Adhered (Continued)

6. **Deck:** NC Incline: 1-1/2
Insulation: — Any UL Certified wood fiberboard; Johns Manville "ENRGY 3 Plus" (composite) insulation; cellular concrete, precast concrete with grouted joints or structural (poured-in-place) concrete.
Membrane: — "Mule-Hide TPO-c", fully adhered with "Mule-Hide TPO-c Bonding Adhesive", at 1-1/3 gal/100-ft.2.

7. **Deck:** NC Incline: 1/4
Insulation: — "Poly ISO 2" or Atlas Roofing "ACFoam II", any thickness.
Membrane: — "Mule-Hide TPO-c", fully adhered with "Mule-Hide TPO-c Bonding Adhesive" at 1-1/3 gal/sq.

8. **Deck:** NC Incline: 1/8
Insulation: — "Poly ISO 2" or Atlas Roofing "ACFoam II", "ACFoam III" or Dow "Hy-Therm AP" or Hunter Panels "H-Shield" or Johns Manville "ENRGY-3" or Firestone Building Products "ISO 95+GL", "GW" or "HF" or Rmax Operating LLC" Multi-Max-3", any combination, any thickness.
Membrane: — "Mule-Hide TPO-c ", fully adhered with "Mule-Hide TPO-c Bonding Adhesive" at 1-1/3 gal/100-ft.2.

9. **Deck:** NC Incline: 3
Insulation (Optional): — Any UL Certified, any combination, any thickness.
Barrier Board: — Minimum ½-in. thick gypsum board.
Membrane: — "Mule-Hide TPO-c", fully adhered with "Mule-Hide TPO-c Bonding Adhesive" at 1-1/3 gal/100-ft.2.

10. **Deck:** NC Incline: 2-1/2 Impact: 2
Insulation (Optional): — Any UL Certified, any combination, any thickness.
Barrier Board: — Minimum ½-in. thick gypsum board.
Membrane: — "72 mil Mule-Hide TPO-c Extra" or "80 mil Mule-Hide TPO-c Extra", fully adhered with "Mule-Hide TPO-c Bonding Adhesive" at 1-1/3 gal/100-ft.2.

11. **Deck:** C-15/32 Incline: Unlimited
Slip Sheet: — Three layers GAF "VersaShield Underlayment" or "VersaShield FB-2S".
Insulation: — Any UL Certified (except EPS or fiberboard), any combination, any thickness.
Membrane: — "Mule-Hide TPO-c (FR)" membrane, fully adhered with "Mule-Hide TPO-c Bonding Adhesive" at 1-1/3 gal/100-ft.2.

12. **Deck:** NC Incline: 3/8
Insulation: — "Poly ISO 1", "Poly ISO 2" or Atlas Roofing Corp. "ACFoam II", "ACFoam III" or Dow "Hy-Therm AP" or Hunter Panels "H-Shield", Johns Manville "ENRGY-3" or Firestone Building Products "ISO 95+GL", "GW" or "HF" or Rmax Operating LLC "Multi-Max-3", any combination, any thickness.
Membrane: — "Mule-Hide TPO-c" or "Mule-Hide TPO-c Extra", fully adhered with "WBBA 2000" bonding adhesive, at 120-ft2/gal.

Class A – Fully Adhered (Continued)

13. **Deck:** NC Incline: 1/2
Insulation: — "Poly ISO 1", "Poly ISO 2" or Atlas Roofing Corp. "ACFoam II", "ACFoam III" o rDow "Hy-Therm AP" or Hunter Panels "H-Shield" or Johns Manville "ENRGY-3" or Firestone Building Products "ISO 95+GL", "GW" or "HF" or Rmax Operating LLC "Multi-Max-3", any combination, any thickness.
Membrane: — "Mule-Hide TPO-c (FR)" or "Mule-Hide TPO-c Extra (FR)", fully adhered with "WBBA 2000" bonding adhesive, at 120-ft2/gal.

14. **Deck:** NC Incline: 1/2
Insulation: — Any UL Certified wood fiberboard; Johns Manville "ENRGY 3 Plus" (composite) insulation; cellular concrete, precast concrete with grouted joints or structural (poured-in-place) concrete.
Membrane: — "Mule-Hide TPO-c" or "Mule-Hide TPO-c Extra", fully adhered with "WBBA 2000" bonding adhesive, at 120-ft2/gal.

15. **Deck:** NC Incline: 1
Insulation: — Any UL Certified wood fiberboard; Johns Manville "ENRGY 3 Plus" (composite) insulation; cellular concrete, precast concrete with grouted joints or structural (poured-in-place) concrete.
Membrane: — "Mule-Hide TPO-c (FR)" or Mule-Hide TPO-c Extra (FR)", fully adhered with "WBBA 2000" bonding adhesive, at 120-ft2/gal.

16. **Deck:** NC Incline: 1
Insulation (Optional): — Any UL Certified, any combination, any thickness.
Barrier Board: — Minimum ½-in. thick gypsum board or minimum ¼-in. thick Georgia-Pacific Gypsum LLC "DensDeck® Roofboard", "DensDeck Prime® Roofboard", "DensDeck DuraGuard™ Roofboard".
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c (FR)" or "Mule-Hide TPO-c Extra (FR)", fully adhered with "WBBA 2000" bonding adhesive, at 120-ft2/gal.

17. **Deck:** C-15/32 Incline: 1
Insulation (Optional): — Any UL Certified, any combination, any thickness.
Barrier Board: — Minimum ½-in. thick gypsum board or minimum ¼-in. thick Georgia-Pacific Gypsum LLC "DensDeck® Roofboard", "DensDeck Prime® Roofboard", "DensDeck DuraGuard™ Roofboard".
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c (FR)" or "Mule-Hide TPO-c Extra (FR)", fully adhered with "WBBA 2000" bonding adhesive, at 120-ft2/gal.

Class A – Fully Adhered (Continued)

21. **Deck:** C-15/32 Incline: See Note

Slip Sheet: — Two layers GAF "VersaShield Underlayment" or "VersaShield FB-2S" or three layers GAF "VersaShield FB-1S".
Insulation (Optional): — Any UL Certified (except EPS), any combination, any thickness.
Membrane: — "Mule-Hide TPO-c Fleece Back".

Note: Maximum incline shall be in accordance with Certification established for the insulation/membrane roofing system when insulation is used or established for the membrane roofing system applied over fiberboard or gypsum when insulation is not used, but cannot exceed 2:12.

22. **Deck:** NC Incline: 1/4

Insulation: — Johns Manville "ENRGY3" any combination, any thickness.
Membrane: — "Mule-Hide TPO-c Fleece Back 100 or 115" (TPO), fully adhered with "Mule-Hide SP-100-LT" adhesive.

23. **Deck:** NC Incline: 1/2

Insulation: — "Poly ISO 1", "Poly ISO 2" or Atlas Roofing Corp. "ACFoam II", "ACFoam III" or Dow "Hy-Therm AP" or Hunter Panels "H-Shield" or "Poly ISO 1", Firestone Building Products "ISO 95+GL", "GW" or "HF" or Rmax Operating LLC "Multi-Max-3", any combination, any thickness.
Membrane: — "Mule-Hide TPO-c Fleece Back 100 or 115" (TPO), fully adhered with "Mule-Hide SP-100-LT" adhesive.

24. **Deck:** NC Incline: 1

Insulation: — Any UL Certified, any thickness.
Insulation: — Johns Manville "ENRGY 3 Plus" (composite) insulation or 1/2 in. (min) wood fiberboard.
Membrane: — "Mule-Hide TPO-c Fleece Back 100 or 115" (TPO), fully adhered with "Mule-Hide SP-100-LT" adhesive.

26. **Deck:** NC Incline: 1/2

Insulation: — Carlisle Syntec Inc. "HP Recovery Board", ½ to 3-in.; Carlisle Syntec Inc. "HP Recovery Board", ½-in. minimum, over any Certified insulation, any combination, any thickness; cellular concrete, precast concrete with grouted joints or structural (poured-in-place) concrete.
Membrane: — "SA-TPO", 45-60 mil.

27. **Deck:** C-15/32 Incline: 4

Insulation (Optional): — Any UL Certified, any combination, any thickness.
Barrier Board: — Minimum ½-in. thick gypsum board or minimum ¼-in. thick Georgia-Pacific Gypsum LLC "DensDeck® Roofboard", "DensDeck Prime® Roofboard", "DensDeck DuraGuard™ Roofboard".
Membrane: — "SA-TPO", 45-60 mil.

Class A – Fully Adhered (Continued)

28. **Deck:** C-15/32 Incline: See Note

Slip Sheet: — Two layers Carlisle Syntec Inc. "FR Base Sheet 2S", GAF "VersaShield Underlayment" or "VersaShield FB-2S".
Insulation: — Any UL Certified (except EPS), any combination, any thickness.
Membrane: — "SA-TPO", 45-60 mil.

Note: Maximum incline shall be in accordance with Certification established for the insulation/membrane roofing system, but cannot exceed 2:12.

29. **Deck:** C-15/32 Incline: See Note

Slip Sheet: — One layer Atlas Roofing Corp. "FR-10" or "FR-50", Carlisle Syntec Inc. "FR Base Sheet 2S" or GAF "VersaShield Underlayment" or "VersaShield FB-2S".
Insulation: — Atlas Roofing Corp. "ACFoam III", minimum 1.5-in. thick with joints staggered minimum 6-in. from the deck joints.
Membrane: — SA-TPO", 45-60 mil.

Maximum incline shall be in accordance with Certification established for the insulation/membrane roofing system.

30. **Deck:** C-15/32 Incline: See Note

Slip Sheet: — Three layers Carlisle Syntec Inc. "FR Base Sheet 2S", GAF "VersaShield Underlayment" or "VersaShield FB-2S".
Insulation: — Any UL Certified (except EPS or fiberboard), any combination, any thickness.
Membrane: — "SA-TPO", 45-60 mil.

Note: Maximum incline shall be in accordance with Certification established for the insulation/membrane roofing system.

31 **Deck:** NC Incline: 1/2

Insulation: — See "Referenced Insulations", any combination, any thickness.
Membrane: — "Mule-Hide "TPO-c Fleece Back 100 or 115" (TPO) adhered with "WBBA 2000" bonding adhesive.

Class A – Fully Adhered (Continued)

32. **Deck:** NC Incline: 1

Insulation: — Any Certified High Density Wood Fiberboard or any oriented strand board (OSB) over any Certified insulation, any combination, any thickness, cellular concrete, precast concrete with grouted joints or structural (poured-in-place) concrete.
Membrane: — "Mule-Hide TPO Fleece Back 100 or 115" (TPO) fully adhered with "WBBA 2000" bonding adhesive".

Class A – Fully Adhered (Continued)

33. **Deck:** C-15/32 Incline: 2

Insulation (Optional): — Any UL Certified, any combination, any thickness.
Barrier Board: — Minimum ½-in. thick gypsum board or minimum ¼-in. thick Georgia-Pacific Gypsum LLC "DensDeck® Roofboard", "DensDeck Prime® Roofboard", "DensDeck DuraGuard™ Roofboard" or United States Gypsum Co "SECUROCK® Glass-Mat Roof Board (Type SGMRX)" or CertainTeed Gypsum "GlasRoc" with all joints staggered a min of 6 in. from the plywood joints without insulation.
Membrane: — "Mule-Hide TPO Fleece Back 100 or 115" (TPO) adhered with Mule-Hide "WBBA 2000" bonding adhesive.

34 (21). **Deck:** NC Incline: 1/4

Insulation (Optional): — See "Referenced Insulations", any combination, any thickness.Membrane: — "Mule-Hide TPO-c", "Sure-Weld EXTRA" or "Mule-Hide TPO-c (FR)" adhered with "AeroWeb". Total application rate is 0.45-gal/100-ft.2.

35 (22). **Deck:** NC Incline: 1

Insulation: — Carlisle Syntec Inc. "Carlisle HP Recovery Board", 1/2 to 3 in. thick or minimum 1/2 in. thick Carlisle Syntec Inc. "Carlisle Recovery Board"applied over any Classified insulation, any combination, any thickness; cellular conrete with grouted joints or structural (poured in place) concrete. Membrane: — "Mule-Hide TPO-c", "Sure-Weld EXTRA" or " Mule-Hide TPO-c (FR)" adhered with "AeroWeb". Total application rate is 0.45-gal/100-ft.2.

36 (23). **Deck:** C-15/32 Incline: 3

Insulation (Optional): — Any UL Classified, any combination, any thickness. Barrier Board: — Minimum 1/2 in. thick gypsum board or minimum 1/4 in. thick Georgia-Pacific Gypsum LLC "DensDeck® Roofboard", "DensDeck Prime® Roofboard" or "DensDeck DuraGuard™ Roofboard".Membrane: — "Mule-Hide TPO-c", "Sure-Weld EXTRA" or " Mule-Hide TPO-c (FR)", adhered with "AeroWeb". Total application rate is 0.45-gal/100-ft.2.

61. **Deck:** C - 7/16-in. "Mule-Hide FR Deck Panel A" or Barrier Technology Corp. “Blazegard A”* **Incline:** 1/2

Membrane: — Any UL Classified fully adhered EPDM, PVC, TPO or self-adhered modified bitumen cap sheet. Maximum incline is determined by the existing membrane Classification but cannot exceed 1/2:12.

* - All deck with non-coated edges require all deck joints blocked with 2 x 4 lumber. Gaps in "Mule-Hide FR Deck Panel" or Barrier Technology Corp. “Blazeguard A” are caulked with Rectorseal "FlameSafe® FS900+" caulk. All FR Deck panel with edges coated with “Blazeguard Fire-Resistant Paint”, 80-250 ft²/gal., only require blocking below the open joints with 2 x 4 lumber.

108. **Deck:** NC Incline: See Note

Insulation (Optional): — Any UL Certified insulation, any thickness.
Barrier Board: — — "Mule-Hide FR Deck Panel A" or Barrier Technology Corp. "Blazeguard A", minimum 7/16-in.
Membrane: — Any UL Certified Mule-Hide fully adhered EPDM, PVC, TPO or self-adhered modified bitumen cap sheet,

Note: Maximum incline is determined by the existing membrane/adhesive Certification.

CLASS B – FULLY ADHERED

1. **Deck:** NC **Incline:** 3/4
Insulation: — Any UL Certified wood fiberboard; Johns Manville "ENRGY 3 Plus" (composite) insulation; cellular concrete, precast concrete with grouted joints or structural (poured-in-place) concrete.
Membrane: — "72 mil Mule-Hide TPO-c Extra" or "80 mil Mule-Hide TPO-c Extra", fully adhered with "Mule-Hide TPO-c Bonding Adhesive", at 1-1/3 gal/sq.

2. **Deck:** NC **Incline:** 3
Insulation (Optional): — Any UL Certified, any combination, any thickness.
Barrier Board: — ½-in. min gypsum board or minimum ¼-in. thick Georgia-Pacific Gypsum LLC "DensDeck® Roofboard", "DensDeck Prime® Roofboard", "DensDeck DuraGuard™ Roofboard".
Membrane: — "Mule-Hide TPO-c (FR)" or "Mule-Hide TPO-c Extra (FR)", fully adhered with "WBBA 2000" bonding adhesive, at 120-ft^2/gal.

3. **Deck:** C-15/32 **Incline:** 3
Insulation (Optional): — Any UL Certified, any combination, any thickness.
Barrier Board: — ½-in. min gypsum board or minimum ¼-in. thick Georgia-Pacific Gypsum LLC "DensDeck® Roofboard", "DensDeck Prime® Roofboard", "DensDeck DuraGuard™ Roofboard".
Membrane: — "Mule-Hide TPO-c (FR)" or "Mule-Hide TPO-c Extra (FR)", fully adhered with "WBBA 2000" bonding adhesive, at 120-ft^2/gal.

4. **Deck:** NC **Incline:** 3
Membrane: — "Mule-Hide TPO-c Fleece Back 100 or 115" (TPO), fully adhered with "Mule-Hide SP-100-LT" adhesive, 100-ft^2/gal.

CLASS C – FULLY ADHERED

1. **Deck:** NC Incline: 1/2
Insulation: — "Poly ISO 2" or Atlas Roofing Corp. "ACFoam II" or wood fiber or glass fiber or perlite, any thickness.
Membrane: — "Mule-Hide TPO", 45-60 mil, fully adhered with Ashland "PILOBOND 2825", 60-ft2/gal.

2. **Deck:** C-7/16-in. "Mule-Hide FR Deck Panel C" or Barrier Technology Corp. "Blazeguard C" Incline: 2
Membrane: — Any UL Certified fully adhered TPO membrane. Maximum incline is determined by the existing membrane Certification but cannot exceed 2:12.

3. **Deck:** C-15/32 Incline: 1
Insulation: — Johns Manville "ENRGY 3 Plus" (composite) insulation or any UL Certified wood fiberboard, ½-in. thick minimum.
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c (FR)", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c Extra (FR)" or "Mule-Hide TPO-c Fleece Back".

4. **Deck:** NC Incline: Unlimited
Insulation: — "Poly ISO 2" or Atlas Roofing "ACFoam II", "ACFoam III" or Dow "Hy-Therm AP" or Hunter Panels "H-Shield" or Johns Manville "ENRGY-3" or Firestone Building Products Co. LLC "ISO 95+GL", "GW" or "HF" or Rmax Operating LLC "Multi-Max-3", any combination, any thickness.
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c (FR)", or "Mule-Hide TPO-c Extra (FR)", 45 to 80 mil thickness, adhered with "Mule-Hide TPO-c Bonding Adhesive".

5. **Deck:** C-15/32 Incline: Unlimited
Insulation: — "Poly ISO 1", "Poly ISO 2" or Atlas Roofing "ACFoam II","ACFoam III" orDow "Hy-Therm AP" or Hunter Panels "H-Shield" or Johns Manville "ENRGY-3", Firestone Building Products Co. LLC "ISO 95+GL", "GW" or "HF" or Rmax Operating LLC "Multi-Max-3", any combination, minimum 2" thickness.
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c (FR)", or "Mule-Hide TPO-c Extra (FR)", 45 to 80 mil thick, adhered with "Mule-Hide TPO-c Bonding Adhesive".

6. **Deck:** C-15/32 Incline: 1
Insulation: — UL Certified wood fiberboard, ½-in. thick minimum.
Membrane: — "SA-TPO", 45-60 mil.

7. **Deck:** NC Incline: Unlimited
Insulation: — "Poly ISO 1", "Poly ISO 1 DWD", "Poly ISO 2" or Atlas Roofing "ACFoam II", "ACFoam III" or , Dow "Hy-Therm AP" or Hunter Panels "H-Shield", "H-Shield-DWD" or Johns Manville "ENRGY- 2", "ENRGY-3" or Firestone Building Products Co. LLC "ISO 95+ GL", "GW" or "HF", Rmax "Multi-Max", any thickness.
Membrane: — "SA-TPO", 45-60 mil.

Class C – Fully Adhered (Continued)

8. **Deck:** C-15/32 Incline: Unlimited
Insulation: — "Poly ISO 1", "Poly ISO 1 DWD", "Poly ISO 2" or Atlas Roofing Corp. "ACFoam II", "ACFoam III" or Dow "Hy-Therm AP" or Hunter Panels "H-Shield", "H-Shield-DWD", or Johns Manville "ENRGY- 2", "ENRGY-3" or Firestone Building Products Co. LLC "ISO 95+ GL", "GW", "HF" or Rmax Operating LLC "Multi-Max", minimum 2-in. thick.
Membrane: — "SA-TPO", 45-60 mil.

9. **Deck:** NC Incline: See Note
Insulation (Optional): — Any UL Certified insulation, any thickness.
Barrier Board: — "Mule-Hide FR Deck Panel C" or Barrier Technology Corp. "Blazeguard C", 7/16 in. min."
Membrane: — Any UL Certified Mule-Hide fully adhered EPDM, PVC, TPO or self-adhered modified bitumen cap sheet.

Note: Maximum incline is determined by the existing membrane/adhesive Certification.

10. **Deck:** C-15/32 Incline: Unlimited
Insulation: — See "Referenced Insulations", any combination, minimum 2-in. thick.
Membrane: — "Mule-Hide TPO-c Fleece Back 100 or 115" (TPO) adhered with "Mule-Hide WBBA 2000 bonding adhesive".

11. **Deck:** NC Incline: 4-1/2
Insulation: — Rmax Operating LLC "Multi-Max-3", any thickness. Membrane: — — "Mule-Hide TPO-c", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c (FR)", or "Mule-Hide TPO-c Extra (FR)", 45 to 80 mil thickness, adhered with "Mule-Hide TPO-c Bonding Adhesive".

12. **Deck:** C-15/32 Incline: 4-1/2
Insulation: — Rmax Operating LLC "Multi-Max-3", minimum 2" thick. Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c (FR)", or "Mule-Hide TPO-c Extra (FR)", 45 to 80 mil thick, adhered with "Mule-Hide TPO-c Bonding Adhesive".

13. **Deck:** NC Incline: 4-1/2
Insulation: — Rmax "Multi-Max", any thickness. " Membrane: — "SA-TPO", 45-60 mil.

14. **Deck:** C-15/32 Incline: 4-1/2
Insulation: — Rmax Operating LLC "Multi-Max", minimum 2-in. thick. Membrane: — "SA-TPO", 45-60 mil. Insulation (Optional): — UL Classified polyisocyanurate, 1 in. thick, minimum. Barrier Board (Optional): — Minimum 1/4-in. thick Georgia-Pacific Gypsum LLC "DensDeck® Roofboard", "DensDeck Prime® Roofboard", "DensDeck DuraGuard™ Roofboard" minimum 1/4-in. or United States Gypsum Co. SECUROCK.
Membrane: — Any UL Classified Mule-Hide EPDM or TPO membrane, mechanically attached or fully adhered for use as a Class C Roofing System with or without optional use of Insulation and/or Barrier Board.

Note: Maximum incline is determined by the existing membrane roof covering Classification, but cannot exceed 1/2:12.

Class C – Fully Adhered (Continued)

Class C

1. **Deck:** "PyroXL", min. 15/32-in Fire-Retardant-Treated Plywood (Building Unit)

Incline: See Note

Membrane: — Any UL Classified fully adhered EPDM, PVC, TPO or self-adhered modified bitumen cap sheet.

Note: Maximum incline is determined by the membrane.

CLASS A – MECHANICALLY FASTENED

24. **Deck: C-15/32 **Incline:** 3/4, See Note

Slipsheet: — Two layers Atlas "FR-10," mechanically fastened
Insulation (Optional): — Any UL Classified, any thickness (except EPS and HDFB).
Membrane: — Any UL Classified PVC, CPE, CSM, CSPE, EPDM, NBP, PIB, TPO, EIP or TRE membrane. (Note: Membrane must be currently Classified for use over the insulation used. Actual incline is determined by the maximum existing membrane/insulation Classification incline.)

1. **Deck:** NC Incline: 1/2

Insulation: — "Poly ISO 2" or "Atlas Roofing "ACFoam II", "ACFoam III" or Dow "Hy-Therm AP" or Hunter Panels "H-Shield" or Johns Manville "ENRGY-3" or Firestone Building Products Co. LLC "ISO 95+GL", "GW" or "HF" or Rmax Operating LLC "Multi-Max-3", any combination, any thickness.
Membrane: — "Mule-Hide TPO-c".

2. **Deck:** NC Incline: 1-1/2

Insulation: — Any UL Certified wood fiberboard; Johns Manville "ENRGY 3 Plus" (composite) insulation; cellular concrete, precast concrete with grouted joints or structural (poured-in-place) concrete.
Membrane: — "Mule-Hide TPO-c".

3. **Deck:** NC Incline: 1-1/2

Insulation: — "Poly ISO 1", "Poly ISO 2" or Atlas Roofing Corp. "ACFoam II", "ACFoam III" or Dow "Hy-Therm AP" or Hunter Panels "H-Shield" or Johns Manville "ENRGY-3", Firestone Building Products Co. LLC "ISO 95+GL", "GW" or "HF" or Rmax Operating LLC "Multi-Max-3", any combination, any thickness.
Membrane: — "Mule-Hide TPO-c (FR)".

4. **Deck:** NC Incline: 1-1/2

Insulation: — Any UL Certified wood fiberboard; Johns Manville "ENRGY 3 Plus" (composite) insulation; cellular concrete, precast concrete with grouted joints or structural (poured-in-place) concrete.
Membrane: — "Mule-Hide TPO-c (FR)".

5. **Deck:** NC Incline: 3

Insulation (Optional): — Any UL Certified, any combination, any thickness.
Barrier Board: — Minimum ½-in. thick gypsum wallboard or minimum ¼-in. thick Georgia-Pacific Gypsum LLC "DensDeck® Roofboard", "DensDeck Prime® Roofboard", "DensDeck DuraGuard™ Roofboard".
Membrane: — "Mule-Hide TPO-c".

6. **Deck:** C-15/32 Incline: See Note

Slip Sheet: — Two layers "VersaShield Underlayment" or "VersaShield FB-2S".
Insulation: — Any UL Certified (except EPS), any combination, any thickness.
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c (FR)", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c Extra (FR)" or "Mule-Hide TPO-c Fleece Back".
Note: Maximum incline shall be in accordance with Certification established for the insulation/membrane roofing system, but cannot exceed 2:12.

Class A – Mechanically Attached (Continued)

7. **Deck:** C-15/32 Incline: Unlimited

Insulation (Optional): — Any UL Certified, any combination, any thickness.
Barrier Board: — Minimum ½-in. thick gypsum board or minimum ¼-in. thick Georgia-Pacific Gypsum LLC "DensDeck® Roofboard", "DensDeck Prime® Roofboard", "DensDeck DuraGuard™ Roofboard" with staggered joints (6 in. offset).
Membrane: — "Mule-Hide TPO-c (FR)".

8. **Deck:** C-15/32 Incline: See Note

Slip Sheet: — One layer Atlas Roofing Corp. "FR-10" or "FR-50" or GAF "VersaShield Underlayment" or "VersaShield FB-2S".
Insulation: — Atlas Roofing "ACFoam III", 1.5-in. thick with joints staggered minimum 6-in. from the deck joints.
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c (FR)", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c Extra (FR)" or "Mule-Hide TPO-c Fleece Back".
Note: Maximum incline shall be in accordance with Certification established for the insulation/membrane roofing system.

9. **Deck:** C-15/32 Incline: ½

Slip Sheet: — Two plies Atlas Roofing Corp. "FR-50".
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c (FR)", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c Extra (FR)" or "Mule-Hide TPO-c Fleece Back".

10. **Deck:** C-15/32 Incline: See Note

Slip Sheet: — Two layers Atlas Roofing Corp. "FR 50" or GAF "VersaShield Underlayment" or VersaShield FB-2S".
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c (FR)", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c Extra (FR)" or "Mule-Hide TPO-c Fleece Back".
Note: Maximum incline shall be in accordance with Certification established for the membrane roofing system applied over fiberboard or gypsum, but cannot exceed 1½:12.

11. **Deck:** C-15/32 Incline: 2-1/2

Insulation (Optional): — Any UL Certified, any combination, any thickness.
Barrier Board: — Minimum ½:-in. thick gypsum board.
Membrane: — "72 mil Mule-Hide TPO-c Extra" or "80 mil Mule-Hide TPO-c Extra".

12. **Deck:** NC Incline: 1-1/2

Insulation: — Any UL Certified wood fiberboard; Johns Manville "ENRGY 3 Plus" (composite) insulation; cellular concrete, precast concrete with grouted joists or structural (poured-in-place) concrete.
Membrane: — "72 mil Mule-Hide TPO-c Extra" or "80 mil Mule-Hide TPO-c Extra".

13. **Deck:** NC Incline: ½

Insulation: — "Poly ISO 1", "Poly ISO 2" or Atlas Roofing "ACFoam II", "ACFoam III" or Dow "Hy-Therm AP" or Hunter Panels "H-Shield" or Johns Manville "ENRGY-3", Firestone Building Products Co. LLC "ISO 95+GL", "GW" or "HF" or Rmax Operating LLC "Multi-Max-3", any combination, any thickness.
Membrane: — "72 mil Mule-Hide TPO-c Extra" or "80 mil Mule-Hide TPO-c Extra".

Class A – Mechanically Attached (Continued)

14. **Deck:** NC Incline: ½

Insulation: — "Poly ISO 2" or Atlas Roofing Corp. "ACFoam II", "ACFoam III" or Dow "Hy-Therm AP" or Hunter Panels "H-Shield" or Johns Manville "ENRGY-3" or Firestone Building Products Co. LLC "ISO 95+GL", "GW" or "HF" or Rmax Operating LLC "Multi-Max-3", any combination, any thickness.
Membrane: — "Mule-Hide TPO-c Fleece Back 100 or 115" (TPO).

15. **Deck:** NC Incline: 1-1/2

Insulation (Optional): — Any UL Certified, any thickness.
Insulation: — Any UL Certified wood fiberboard; Johns Manville "ENRGY 3 Plus" (composite) insulation.
Membrane: — "Mule-Hide TPO-c Fleece Back 100 or 115" (TPO).

16. **Deck:** NC Incline: 3

Insulation: — Any UL Certified, any thickness.
Barrier Board: — Minimum ¼-in. thick Georgia-Pacific Gypsum LLC "DensDeck® Roofboard", "DensDeck Prime® Roofboard", "DensDeck DuraGuard™ Roofboard" or ½-in. thick gypsum wallboard.
Membrane: — "Mule-Hide TPO-c Fleece Back 100 or 115" (TPO).

17. **Deck:** C-15/32 Incline: See Note

Slip Sheet: — Two layers GAF "VersaShield Underlayment" or "VersaShield FB-2S".
Insulation: — Any UL Certified (except EPS), any combination, any thickness.
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c (FR)", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c Extra (FR)" or "Mule-Hide TPO-c Fleece Back".

Note: Maximum incline shall be in accordance with Certification established for the insulation/membrane roofing system, but cannot exceed 2:12.

18. **Deck:** NC Incline: 1

Insulation: — Any UL Certified expanded or extruded polystyrene, any combination, any thickness.
Slip Sheet: — One layer Atlas Roofing Corp. "FR-10" or "FR-50" or GAF "VersaShield Underlayment" or "VersaShield FB-2S".
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c (FR)", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c Extra (FR)" or "Mule-Hide TPO-c Fleece Back".

19. **Deck:** C-15/32 Incline: See Note

Slip Sheet: — Three layers GAF "VersaShield FB-1S".
Insulation: — Any UL Certified (except EPS), any combination, any thickness.
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c (FR)", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c Extra (FR)" or "Mule-Hide TPO-c Fleece Back".

Note: Maximum incline shall be in accordance with Certification established for the insulation/membrane roofing system, but cannot exceed 2:12.

Class A – Mechanically Attached (Continued)

20. **Deck:** C-15/32 Incline: See Note
Slip Sheet: — Three layers GAF "VersaShield FB-1S".
Insulation (Optional): — Any UL Certified (except EPS and wood fiberboard), any combination, any thickness.
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c (FR)", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c Extra (FR)" or "Mule-Hide TPO-c Fleece Back".

Note: Maximum incline shall be in accordance with Certification established for the insulation/membrane roofing system when insulation is used or established for the membrane roofing system applied over fiberboard or gypsum when insulation is not used.

21. **Deck:** NC Incline: 1-1/2
Insulation: — Rmax Operating LLC "Multi-Max-3", any thickness. Membrane: — "Mule-Hide TPO-c (FR)".

22. **Deck:** C-15/32 Incline: 1/4
Membrane: — "TPO Fleece Back FR", 45 to 80-mil thick mechanically fastened.

61. **Deck:** C - 7/16-in. "Mule-Hide FR Deck Panel A" or Barrier Technology Corp. “Blazegard A”* **Incline:** 1/2
Membrane: — Any UL Classified fully adhered EPDM, PVC, TPO or self-adhered modified bitumen cap sheet. Maximum incline is determined by the existing membrane Classification but cannot exceed 1/2:12.

* - All deck with non-coated edges require all deck joints blocked with 2 x 4 lumber. Gaps in "Mule-Hide FR Deck Panel" or Barrier Technology Corp. “Blazeguard A” are caulked with Rectorseal "FlameSafe® FS900+" caulk. All FR Deck panel with edges coated with “Blazeguard Fire-Resistant Paint”, 80-250 ft²/gal., only require blocking below the open joints with 2 x 4 lumber.

108. **Deck:** NC Incline: See Note
Insulation (Optional): — Any UL Certified insulation, any thickness.
Barrier Board: — — "Mule-Hide FR Deck Panel A" or Barrier Technology Corp. "Blazeguard A", minimum 7/16-in.
Membrane: — Any UL Certified Mule-Hide fully adhered EPDM, PVC, TPO or self-adhered modified bitumen cap sheet,

Note: Maximum incline is determined by the existing membrane/adhesive Certification.

CLASS B – MECHANICALLY FASTENED

6. **Deck: C-15/32 **Incline:** 1/2, See Note
Slipsheet: — One Ply Atlas "FR-10," mechanically fastened
Membrane: — Any UL Classified PVC, CPE, CSM, CSPE, EPDM, NBP, PIB, TPO, EIP or TRE membrane. (Note: Membrane must be currently Classified for use over the insulation used. Actual incline is determined by the maximum existing membrane/insulation Classification incline, but cannot exceed 1/2:12.)

1. **Deck:** C-15/32 Incline: See Note
Base Sheet: — One layer Owens Corning "Perma Ply No. 28" or GAF "GAFGLAS #75 Base Sheet" or Johns Manville "Glasbase" or Tamko "Glass Base" or Celotex Type G2 "Vaporbar GB" or Atlas Roofing Corp. "FR 50" or GAF "VersaShield Underlayment" or "VersaShield FB-2S", mechanically fastened.
Insulation: — "Poly ISO 1", "Poly ISO 2" or Atlas Roofing Corp. "ACFoam II" or "ACFoam III" or Dow "Hy-Therm AP" or Hunter Panels "H-Shield" or Johns Manville "ENRGY-3" or Firestone Building Products Co. LLC "ISO 95+GL", "GW" or "HF" or Rmax Operating LLC "Multi-Max-3", any combination, any thickness; Johns Manville "ENRGY 3 Plus" (composite) insulation; UL Certified wood fiber board, minimum ½-in. thick over any Certified insulation (any combination), min 1 in. thick. The bottom insulation layer joints are to be staggered a minimum 6-in. from the deck joints.
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c (FR)", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c Extra (FR)" or "Mule-Hide TPO-c Fleece Back".

Note: Maximum incline shall be in accordance with Certification established for the insulation/membrane roofing system but not to exceed 1-in.

2. **Deck:** C-15/32 Incline: See Note
Insulation: — Johns Manville "ENRGY 3 Plus" (composite) insulation or UL Certified wood fiberboard, minimum 1½-in. thick. The bottom insulation layer joints are to be staggered a minimum 6-in. from the deck joints.
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c (FR)", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c Extra (FR)" or "Mule-Hide TPO-c Fleece Back".

Note: Maximum incline shall be in accordance with Certification established for the insulation/membrane roofing system but not to exceed 1-in.

3. **Deck:** C-15/32 Incline: See Note
Slip Sheet: — One layer Atlas Roofing Corp. "FR 50" or GAF "VersaShield Underlayment" or "VersaShield FB-2S".
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c (FR)", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c Extra (FR)" or "Mule-Hide TPO-c Fleece Back".

Note: Maximum incline shall be in accordance with Certification established for the membrane roofing system applied over fiberboard or gypsum, but cannot exceed 1½:12.

4. **Deck:** C-15/32 Incline: 1/2
Insulation (Optional): — Polyisocyanurate, minimum 1-in. thick.
Slip Sheet: — Two plies Atlas Roofing Corp. "FR 50" or GAF "VersaShield Underlayment" or "VersaShield FB-2S.
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c (FR)", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c Extra (FR)" or "Mule-Hide TPO-c Fleece Back".

Class B – Mechanically Attached (Continued)

5. **Deck:** C-15/32 Incline: 1/2
Slip Sheet: — One ply Atlas Roofing Corp. "FR-50".
Membrane: — "Mule-Hide TPO-c (FR)".

CLASS C – MECHANICALLY FASTENED

1. **Deck:** C-15/32 Incline: 1
Insulation: — Johns Manville "ENRGY 3 Plus" (composite) insulation or any UL Certified wood fiberboard, ½-in. thick minimum.
Membrane: — Mule-Hide TPO-c", "Mule-Hide TPO-c (FR)", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c Extra (FR)" or "Mule-Hide TPO-c Fleece Back".

2. **Deck:** NC Incline: Unlimited
Insulation: — "Poly ISO 1", "Poly ISO 2" or Atlas Roofing Corp. "ACFoam II", "ACFoam III" or Dow "Hy-Therm AP" or Hunter Panels "H-Shield" or Johns Manville "ENRGY-3" or Firestone Building Products Co. LLC "ISO 95+GL", "GW" or "HF" or Rmax Operating LLC "Multi-Max-3", any combination, any thickness.
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c (FR)", or "Mule-Hide TPO-c Extra (FR)", 45 to 80 mil thickness.

3. **Deck:** C-15/32 Incline: Unlimited
Insulation: — "Poly ISO 1", "Poly ISO 2" or Atlas Roofing Corp. Corp. "ACFoam II", "ACFoam III" or Dow "Hy-Therm AP" or Hunter Panels "H-Shield" or Johns Manville "ENRGY-3" or Firestone Building Products Co. LLC "ISO 95+GL", "GW" or "HF" or Rmax Operating LLC "Multi-Max-3", any combination, minimum 2" thickness.
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c (FR)", or "Mule-Hide TPO-c Extra (FR)", 45 to 80 mil thickness.

4. **Deck:** NC Incline: 4-1/2
Insulation: — Rmax Operating LLC "Multi-Max-3", any thickness. Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c (FR)", or "Mule-Hide TPO-c Extra (FR)", 45 to 80 mil thickness.

5. **Deck:** C-15/32 Incline: 4-1/2
Insulation: — Rmax Operating LLC "Multi-Max-3", minimum 2" thickness. Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c (FR)", or "Mule-Hide TPO-c Extra (FR)", 45 to 80 mil thickness.

MAINTENANCE AND REPAIR SYSTEMS

The insulation and membrane are fastened to the deck with metal screws and discs. The membrane laps are hot air welded.

CLASS A, B, AND C

7. **Deck:** C-15/32 **Incline:** 1/2
Existing Roof System: — Class A, B or C roofing system, to retain the existing Classification, is covered with:
Slip Sheet: — One or more layers of the following - Lydall "Manniglas 1200" mat, 15 mil, Atlas Roofing "FR-10" or "FR 50", Elk "Versashield" or Type G2 base sheet, laid loosely.
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c Extra", or "Sure-Flex PVC", mechanically fastened.

8. **Deck:** C-15/32 **Incline:** 3/4
Existing Roof System: — Class A, B or C roofing system, to retain the existing Classification, is covered with:
Slip Sheet: — One or more layers of the following - Lydall "Manniglas 1200" mat, 15 mil, Atlas Roofing "FR-10" or "FR 50", Elk "Versashield" or Type G2 base sheet, laid loosely.
Membrane: — "Mule-Hide TPO-c (FR)", mechanically fastened.

9. **Deck:** C-15/32 or NC **Incline:** 1
Existing Roof System: — Class A, B or C roofing, gravel to be maintained on gravel built-up system, to retain the existing Classification, is cover with:
Insulation: — Owens Corning Specialty & Foam Products "Durapink", 1 in. max.
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c (FR)", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c Extra (FR)" or "Mule-Hide TPO-c Fleece Back", mechanically fastened.

10. **Deck:** C-15/32 **Incline:** See Note
Existing Roof System: — Class A, B or C roofing system, to retain the existing Classification, is covered with:
Slip Sheet (Optional): — One or more layers Atlas Roofing "FR 50", Elk " VersaShield Underlayment" or "VersaShield FB-2S".
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c (FR)", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c Extra (FR)" or "Mule-Hide TPO-c Fleece Back".

Note: Max incline shall be in accordance with Classification established for the existing roofing system, but can not exceed 1-1/2:12.

12. **Deck:** C-15/32 or NC **Incline:** See Note
Existing Roof System: — Any Class A, B or C roofing system, to retain the existing Classification, is covered with:
Insulation: — Hunter Panels "Poly ISO 1-HD" or " Poly ISO 1-HD90".
Membrane: — Any UL Classified membrane.

Max incline shall be in accordance with Classification established for insulation/membrane roofing system, but cannot exceed 2:12. TPO membranes are limited to a 1/2:12. max. slope.

Maintenance and Repair – Class A, B & C (Continued)

13. **Deck:** C-15/32 or NC **Incline:** See Note

Existing Roof System: — Any Class A, B or C roofing system, to retain the existing Classification, is covered with:
Insulation: — Hunter Panels " Poly ISO 1-HD-Composite ".
Membrane: — Any UL Classified membrane.

Note: Max incline shall be in accordance with Classification established for insulation/membrane roofing system, but cannot exceed 2:12. TPO membranes are limited to a 1/2:12. max. slope.

MAINTENANCE AND REPAIR SYSTEMS - CLASS A

17. **Deck:** NC **Incline:** ¼
Existing Roof System: — Class A, B or C roofing (gravel may be removed from gravel built-up system).
Insulation: — Tenneco "AMOCOR®-PB6, PB6W, PG38 or PG39", mechanically fastened.
Slip Sheet: — One layer Atlas Roofing"FR 10" or FR 50", or Elk "VersaShield Underlayment" or "VersaShield FB-2S.
Membrane: — "Mule-Hide TPO-c (FR)", mechanically fastened.

18. **Deck:** C-15/32 **Incline:** 1/2
Existing Roof System: — Class A, B or C roofing system, to retain the existing Classification, is covered with:
Slip Sheet: — Two or more layers Atlas Roofing "FR-50", Elk "VersaShield Underlayment" or "VersaShield FB-2S.
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c (FR)", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c Extra (FR)" or "Mule-Hide TPO-c Fleece Back", mechanically fastened.

19. **Deck:** NC **Incline:** 1/2
Existing Roof System: — Class A, B or C BUR or modified bitumen roofing system gravel may be removed, covered with:
Insulation (Optional): — Atlas Roofing "ACFoam II" or "ACFoam III", Dow "Hy-Therm AP", Hunter Panels "H-Shield", Johns Manville "ENRGY-3", Firestone Building Products "ISO 95+GL", "GW" or "HF", Rmax Inc. "Multi-Max-3", any combination, any thickness.
Insulation (Optional): — Any UL Classified wood fiberboard; Johns Manville "ENRGY 3 Plus" (composite) insulation.
Membrane: — "Mule-Hide TPO-c Fleece Back 100" (TPO) or "Mule-Hide TPO-c Fleece Back 115 " (TPO), mechanically attached or fully adhered with "Mule-Hide SP-100 Adhesive".

21. **Deck:** NC **Incline:** See Note
Existing Roof System: — Class A, B or C roofing system (gravel may be removed from gravel built-up or ballasted single-ply system).
Insulation: — A minimum 3 in. layer or minimum two layers of "Poly ISO 1-DWD".
Membrane: — Any UL Classified roofing membrane.

Note: The maximum incline shall be in accordance with the Class A Classification established for the membrane/insulation roofing assembly, however the incline can not exceed 1/2:12.

22. **Deck:** C-15/32 **Incline:** See Note
Existing Roof System: — Class A, B or C roofing system (gravel may be removed from gravel built-up or ballasted single-ply system).
Insulation: — A minimum 3 in. layer or minimum two layers of "Poly ISO 1-DWD".
Membrane: — Any UL Classified roofing membrane.

Note: The maximum incline shall be in accordance with the Class A Classification established for the membrane/insulation roofing assembly, however the incline can not exceed 1/2:12.

MAINTENANCE AND REPAIR SYSTEMS - CLASS B

5. **Deck:** C-15/32 **Incline:** 1/2

Existing Roof System: — Class B mineral or smooth surfaced built-up or modified roofing system, to retain the existing Classification, is covered with:
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c (FR)", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c Extra (FR)" or "Mule-Hide TPO-c Fleece Back", mechanically fastened.

6. **Deck:** NC **Incline:** See Note

Existing Roof System: — Class A, B or C roofing system (gravel may be removed from gravel built-up or ballasted single-ply system).
Insulation: — A minimum 1.9 in. layer of "Poly ISO 1-DWD".
Membrane: — Any UL Classified roofing membrane.

Note: The maximum incline shall be in accordance with the Class A Classification established for the membrane/insulation roofing assembly, however the incline can not exceed 1/2:12.

7. **Deck:** C-15/32 **Incline:** See Note

Existing Roof System: — Class A, B or C roofing system (gravel may be removed from gravel built-up or ballasted single-ply system).
Insulation: — A minimum 1.9 in. layer of "Poly ISO 1-DWD".
Membrane: — Any UL Classified roofing membrane.

Note: The maximum incline shall be in accordance with the Class A Classification established for the membrane/insulation roofing assembly, however the incline can not exceed 1/2:12.

MAINTENANCE AND REPAIR SYSTEMS - CLASS B AND C

1. **Deck:** C-15/32 **Incline:** 1/2

Existing Roof System: — Class B or C roofing system, to retain the existing Classification, is covered with:
Slip Sheet: — One or more layers Atlas Roofing "FR-50", Elk "VersaShield Underlayment" or "VersaShield FB-2S.
Membrane: — "Mule-Hide TPO-c", "Mule-Hide TPO-c (FR)", "Mule-Hide TPO-c Extra", "Mule-Hide TPO-c Extra (FR)" or "Mule-Hide TPO-c Fleece Back", mechanically fastened.

City of Steamboat Springs

Construction Site Management Plan Checklist

Prior to the approval of a building/ROW permit, any commercial, multi-family, or applicable single family/duplex project must complete an approved Construction Site Management Plan (CSMP). Below are the required items to be included in the CSMP. Please check "yes" if the item is included, "no" if it is not, and "N/A" if not-applicable. Please provide an explanation for any "No" answers at the bottom of the checklist.

Project Name: SUNDANCE PLAZA **Date:** APRIL 21, 2021

Estimated Construction Start Date: MAY 10, 2021 **End Date:** MAY 21, 2021

Individual responsible for CSMP monitoring and compliance

Name: AARON WHITENACK **Phone # (local):** 720-320-2258

	Yes	No	N/A
1. General			
a. CSMP is shown on the proposed site plan	✓		
b. Schedule Pre-Construction Meeting	✓		
c. Right of Way permit (i.e. work or obstruction within ROW). *If required, describe below and include estimated start and stop dates.*			✓
2. Erosion and Sedimentation Control Plan showing			
a. Topographic Information – including sufficient detail to characterize the site			✓
b. Areas and extent of soil disturbance (show any phasing)			✓
c. Location of all on site and adjacent water bodies, wetlands, drainages, and storm water systems			✓
d. Vehicle tracking control measures (vehicle track pad, vehicle wash station, etc.)			✓
e. Inlet protection			✓
f. Temporary sedimentation ponds			✓
g. Provide standard details of control measures			✓
3. Site Construction Facilities (Identify the following):			
a. Staging areas	✓		
b. Stockpile areas			✓
c. Dumpsters and trash receptacles	✓		
d. Sanitary facilities	✓		
e. Loading/Unloading areas	✓		
f. Trailers and field offices (show access)			✓
4. Parking:			
a. Location and number of onsite and any offsite stabilized parking areas			✓
b. Is project located downtown or at ski resort base area? *If so, describe below where contractor parking will occur:*		✓	

5. External Traffic Control Plan showing:			
a. Show/label all traffic control devices (MUTCD compliant)			✓
b. Site access points; show existing adjacent streets and driveways; identify any changes and associated signage			✓
c. Sidewalks and trails; identify any changes and associated signage			✓
d. Use of the public Right of Way (ROW) - generally not permitted (for constrained sites show any proposed use of ROW)			✓
e. Crane use details, including but not limited to, ROW encroachment, swing radius, loading locations (Crane will require ROW permit from the City)			✓
6. Internal Access Control showing			
a. Emergency access- 24' wide all weather surface for emergency access thru site (to be maintained at all times)			✓
7. CSMP Standard Notes:			
a. Standard CSMP notes included on the site plan or Civil Plan Sheets	✓		
8. Dust Control			

Provide narrative describing efforts to reduce fugitive dust from construction activities:

ROOFING DEBRIS TO BE CONTAINED & REMOVED USING EQUIPMENT. TRASH BAGS USED AS NEEDED FOR FINE PARTICULATES. DEBRIS WILL BE SWEPT AND NOT BLOWN.

Provide explanation for any "No" or "N/A" answers:

SUNDANCE PLAZA - 255 ANGLETES DR

** Plans shall be phased and updated as the project evolves and site conditions change.

** Please notify adjacent property owners prior to mobilization.

** Refer to chapter 36 of the Community Development Code for more information.

Standard Notes for Construction Site Management Plans:

1. This plan shall be kept on site at all times and updated to reflect any changes.
2. Clearing or grading shall not begin until all control measures have been installed.
3. Contractor is responsible for installing and maintaining temporary erosion and sediment control measures during construction and establishing any required permanent control measures to prevent release of pollutants from the project site.
4. Control measures shall be used, modified, and maintained whenever necessary to reflect current conditions. Control measures shall be inspected weekly and after every precipitation event. Accumulated sediment shall be removed from control measures when the sediment level reaches ½ the height of the control measure.
5. The contractor shall promptly remove all sediment, mud, and construction debris that may accumulate in the right of way, private property, or water ways as a result of the construction activities.
6. All ingress and egress access points on to the disturbed site must be stabilized with a vehicle tracking control pad. Access shall only be via approved locations as shown on approved CSMP.
7. Temporary soil stabilization measures shall be implemented where ground disturbances have temporarily or permanently ceased for 14 days or for areas of land disturbance within one growing season.
8. Concrete waste and washout water from mixing trucks shall be contained on site, removed from the site, and properly disposed. Materials shall not be allowed to enter state waters.
9. Contractor is responsible for complying with all local, state, and federal laws. In addition contractor must obtain required permits.
10. Emergency access must be kept obstacle free and passable at all times.
11. For any work to be done in the Right of Way, coordinate with the City ROW Manager regarding special permitting. No work shall be conducted in the ROW between November 1 and May 1 without prior approval from the director of Public Works.
12. Where required as part of the ROW permit or where site work affects the pedestrian or vehicle travel way, traffic control shall be installed. All traffic control shall be in accordance with the Manual on Uniform Traffic Control Devices, latest edition.
13. Sidewalks adjacent to construction sites shall be maintained, for public use, by the contractor. In areas where construction is taking place next to the sidewalk and overhead hazards are possible, site is responsible for installing and maintaining sidewalk protection.

Darby Enterprises, Inc. - Construction Site Management Plan

- This plan shall be kept on site at all time and updated to reflect any changes.
- Contractor is responsible for sediment control measures during construction to prevent release of pollutants from the project site.
- Control measures shall be inspected daily and after any precipitation event.
- Control measures shall be used, modified and maintained whenever necessary to reflect current conditions.
- Contractor shall promptly remove all sediment, mud, and construction debris that may accumulate in the right of way, private property or water ways as a result of construction activities.
- Debris or material from construction shall not be permitted to enter state waters.
- Emergency and ADA access must be kept obstacle free and passable at all times.
- Sidewalks adjacent to construction site shall be maintained, for public use, by the contractor.
- In areas where construction is taking place next to the sidewalk and overhead hazards are possible, site is responsible for installing and maintaining sidewalk protection.
- Site map indicating staging areas, dumpsters, sanitary facilities and loading/unloading areas shall be accompanied with this construction site management plan.
- Building permit shall be accompanied with this construction site management plan.
- Work will be in accordance with manufacturer published details, local building codes and state building codes.

SUNDANCE PLAZA
255 ANGLERS DR

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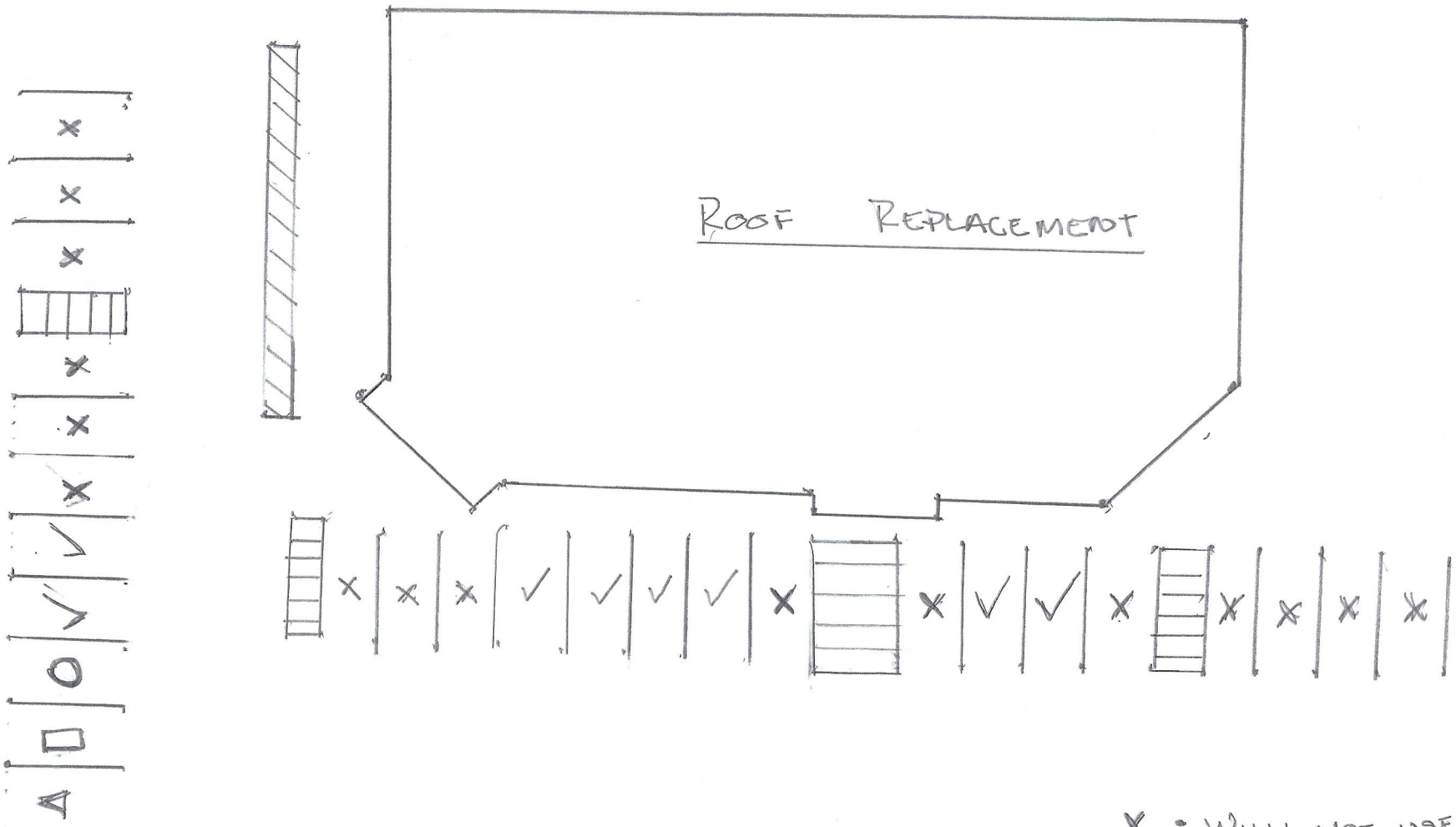

X - WILL NOT USE
✓ - DAILY / TEPORARY USE
○ - EQUIPMENT AREA
□ - ROLL OFF CONTAINER
△ - TEMPORARY TOILET