SECTION 1

MULE-HIDE PRODUCTS CO., INC.
GUIDELINES

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PLEASE CONSULT THE MULE-HIDE WEBSITE FOR THE MOST CURRENT INFORMATION

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Design Guide
Mule-Hide EPDM Roofing Systems

1.01 System Selection Guide

Mule-Hide EPDM Roofing Systems may be selected for many commercial and industrial roofing applications. The choice of system is left up to the specifier, however, there are certain guidelines that should be followed in order to assure that the system chosen is appropriate. The following list of systems and their applicability is meant to be a guide in the proper system selection.

A. Mule-Hide Ballasted Systems may be installed up to a maximum roof slope of 2:12 pitch. They may be installed up to a height of 60 ft. in FM Zones 1 or 2. See FM Loss Prevention Data Sheet 1-28. CAUTION! The specifier must ensure that the deck is capable of withstanding the weight of this system.

B. Mule-Hide Fully Adhered Systems are not limited by slope. They may be installed up to a height of 100 ft. in FM Zones 1 or 2. See FM Loss Prevention Data Sheet 1-28. A minimum fastener pullout of 360 lbs. is required.

C. Mule-Hide Mechanically Attached Systems are limited to decks where the slope will not exceed 18:12 pitch. They may be installed up to a height of 60 ft. in FM Zones 1 or 2. See FM Loss Prevention Data Sheet 1-28. A minimum fastener pullout of 360 lbs. is required.

NOTE: Should any of the building parameters fall outside of those listed above, contact Mule-Hide's Technical Department for special consideration.

1.02 System Limitations

A. Should any of the following conditions exist, Mule-Hide EPDM Systems are not recommended and should not be used. The systems are not warrantable under the following conditions.

1. The structure is unable to support the completed roofing system and other anticipated loads identified by the owner’s engineer or architect.

2. The roofing surface will be used for something other than normal commercial roofing conditions, such as plaza decks, waterproofing, or other non-roofing uses or activities.

B. To ensure that the minimum requirements are met for a Mule-Hide Warranty, Mule-Hide Roofing Systems should not be installed without first consulting Mule-Hide's Technical Department for special consideration if any of the following conditions exist:

1. For Mechanically Attached and Ballasted Systems, the building height exceeds 60 ft.

2. For an Adhered System, the building height exceeds 100 ft.

3. Building is located within 1500 ft. of a coastline or large body of water.

4. Roof is within an area classified as Zone 3 by FM Loss Prevention Sheet 1-28.

5. Roof will be subject to discharge of chemicals or industrial contaminants.

6. Roof will be subject to positive pressure from air infiltration of the deck from

canopies, overhangs, or positive interior pressure from air handlers.

7. Buildings have large openings (in excess of 10% of wall area of any side) in the wall, which could cause positive pressure to occur if they were left open to strong wind, such as aircraft hangers warehouses, loading terminals and large maintenance facilities.

8. Building will be refrigerated, a freezer or have a high interior humidity such as a swimming pool or produce storage area.

9. The Roofing System must meet specific code approvals or meet specific regulations. These might be UL or FM approvals and State and Local building codes.

1.03 Roof Deck/Substrate Criteria

A. Providing a suitable surface to receive the Mule-Hide Roofing Systems is the responsibility of the General Contractor or building owner. Prior to installation of the Roofing System the Roofing Contractor must accept the surface. Do not proceed with the roofing if there is any doubt as to the acceptability of the substrate. Contact Mule-Hide's Technical Department for recommendations.

B. Thermal barriers may be necessary to meet local building code requirements.

C. The following is a table of substrate requirements for Mule-Hide Products Co., Inc. Roofing Systems:

Table of Substrates

Substrate Type	**Ballasted System**	**Adhered System**	**Mechanically Attached System**
Steel (Min. 22 Ga.)	Insulation Required	Insulation Required	Insulation Required
Structural Concrete (Min. 3000 psi)	Insulation Required	Insulation Required (7)	Insulation Required (1)
Wood Plank (3/4" Min. thickness) (2)	Insulation Required	Insulation Required	Insulation Required
Plywood (Min. 15/16" APA grade CDX) (2)	Insulation Required	Insulation Required (4)	Insulation Required
Oriented Strand board (Min. 7/16") (2) (3)	Insulation Required	Insulation Required (4)	**NOT APPROVED!**
Gypsum	Insulation required	Insulation Required	Insulation Required
Cementicious Wood Fiber	Insulation Required	Insulation Required	Insulation Required
Lightweight Concrete	Insulation Required	Insulation Required	Insulation Required
Existing Smooth Surface Built-up Roofs	Insulation Required	Insulation Required	Insulation Required
Coal Tar Pitch or Gravel			

Surface BUR (5)	Insulation Required	Insulation Required	Insulation Required
Sprayed-in-Place Urethane	Tear-off Required (8)	Tear-off Required (8)	Tear-off Required (8)
Removed Existing Roof to Deck (6)	Insulation Required	Insulation Required	Insulation Required

Notes:

(1). A protective mat acceptable to Mule-Hide Products Co., Inc. may be used in lieu of rigid insulation, provided that prior written approval is obtained from Mule-Hide's Technical Department.

(2). Fire Treated material may be used, provided that it has not been treated with ammonium phosphates. Salt-based preservatives are preferred.

(3). Oriented Strand Board (OSB) must be an APA rated OSB.

(4). An .060" EPDM membrane may be adhered directly over this product provided that it is clean, smooth, dry and free of sharp edges, fins, splinters, or contaminants such as oil and grease that may damage the membrane. The decking must be properly fastened with an acceptable screw or rink shank-flooring nail. The roof deck must NOT be 'green treated'. OSB must be installed rough side up.

(5). Loose gravel must be removed to prevent moisture entrapment.

(6). Follow all laws, regulations and procedures to identify and properly remove and dispose of asbestos materials which are to be torn off.

(7). If the concrete is trowel finished and free of rough or sharp ridges, and the surface is clean, clear of all debris and contaminants that may harm the membrane or cause loss of adhesion of the Mule-Hide Bonding Adhesive, an .060 inch thick EPDM membrane may be fully adhered directly to the poured structural concrete. New concrete must cure a minimum of 28 days. Only the Mule-Hide Bonding Adhesive (solvent based) may be used.

(8). Mule-Hide Products does not warrant roofs that have been installed over Sprayed-in-Place Polyurethane Foam (SPUF). All existing SPUF must be removed down to the substrate.

1.04 Roof Drainage

A. Mule-Hide requires that the roof drains water and recommends a minimum slope of 1/4" per foot to help assure positive drainage. Adequate drainage will assure the long-term performance of the roofing system and eliminate the ponding of water, which might cause the dynamic design load to be exceeded. Ponding water is defined as water that remains on the roof in excess of 48 hours after a precipitation.

1.05 Roof Expansion Joints

A. Expansion joints shall be located where necessary to accommodate structural and thermal movement.

B. The need for expansion joints and their placement should be determined by an Architect or Engineer. Expansion joints should be considered whenever the following circumstances exist:

1. There is a construction joint in the structure.

2. Movement between the roof and the wall is anticipated.

3. Structural framing elements change direction (joists, purlins, deck).

4. An addition is connected to an existing building.

5. Different types of decking abut each other, such as concrete and steel.

1.06 Wood Nailers and Blocking

A. Where wood blocking is required, Mule-Hide Products Co., Inc. recommends the use of lumber that is salt treated.

B. Wood nailers and blocking shall be fastened to withstand a minimum force of 200 lbs. per linear foot in any direction. Refer to current FM Loss Prevention Bulletin 1-49.

C. Wood nailers must match the insulation height and are required at the following locations:

1. At all roof edges.

2. At sheet metal attachment points (sheet metal shall be totally supported by wood blocking).

3. Beneath metal equipment curbs, unless they are fastened directly to the deck.

4. At pitch pockets that are in excess of 12" square.

NOTE: Wood nailers are not required at the base of parapet walls or other walls, unless needed for the attachment of sheet metal.

1.07 Vapor Retarders

A. Specific climate and humidity conditions may require the use of a vapor retarder. It is the sole responsibility of the design professional to determine the need for a vapor retarder, its type and location in the roofing system.

B. The need for a vapor retarder should be investigated whenever the following circumstances exist:

1. The average January outside air temperature is below 40 degrees and the average inside winter humidity will be 45% or greater.

2. The building usage will be such that there is a high interior humidity (swimming pools, food processing and other wet process plant operations).

3. Construction products will be used that will release moisture after the roof has been installed (i.e. interior concrete and plaster, poured in place roof decks and fills, fuel burning heaters etc.).

C. Consult the NRCA Roofing and Waterproofing Manual for recommendations when considering the inclusion of a vapor barrier in the roofing system.

1.08 Insulation

A. There are certain minimum insulation requirements and product limitations for the different types of insulations that must be considered when specifying a roofing system. Consult the Insulation Guideline section of this manual as a guide to making the proper choices for each Mule-Hide Roofing System.

1.09 Fasteners and Insulation Attachment

A. The type of Mule-Hide fastener and the proper fastening pattern that is appropriate for each roof is dependant on the type of deck, pullout values, wind zone area, building height and ground roughness. Consult the Insulation Guideline section and the Fastener Guideline section of this manual as a guide to selecting the proper fasteners and fastener patterns.

1.10 Non-Fastener Insulation Attachment

A. Insulation may be adhered to certain substrates with Type III or IV asphalt, or other types of adhesives specifically designed for this use, on a job-to-job basis, providing that *prior* written approval is obtained from Mule-Hide Products Technical Department. The Technical Department may require documentation from the various manufacturers stating the proper procedures and suitability of their products for the intended use.

B. Mule-Hide does not manufacturer or supply asphalt for the purpose of adhering insulation to concrete decks and has no control over the quality of the product used. Mule-Hide does not warrant the attachment of the insulation when adhered to the substrate with asphalt.

1.11 Walkways

A. Walkways should be provided in areas where routine rooftop maintenance occurs and in areas where regular rooftop traffic is expected. This should include but is not limited to all roof access points such as doors, hatches and ladders and around rooftop mechanical equipment.

B. Mule-Hide recommends the use of rubber walk pads as they may be adhered directly to the roof surface. Do not install walk pads over field seams or flashings. Install the walk pads with a min. 3" spacing between pads to allow for water flow.

C. When using masonry paver blocks as walkways, a protection membrane layer must be installed prior to the pavers. A layer of EPDM membrane or a polyester slipsheet is acceptable for use as a protection membrane.

1.12 Warranties

A. Mule-Hide Products Co., Inc. offers several warranties for commercial roofing systems. Refer to the Warranty Information section of this manual see the different warranties available, and any special requirements for their issuance.

B. Only Mule-Hide Warranty Eligible Contractors may apply for Mule-Hide Standard and Premium warranties.

*** End Of Section***

MULE-HIDE PRODUCTS CO., INC.
FLASHING/ADHESIVES GUIDE

PART 1 - GENERAL

1.01. Introduction

A. While many roofing projects are likely to have their special problems, the contractor is certain to encounter some common features over and over again, such as curbs, walls, pipes, corners and drains. This guide explains how to address the common roof features quickly and effectively, using the Mule-Hide Products Co., Inc. (Mule-Hide) EPDM Roofing Systems Standard Details. You will be able to execute these details using the various products that Mule-Hide provides to accomplish the various tasks.

B. Our products are only as good as the workmanship with which they are installed. This is the reason that we emphasize good workmanship and attention to detail. By adhering to the Details and Specifications, you will be installing the various components of the roofing system, using time proven details, methods and procedures. This will provide a roofing system that you can be proud of and one that will give its owner years of service.

C. This Flashing/Adhesive Guide is designed to provide a quick reference to the materials, procedures and details that you will most often encounter. It answers many of the common questions that will come to mind as you are installing the roofing system. However, it is not a comprehensive guide to all of our details; it is meant to be used in conjunction with our Standard Detail section and the System Specifications. From time to time a condition may be encountered that may not be covered in the Mule-Hide EPDM Manual. When this occurs, contact the Mule-Hide Technical Department.

D. As you review this guide you will notice a few differences in the details and the use of some of the products. These changes were meant to improve the performance of the roofing system or to simplify and standardize the way things are done. Abide by these changes.

1.02. Scope:

A. Provide a comprehensive guide to the products that are used when flashing, what they are used for, and the proper way to use them.

B. Give a step-by-step account of how to construct the common details according to Mule-Hide Standard Details and Specifications.

PART 2-PRODUCTS

2.01 Product Storage and Handling.

A. All products delivered to the job site shall be in their original unopened containers or wrappings and clearly labeled with the manufacturer's name, product identification and date of manufacture.

B. Protect all materials from damage during transit, storage and delivery to the job site. Place all materials on pallets and protect from moisture. Materials damaged in handling or storage shall not be used.

C. Store all materials in a dry, clean area protected from the elements. All adhesive and caulking shall be stored at temperatures between 60°F and 80°F. Materials exposed to lower temperatures affect the workability and performance of the product. Products shall be restored to room temperature prior to use.

D. All flammable materials shall be stored in a cool, dry area away from open flames and sparks. Follow precautions outlined on containers or supplied by the material manufacturer/supplier.

E. All damaged materials are to be replaced.

2.02. Materials Used in Flashing.

A. Mule-Hide non-reinforced EPDM membrane is available for use with a Fully Adhered System in standard widths of 7, 10 and 20 feet, and lengths of 50 and 100 feet. This membrane is used to flash flat surfaces, and is cut to the appropriate size in the field.

B. Mule-Hide Splice Adhesive - a black or white solvent based, synthetic rubber based (butyl) product designed for splicing EPDM roof membranes and uncured EPDM flashing.

C. Mule-Hide Single Seal Adhesive - a black synthetic rubber based (blended) adhesive that may be used as either a splice or bonding adhesive for EPDM membranes (cured or uncured). Not to be used for RMS details.

D. Mule-Hide Bonding Adhesive (solvent based) - an amber colored synthetic rubber based (neoprene) adhesive designed to bond EPDM membranes to approved insulation boards, metal, concrete, wood and other approved substrates.

E. Mule-Hide Water Base Adhesive - a non-flammable and non-toxic acrylic latex-based adhesive designed to bond EPDM membranes to approved insulation boards, wood, concrete and other approved decking materials. For horizontal surfaces only (not to exceed inclines greater than 2"). Not suitable for vertical surfaces.

F. Mule-Hide In-Seam Tape - a cured butyl rubber tape designed to adhere EPDM membrane seams in conjunction with Mule-Hide's Tape Primer.

G. Mule-Hide Tape Primer - a cleaner specifically formulated to clean and prime EPDM membrane surfaces to be bonded with splice adhesives, In-Seam Tapes or Cured and Uncured EPDM Laminates.

H. Mule-Hide Uncured EPDM Flashing - an uncured EPDM membrane (.060 inches thick) to be used in conjunction with the Mule-Hide EPDM Roofing Systems. Uncured EPDM flashing is easily formed and used to flash pipes, inside and outside corners and various other penetrations that require a moldable product.

I. Mule-Hide Uncured Laminated Flashing Tape - an uncured EPDM membrane laminated to cured butyl tape. Used to flash pipes, inside and outside corners, T-joints and various other penetrations that require a moldable product. Flashing tape is used in conjunction with the Mule-Hide Tape Primer. Mule-Hide Uncured Laminated Flashing Tapes shall not be used for stripping seams, gravel stops, drip aprons or batten bars.

J. Mule-Hide Cured Laminated Cover Tape - a cured EPDM membrane laminated to cured butyl tape, used for stripping seams, batten bar, gravel stop, drip apron and to patch EPDM membrane.

K. Mule-Hide Lap Sealant - a one part, black or white elastomeric caulk designed for sealing the exposed edge of field fabricated membrane laps.

L. Mule-Hide Water Cut-Off - a butyl based, one-component mastic designed specifically for sealing roofing membranes to wood, metal, concrete, plastic and other substrates.

M. Mule-Hide Pourable Sealer - a two-component, liquid (100% solids) polyurethane elastomer used as filler for pitch pockets.

N. Mule-Hide Pipe Boots - an economical premolded EPDM flashing designed for flashing single pipe penetrations.

O. Mule-Hide All Purpose Bar - a specially extruded aluminum bar, .050" thick x 1" wide x 10' long, that may be used as an anchor bar, batten bar or as a termination bar.

P. Mule-Hide RMS Strips - 6 inch wide, cured, reinforced EPDM strips used as a base attachment around curbs and walls to mechanically attach the EPDM field sheet.

Q. Mule-Hide Fasteners - Factory Mutual approved # 14 heavy duty and # 12 drill point fasteners used for fastening insulation, reinforced membrane, Mule-Hide All Purpose Bar and Mule-Hide RMS Strip to roof decks, curbs and walls.

R. Mule-Hide 2.4" Barbed Seam Plates - Factory Mutual approved 2.4" round Galvalume plates with reinforcing ribs used in conjunction with the Mule-Hide HD Fasteners to attach the reinforced membrane and RMS strips.

2.03. Procedures for Adhesive and Sealant Use.

A. Splicing seams with Mule-Hide Butyl Splice Adhesive or Mule-Hide Single Seal Adhesive.

1. Position the two membrane sheets, allowing for 4" overlap and fold the top sheet back about 12". Make sure that the laps are shingled so that water runs over the splice edge and not against it.

2. All surfaces to be spliced shall be clean and dry. Remove excess talc by wiping the seam area with a clean damp rag. Dispose of rags as they become dirty.

3. Prepare each surface of the seam by scrubbing the cleaned areas with Mule-Hide Tape Primer using clean cotton rags or Scotch-Brite pads. Additional cleaning may be required along the factory seams that intersect the seam area to remove excess accumulations of talc. Rags and Scotch-Brite pads must be replaced with clean ones as they become dirty. The primed membrane should have a uniform black color when dry. There should be no streaks present. The Mule-Hide Tape Primer shall be thoroughly stirred prior to use.

4. Tape Primer and Splice Adhesives must be thoroughly stirred prior to application. Be sure to scrape the sides and bottom of the cans while stirring.

5. Apply the Splice Adhesive to the cleaned surfaces of both sheets. Mule-Hide recommends the use of a solvent resistant, 3" - 4" wide, short bristle paint brush or a solvent resistant 3" wide, " medium nap, paint roller.

6. Apply the adhesive in a uniformly thick even coat. When using a paintbrush do not use a circular motion. Use long, straight strokes applying sufficient adhesive that will achieve a smooth surface without leaving brush marks. When using a roller do not over roll the adhesive. This will cause an uneven application.

7. Do not allow the adhesive to puddle or leave globs, as these areas will not dry properly and may cause excessive swelling of the membrane which will result in fishmouths in the finished seam.

8. Adhesive must be applied to both surfaces of the seam at the same time to allow for uniform drying of the adhesive. The adhesive must fully cover the surface of the splice areas a minimum of 4" wide.

9. Allow the adhesive to dry until tacky to the touch of a dry finger without stringing or sticking to the finger and does not move when pushed forward or the finger is twisted.

   Note: Drying time (also referred to as Flash Off time) will vary from day to day depending on the ambient weather conditions. In colder weather, condensation may form on the surface of the adhesive, which is caused by the solvent flashing off. If this occurs, the application of the Splice Adhesive should be discontinued. The surface must be allowed to dry and a thin coat of adhesive must be applied over the existing adhesive.

10. Roll the top sheet onto the bottom sheet being careful not to stretch or wrinkle the membrane. Apply hand pressure brushing from the inside of the sheet outward to the edge removing air and fishmouths.

11. Using a 2" wide steel roller, apply positive pressure rolling from the inside of the seam working out over the edge of the sheet perpendicular to the direction of the seam. The entire seam must be rolled in this manner.

12. All "T-joint" laps in the field membrane shall be reinforced with a 6" piece of uncured EPDM membrane (uncured flashing tape may also be used) centered over the intersection of the edges of the seams. All T-joint patches shall be caulked with Lap Sealant.

13. Field seams and flashing should be allowed to set for several hours prior to the application of Lap Sealant. Lap Sealant should be applied to all seam edges by the end of the workday and before any moisture has a chance to form on the membrane.

14. Just prior to applying the Lap Sealant, the seam and flashing edges shall be cleaned with a clean rag or cloth using the Mule-Hide Seam Cleaner to remove any dirt or talc that may remain along the seam edge. Be sure that all edges of the splice have been covered with a continuous bead of Lap Sealant. It is not necessary to trowel (screed) the caulk. The Lap Sealant shall be applied at a maximum rate of 20 linear feet per tube.

B. Splicing seams with Mule-Hide In-Seam Tapes.

1. Make sure that the top sheet is lapped over the bottom sheet in shingle fashion so that the water will flow over the seam edge and not against it.

2. All surfaces to be spliced shall be clean and dry. Overlap the adjacent membrane a minimum of 4" and fold back the top sheet approximately 12" to allow for cleaning. Remove excess talc by wiping the seam area with clean damp rags. Dispose of all rags as they become dirty.

3. Prepare each surface of the seam by scrubbing the cleaned areas with Mule-Hide Tape Primer using clean cotton rags or Scotch-Brite pads. Additional cleaning may be required along the factory seams that intersect the seam area to remove excess accumulations of talc. Rags and Scotch-Brite pads must be replaced with clean ones as they become dirty.

4. The primed membrane should have a uniform black color when dry. There should be no streaks present. The Mule-Hide Tape Primer shall be thoroughly stirred prior to use.

5. Roll the top sheet back over the bottom sheet and mark the bottom sheet to allow for proper placement of the In-Seam Tape. Mark the bottom sheet along the edge of the top sheet, but " away from the sheet, as a guide for the installation of the In-Seam Tape. Do not use a chalk line or any type of marker that will prevent the seam tape from sticking.

6. Fold the top sheet back. Approximately 1/8" to 3/8" of In-Seam Tape should be exposed along the completed seam. Unroll 2 or 3 feet of the In-Seam Tape leaving the release liner in place. Align the In-Seam Tape so that the edge of the release liner is touching the guideline. Do not install the tape over the line. Leaving the release paper in place, install the In-Seam Tape along the marks on the bottom sheet. Roll the tape with a 2" steel roller along the entire length of the seam. The roller must run perpendicular to the tape with overlapping strokes. If more than one piece (roll) of tape is required to complete a seam, the second piece of tape must overlap the first a minimum of 1 inch.

7. Fold the top sheet back onto the tape so that the sheet is lying over the release paper. Peel the release paper off the tape at a 45o angle and parallel with the roof allowing the top sheet to fall freely onto the exposed tape. Press the seam together using hand pressure and wiping toward the splice edge. Immediately roll the seam with a 2 inch wide steel roller, using positive pressure, toward the edge of the seam.

8. Wait a minimum of 2 hours prior to application of the Lap Sealant. The Lap Sealant is only required at intersections with factory seams, where two pieces of tape overlap within the seam and on patches installed over T-joints. A bead of Lap Sealant should be applied along the overlap for 6" in each direction from the center point of the overlap.

C. Regardless of the method used to splice the seams, all seams must be thoroughly inspected for fishmouths, bubbles, blisters and wrinkles and repaired as necessary.

1. If fishmouths or wrinkles occur through the seam, they must be cut out and patched with cured membrane (cured cover tape may be used).

2. Patch with cured EPDM membrane or Cured Cover Tape (do not use uncured flashing or flashing tape) that is at least 3 inches larger in all directions than the area that has been cut out. Round the corners of the patch.

3. Center the patch over the area to be repaired. Follow the splicing procedures for the appropriate material used.

2.04. Mechanical Attachment Procedures and Options.

A. Mule-Hide All Purpose Bar may be installed either as a batten bar or a termination bar, depending on the placement in the system.

1. When used as a batten bar its purpose is to secure the field membrane. It is fastened either to the wall or curb through the field membrane, or to the roof deck through any insulation being used as an overlayment. The fastening is accomplished using the proper Mule-Hide fastener for the material to which the membrane shall be anchored.

a. The batten bars are positioned 1/2" to 1" apart, and held back approximately 6" to 9" from inside and outside corners.
b. The batten bar is fastened a maximum of 12"o.c.
c. The batten bar must have a fastener within 1-1/2" from each end.
d. The batten bar is positioned and fastened by either starting in the middle of each bar and installing fasteners consecutively toward each end, or by starting the fasteners at one end and consecutively fastening toward the other end. Do not fasten at both ends and then install the interior fasteners, as this will cause the bar to buckle between the fasteners and not lay flat.
e. The fasteners should be snug, but do not over tighten, causing the bar to deform.

2. When the Mule-Hide All Purpose Bar is used as a termination bar; it is turned over so as to form a caulk edge. Refer to the termination bar Standard Detail.

a. The All Purpose Bar is positioned on the membrane so that the fasteners will be compressing the membrane into the bead of water cut off between the membrane and the substrate.
b. The termination bar will be fastened, using the Mule-Hide fastener suited to the substrate, at a maximum of 6" o.c., with the required fastener at all bar ends.
c. Follow the same fastening order as for batten bar.
d. Term bar may be installed horizontally or vertically.

B. The Mule-Hide 6" RMS strip is rapidly becoming the method of choice for providing mechanical attachment of the field membrane at the base of walls and curbs.

1. Lay the RMS strip along the wall or curb to be flashed.

2. Cut the RMS strip to the proper length, and position it where it will be fastened.

3. Fasten the RMS strip either horizontally to the roof deck, or vertically into the wall or curb, using the 2.4" barbed seam plates and appropriate Mule-Hide Fasteners spaced a maximum of 12" on center. Fasteners must be installed within 1-1/2" of each end of the RMS strip.

4. The field sheet is then spliced to the RMS with Mule-Hide Butyl Splice Adhesive, following the splicing procedure in (2.03.A.). Mule-Hide Single Seal Adhesive is not an acceptable product for this detail. Do not use Single Seal Adhesive to splice the field sheet to the RMS strip.

C. The Mule-Hide 6" RMS strip is also available with a pre-applied seam tape for even easier installation.

1. Lay the RMS strip along the wall or curb to be flashed with the marked 'X's toward the exterior of the roof and release tape facing upward.

2. Cut the RMS strip to the proper length, and position it where it will be fastened.

3. Fasten the RMS strip either horizontally to the roof deck, or vertically into the wall or curb, using the 2.4" barbed seam plates and appropriate Mule-Hide Fasteners spaced a maximum of 12" on center. Fasteners must be installed within 1-1/2" of each end of the RMS strip.

4. The field sheet is then seamed to the RMS using tape primer and the pre-applied tape. Apply tape primer to the underside of the field membrane where it will make contact with the seam tape (see 2.03, B above).

5. Fold the field sheet back onto the tape so that the sheet is lying over the release paper. Peel the release paper off the tape at a 45o angle and parallel with the roof allowing the top sheet to fall freely onto the exposed tape. Press the seam together using hand pressure and wiping toward the splice edge. Immediately roll the seam with a 2 inch wide steel roller, using positive pressure, toward the edge of the seam.

PART 3-EXECUTION

3.01 Flashing Vertical Surfaces.

A. The field membrane must be mechanically attached at the base of the wall. This can be accomplished with either the All Purpose Bar or the RMS strips (see 2.04 above). If you are installing a Reinforced EPDM field membrane, 2.4" barbed seam plates may be substituted for the All Purpose Bar.

Note: Use of the RMS strip at the base of vertical surfaces allows the field membrane to be used as a continuous field and flashing sheet. The field sheet is adhered to the RMS strip and then adhered to the vertical surface, running to the point of termination. The field sheet should extend up the vertical surface a minimum of 8 inches where possible.

B. Cut the cured flashing sheet to the size needed, but limit the area to be flashed so that the sheet size is manageable.

C. Position the flashing sheet along the wall or curb to be flashed with the edge to be spliced to the field sheet along the outside edge of where the splice will occur. This should be a minimum of 3" out from the edge of the plate or bar.

D. Prepare the flashing sheet and the field membrane for splicing as in sections 2.03., paragraphs A.2. through 9. Prepare both sheets at the same time, especially applying the adhesive at the base of the flashing sheet, so that when it flashes off, a hinge is formed. The edge of the sheet is hinged to the field sheet by the adhesive.

E. Apply the bonding adhesive to the curb or wall and to the remaining surface of the flashing sheet.

F. After all of the adhesives have flashed off, roll the flashing sheet into the splice area taking care not to let the sheet bond to the wall until the splice is mated and worked up tight to the wall. Care must be taken to make this splice so that there are no wrinkles in the splice.

G. When the splice is completed up to the wall, mate the flashing sheet to the vertical surface. Work the sheet up the surface, starting at the middle of the sheet and working up and out to the ends. Do not force or stretch the membrane as wrinkles may occur. Carefully roll all surfaces with a 2" steel roller to ensure positive contact of the membrane to the horizontal and vertical surfaces.

H. Terminate the flashing sheet at the top using one of the Standard Details. When using Mule-Hides All Purpose Bar, a bead of Water Cut-Off must be installed between the membrane and the substrate at the point where the bar is to be fastened. Do not flatten the bead of Water Cut-Off with a roller. The termination bar must compress the membrane into the water cut-off to create a proper seal. Trim excess membrane with a utility knife prior to applying the final bead of sealant along the top edge of the All Purpose Bar.

3.02. Fabricating an Outside Corner Using Uncured EPDM

A. Cut two pieces of the uncured EPDM to the proper size keeping in mind that the flashing must extend up the vertical and the flange must extend out onto the horizontal a minimum of 3". Each piece of the flashing must extend around the corner a minimum of 2" in one direction and 4" in the other. Round the corners.

B. Prepare the uncured corner pieces and the and the membrane to which they will be applied the same as for a splice.(2.03.A.)

C. When the adhesives have flashed off, take the first piece of Uncured EPDM and fold the 3" flange up. Mate the corner piece to the vertical surface as follows:

1. Starting at a minimum 2" from the corner, position the corner piece so that the flange edge is down flush with the horizontal surface and mate it to the vertical surface. Wrap the corner piece around the corner a minimum of 4", pressing it into place and allowing no wrinkles.

2. Now form the flange out onto the horizontal surface by starting at each end of the corner piece and working it out without stretching it. Once the ends of the flange have been started without stretching, form the flange by working it out and forming it to the horizontal surface.

3. Roll the corner piece with a 2" steel or silicone roller.

D. Install the second corner piece following the procedures in C. above, only do it in the opposite direction. The pieces overlap to form a double thickness at the base of the corner.

E. At the end of the day, apply Lap Sealant to all of the splice edges. It is not necessary to trowel (screed) the bead of Lap Sealant as it is self-leveling.

Note: This detail may also be done using Uncured Laminated Flashing Tape and Tape Primer.

F. Refer to Mule-Hide Detail # MHE-183 for reference.

3.03. Fabricating an Inside Corner Using Uncured EPDM

A. Cut a 12"x 12" piece of Uncured EPDM and round the corners.

B. Prepare the surfaces as for splicing as in section 2.03.A.

C. When the adhesives have flashed off, fold the piece back in half and position it in the corner so that the midpoint is at the base of the corner and press half of the folded piece onto the horizontal flange area and the other half onto the vertical surface.

D. To complete the installation of this piece, work the folded material up the wall and into the corner. When this is done correctly there is a triangular flap sticking out called a pig's ear. Splice the pig's ear to the vertical surface.

E. Roll the fabricated corner with a 2" steel or silicone roller.

F. With a second piece of Uncured EPDM cover the pig's ear using the splicing method described in section 2.03.A.

G. Apply a bead of Lap Sealant over the splice edges at the end of the day.

Note: This detail may also be done using Uncured Laminated Flashing Tape and Tape Primer.

H. Refer to Mule-Hide Detail # MHE-184 for reference.

3.04. Flashing a Roof Drain

A. Remove the strainer and the drain clamp ring from the drain, saving the parts for later use. If it is a reroof situation, the existing flashing material must be removed, and the drain bowel flange and the clamping ring must be clean of all foreign debris. Remove any lead flashing and properly dispose of it.

B. Make sure that there is a smooth transition down to the drain bowel flange. This might require that the insulation be tapered in order to provide the smooth transition.

C. Position the field membrane over the drain and press it down onto the drain bowel flange and mark the spot in the center of the drain pipe where the hole in the membrane will be cut.

D. Cut a smooth round hole in the membrane, centered on the marked spot, that is larger than the drainpipe, but smaller than the drain clamp ring.

E. Install a heavy bead of Water Cut-off under the membrane and on top of the drain bowel flange, so that the drain bowel clamping ring rests over the bead of Water Cut-off.

F. Install the clamping ring and the clamping ring nuts and bolts, tightening the clamping ring securely and forming a compression seal between the membrane and the drain bowel flange. Any clamp bolts that have been broken off or are missing must be replaced.

G. Install the strainer on the drain.

Note: It is not acceptable for a splice to run through a drain. If this condition occurs, a 4'x 4' target of field sheet must be installed, centered over the drain.

H. Refer to Mule-Hide Details # MHE-130 to MHE-133

3.05. Installing a Prefabricated Pipe Boot

A. Prefabricated Pipe Boots are manufactured so that they will work on pipes ranging in size from 1" to 6", depending on where they are cut. Cut off the top of the boot so that it fits the pipe that is to be flashed.

B. Place the boot over the pipe so that the flange rests flat on the roof surface, and mark the pipe at the top of the boot.

C. Remove the boot and run a heavy bead of Water Cut-off around the pipe just under the mark on the pipe.

D. Clean the membrane around the pipe and the bottom side of the boot flange with Mule-Hide Seam Cleaner following the splice procedure in section 2.03.A. When the adhesive has flashed off, replace the boot on the pipe and press the flange to the field sheet. Carefully roll the boot flange with a 2" steel roller to ensure positive contact.

E. Install a stainless steel clamp at the top of the boot, compressing the boot onto the pipe and bead of Water Cut-off.

F. At the end of the day, apply a bead of Lap Sealant around the outside edge of the flange and at the top of the boot above the clamping ring.

G. Refer to Mule-Hide Detail # MHE-140 A and MHE-140 B.

3.06. Field Fabricated Pipe Flashing

A. Remove any lead or flashing of any type from the pipe to be flashed and clean the pipe.

B. Cut a one-piece target out of field sheet that is large enough to allow a minimum 6" flange around the pipe (i.e. a 6" pipe would require a minimum 18" target). Round the corners or make the target round.

C. Mark the center of the target and cut a smooth round hole, centered on the mark, that is half the size of the pipe.

D. Force the target over the pipe, forming a 3/4" to 1" flange running up the pipe.

E. Splice the target to the field sheet following the splicing procedure in section 2.03.A.

F. Cut a piece of uncured EPDM a minimum of 6" wide and long enough to wrap around the pipe and overlap itself by a minimum of 2".

G. Prepare the target for 3" around the pipe and the uncured strip for splicing as described in section 2.03.A., and apply adhesive to the pipe.

H. When the adhesives have flashed off, fold back about 1-1/2" of the uncured strip which will be the flange onto the horizontal. Position the folded strip at the base of the pipe and wrap it around the pipe until it almost meets itself. It should be stretched a little during this procedure to obtain a tight, wrinkle free installation.

I. Before completing the wrap, start to form the flange. Start at the beginning of the wrap and work the folded portion out onto the horizontal portion of the target, taking care not to over stretch the uncured EPDM for the first inch or two. After the flange is started, continue to form it, stretching it out onto the horizontal, for about half way around the pipe.

J. Make the splice at the 2" overlap, taking care not to stretch the flashing during the initial forming of the flange going back in the other direction.

K. Complete the forming of the flange, and then roll the wrap and the flange completely with a 2" steel or silicone roller.

L. At the end of the day apply a bead of Lap Sealant to all of the splice edges and around the top of the wrap.

M. Refer to Mule-Hide Detail # MHE-141.

MULE-HIDE PRODUCTS CO., INC.
INSULATION GUIDELINES

1.0 Insulation Guidelines

A. The following is a list of generic insulations acceptable for use with Mule-Hide Roofing Systems. Requests to use other types of insulation boards are to be made to Mule-Hide's Technical Department in writing prior to job bid. Such requests must include the conditions for approval, project name and location of project.

B. Insulation must be no less than 1 inch thick with the exception of high-density wood fiberboard, extruded polystyrene and tapered boards. When the insulation is applied directly over a steel deck, in no case shall the minimum allowable thickness be less than that required to span the flutes of a steel deck.

C. Applicable building codes should always be checked prior to proposing the application to Mule-Hide or the building owner.

D. Factory Mutual (FM) and Underwriters Laboratory (UL) assemblies can be found in the Factory Mutual Approval Guide and/or Underwriters Laboratories Building Material Directory and Fire Resistance Directory. Code requirements may dictate the use of specific types and thicknesses of insulation. You can contact the Mule-Hide Technical Department for help in determining which Mule-Hide system may meet your code requirements.

2.0 Insulation

Insulation Type	Used as Overlay Board	Roof Systems		
		Adhered	Ballasted	Mech Attached
Polyisocyanurate - Min 1" thick (top layer) - Min 20 psi	Yes	Yes	Yes	Yes
OSB/Polyisocyanurate Composite - Min 1.5"	Yes	Yes	Yes	Yes
HD Polyisocyanurate Coverboard – Min ½" thick	Yes	Yes	Yes	Yes
HD Fiberboard - Min 1/2" thick [8]	Yes	Yes	Yes	Yes
Dens Deck Prime / Securock - Min 1/4" thick	Yes	Yes	Yes	Yes
OSB - Min 7/16" thick [2]	Yes	Yes	Yes	Yes
Expanded Polystyrene - Min 1" - Type I [3 4 6]	NO	NO [1]	Yes	NO [1]
Expanded Polystyrene w/facer - Min 1" - Type II [3 4 7]	NO	NO [1]	Yes	Yes [5]
Extruded Polystyrene - Min 3/4" thick - Type X [3 4]	NO	NO [1]	Yes	NO [1]
Extruded Polystyrene - Min 1" - Type IV [3 4]	NO	NO [1]	Yes	Yes [5]
Extruded Polystyrene Fan Fold – Min ¼" thick [3 4]	NO	NO [1]	NO	Yes
Protection Mat - Min 6 oz.	NO	NO [1]	Yes	Yes

Notes:
1 - Requires overlay board
2 - OSB must be installed with the rough side up
3 - Not approved over Coal Tar Pitch
4 - Can not be placed in contact with PVC, requires a separation layer
5 - Overlay board recommended
6 - Type I = min 0.90 lb density
7 - Type II = min 1.35 lb density
8 - DO NOT use '6-sided' or asphalt coated board for PVC or water based adhesive

See other requirements listed below.

3.0 Minimum Insulation Specifications

A. Project or Code requirements may dictate use of materials other than those listed below. Contact Mule-Hide Technical Department with questions regarding use insulations in a Mule-Hide Roofing System.

1. Wood fiberboard (High Density)
   Thickness: 1/2" Minimum
   Classification: ASTM C-208, Grade E

2. Polyisocyanurate
   Thickness: 1" Minimum
   Classification: ASTM C 1289,
   Facers: Fiber reinforced facers, both sides

3. High Density Polyisocyanurate
   Thickness: 1/2" Minimum
   Compressive Strength: Min 90 psi at 10% deformation
   Facers: Fiber reinforced facers, both sides

4. Extruded Polystyrene Boards (flat stock)
   Thickness: 3/4" Minimum
   Classification: Type X
   Compressive Strength: Min 15 psi at 10% deformation
   Not for use over Coal Tar Pitch. Applications may require use of higher density material or overlay.

5. Extruded Polystyrene Boards (fan fold)
   Thickness: 1/4" Minimum
   Compressive Strength: Min 15 psi at 10% deformation
   Not for use over Coal Tar Pitch.

6. Expanded Polystyrene Boards
   Thickness: 1" Minimum
   Classification: Type 1
   Compressive Strength: Min 10 psi at 10% deformation
   Not for use over Coal Tar Pitch. Applications may require use of higher density material or overlay.

7. Perlite is a mineral fiber insulation board that Mule-Hide does not recommend be used in conjunction with the Mule-Hide Roofing Systems. However, should perlite be required to meet building codes, FM or UL requirements, the perlite **must** be overlaid with an acceptable insulation. **Perlite is not acceptable for use in recover applications.**

8. Fiberglass is not an acceptable insulation for use in Mule-Hide Roofing Systems.

4.0 Insulation Fastening Patterns

A. Insulation that is mechanically attached to the substrate shall use approved Mule-Hide fasteners. Minimum insulation attachment rates shall be as per Mule-Hide's requirements or insulation manufacturer's specifications, whichever is greater. Projects requiring Factory Mutual or Code approvals may require heavier gauge fasteners or additional fasteners. In no case shall the insulation attachment rate be less than Mule-Hide's requirements.

B. Refer to Mule-Hide specifications and details for minimum fastening rates and patterns.

5.0 Other Methods of Insulation Attachment

A. Asphalt - While Mule-Hide may accept (on a job to job basis) attachment of insulation with hot asphalt for use with Mule-Hide systems, asphalt is neither supplied nor manufactured by Mule-Hide; therefore, the attachment of the insulation with asphalt shall not be covered by Mule-Hide's Standard Warranty. However, if a qualified project designer specifies asphalt attachment, the following recommendations are given:

1. Steep asphalt ASTM D312, Type III or IV, shall be specified

2. Asphalt may only be used to attach approved insulations to primed structural concrete decks, properly nailed base sheets or a base layer of mechanically attached, approved insulation. Insulation must be approved by Manufacturer for use with hot asphalt.

3. Maximum insulation board size shall not exceed 4'x 4'. **4'x 8' boards are not permitted.**

4. Expanded or extruded polystyrene insulation shall not be attached with asphalt.

B. Other insulation adhesive products may be an acceptable method of attaching certain insulation boards to approved substrates. As Mule-Hide does not supply or manufacture insulation adhesives, the products must be installed in strict compliance with the requirements published by the manufacturer. Contact the manufacturer for information and recommendations regarding the appropriate use of these products. Mule-Hide must be contacted prior to the use of any such product. The attachment of the insulation is not covered by the Standard Mule-Hide warranty.

C. Mule-Hide Premium warranties require that approval of the insulation adhesive be given by Mule-Hide prior to bidding. A copy of the Insulation Adhesive Manufacturer's letter of acceptance for the project must be forwarded to Mule-Hide for review and acceptance by Mule-Hide prior to bidding the project.

6.0 Insulation Storage

A. Insulation boards stored or stocked on the job site or roof must be stacked on pallets (or other supports) above the deck or ground.

B. Insulation shall be covered with waterproof tarps to protect insulation from sun and inclement weather. Wet or damaged insulation must not be used in Mule-Hide roofing systems.

C. Insulation should not be stored on the job site for more than thirty (30) days if at all possible.

7.0 Insulation Application - Recommended Practices

A. For mechanically attached systems, install field sheets perpendicular to long dimension of the top layer of insulation. Where possible, boards should run parallel to the direction of the flutes of the deck.

B. Install insulation boards in parallel courses with tightly fitted and staggered joints. Cut all boards accurately to fit neatly around all projections and at all edges. Gaps greater than 1/4" shall be filled. End joints should be staggered a minimum of 6 inches or as approved

by insulation manufacturer.

C. Do not use wet or damaged insulation boards. Install no more insulation than can be covered with seamed membrane and watertight details before any precipitation occurs.

D. On steel decks, the ends of the insulation boards shall rest on the top of the flutes and not in suspension over the valleys.

E. When two layers of insulation are used, the second layer must have the joints staggered to the first layer a minimum of 6 inches or as approved by insulation manufacturer. One set of fasteners may be used to secure both layers of insulation unless otherwise required by the insulation board manufacturer or the architect.

F. In accordance with Mule-Hide specifications, provide proper water cutoffs to completely seal the insulation on a daily basis.

Caution: Do not install over wet, damp or uneven substrates.

Caution: Keep all insulations away from fire, flame and ignition sources during storage and installation.

End Of Section

MULE-HIDE PRODUCTS CO., INC
FASTENER GUIDELINES

Fastener Overview

A. Mule-Hide offers a variety of fasteners and plates to:
- Attach roof insulation
- Attach mechanically fastened roofing membranes
- Secure All Purpose Bar and termination bars

Mule-Hide fasteners must be used to fasten the roof insulation, roof membrane, and All Purpose Bar. On a job-to-job basis, the Mule-Hide Technical Department may accept the use of non-Mule-Hide fasteners and/or insulation adhesives for attachment of Mule-Hide accepted insulation. Any non-Mule-Hide fastener and plate used must be approved by the Mule-Hide Technical Department prior to job start-up. Your local Mule-Hide Territory Manager can advise you of the acceptability of any proposed non-Mule-Hide fastener. The following fastener guidelines apply:

Technical Specifications - Drill Point Fasteners (#12 Insulation fasteners)

A.

Technical Specifications	Minimum Performance
Material	C-1022 Phillips Cold Heading Wire
Thread OD	0.209 to 0.218 diameter
Point	Double Flute Self-Drilling
Corrosion Coating	Cathodic Epoxy Electrocoat
Average Pull-out	600 lbs. - 3/4" plywood
	480 lbs. - 22 gauge steel

Technical Specifications - HDP Fasteners (#14 membrane or insulation fasteners)

A.

Technical Specifications	Minimum Performance
Material	C-1022 Phillips Cold Heading Wire
Thread OD	.233 - .241 diameter
Point	Double Flute Self-Drilling
Corrosion Coating	Cathodic Epoxy Electrocoat
Average Pull-out	710 lbs. - 3/4" plywood
	575 lbs. - 22 gauge steel

Technical Specifications - EHD Fasteners (#15 membrane or insulation fasteners)

A.

Technical Specifications	Minimum Performance
Material	C-1022 Phillips Cold Heading Wire
Thread OD	.275 - .285 diameter
Point	Double Flute Self-Drilling
Corrosion Coating	Cathodic Epoxy Electrocoat
Average Pull-out	810 lbs. - 3/4" plywood
	725 lbs. - 22 gauge steel

Note: Additional information is available on our website at www.mulehide.com

Physical Characteristics - Drill Point & Heavy Duty Fasteners

A. **Drill Point Fasteners** (#12 Insulation fasteners)

Screw Length*	Thread Length*	Pieces / Box*	Weight / Box*
1 5/8	Full	1000	12#
2 1/4	Full	1000	16#
2 7/8	Full	1000	19#
3 1/4	2 7/8	1000	22#
3 3/4	2 7/8	1000	25#
4 1/2	4	1000	29#
5	4	1000	32#
6	4	1000	37#
7	4	500	21#
8	4	500	24#

*Approximate Values - Other sizes available as special order

B. **HDP Fasteners** (#14 membrane or insulation fasteners)

Screw Length*	Thread Length*	Pieces / Box*	Weight / Box*
1 1/2	Full	1000	13#
2	Full	1000	16#
3	2 7/8	1000	24#
4	3 7/8	1000	31#
5	3 7/8	1000	38#
6	3 7/8	1000	44#
7	3 7/8	500	26#
8	3 7/8	500	30#

*Approximate Values - Other sizes available as special order

C. **EHD Fasteners** (#15 membrane or insulation fasteners)

Screw Length*	Thread Length*	Pieces / Box*	Weight / Box*
1 1/4	Full	1000	15#
2	Full	1000	22#
3	2 7/8	1000	29#
4	3 7/8	1000	38#
5	3 7/8	1000	47#
6	3 7/8	500	29#
7	3 7/8	500	33#
8	3 7/8	500	38#

*Approximate Values - Other sizes available as special order

D. Determine minimum screw length per following:

Plywood Decks:	Fastener length must penetrate deck a minimum of 1"
Wood Plank Decks:	Fastener length must embed deck a minimum of 1”
Steel Decks:	Fastener length must penetrate deck a minimum of 1"
Structural Concrete Decks:	Fastener length must embed deck a minimum of 1"

Method of Application

A. Install fasteners with low speed variable drill with depth sensing tip, if possible, to prevent over-drill of fastener. Use a #3 Phillips bit to drill fasteners. Structural concrete should be pre-drilled with a hole 1/2" deeper than the fastener to be used using a masonry 3/16" carbide drill bit. **Caution:** Eye protection is recommended during the installation of all fasteners.

General Requirements

A. Plywood decks require a 1” penetration through the bottom surface of the deck.

B. Steel decks require 1" minimum deck penetration by the fastener. The threaded portion of the fastener must be secured to the deck. The fluted design of some steel decks require the use of longer fasteners to guarantee penetration in the fluted area.

C. Structural concrete decks require the fastening of the insulation with fasteners approved by Mule-Hide for use in concrete roof decks and insulation plates. The fastener must penetrate the deck by at least one inch. It is suggested that each hole drilled in a concrete deck be at least 1/2" deeper than the potential penetration of the concrete fastener. The 1/2" area is for the residual filings left by the concrete after the drill has been removed.

D. Gypsum, either poured or precast, cementitious fiber decks (tectum, etc.) and lightweight concrete decks must be secured with Mule-Hide TL Fasteners, Peel Rivets (a registered trademark of Creative Construction Components, Inc.) or an acceptable fastener approved by Mule-Hide Technical Department.

E. All decks must have a pull-out resistance of 360 pounds minimum. Mule-Hide recommends a test installation be performed to check the pull-out resistance of the appropriate fastener prior to bidding the project. Pull-out tests should be performed by a qualified individual and include different sections of the roof to assure uniformity of the deck.

Approved Fasteners

A. Only approved Mule-Hide fasteners supplied by Mule-Hide Products Co. may be used on warranted Mule-Hide systems. **Caution:** Some fasteners have unusual design characteristics which could harm the membrane if used with the Mule-Hide membrane; therefore, it is recommended that Mule-Hide approved fasteners be used whenever possible.

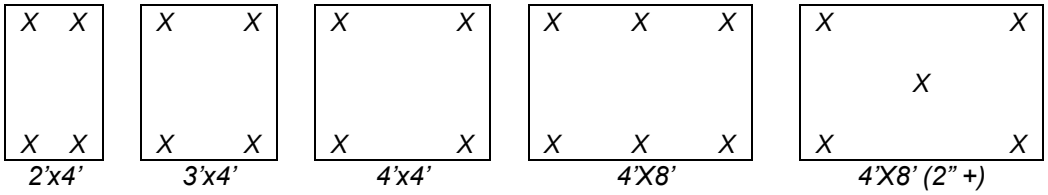
B. All fasteners shall be corrosion resistant coated and meet the corrosion resistance requirements of Factory Mutual Standard 4470.

C. All fasteners shall be compatible with and suitable for the insulation used and the deck to be penetrated.

Fastener Patterns - Insulation

A. Insulation shall be mechanically attached using approved fasteners per insulation manufacturers' specifications and FM wind uplift requirements. Unless the insulation manufacturer's fastening requirements are more stringent, Mule-Hide requires the following minimum fastening rates and suggests the following patterns:

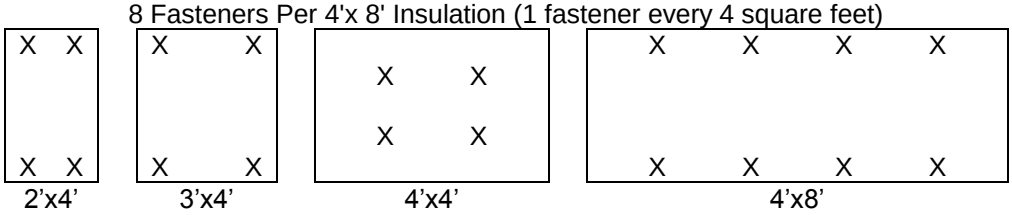
Mechanically Attached Systems



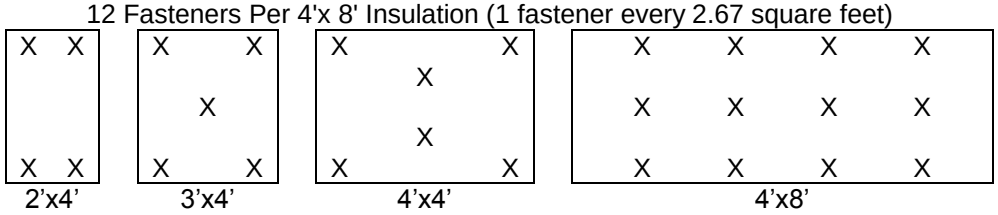
All of the insulation must be pre-fastened to the deck with Mule-Hide fasteners and 3" plates at a minimum as shown above. All fasteners must be at least six (6) inches from the edge of the board and centered as shown.

Fully Adhered

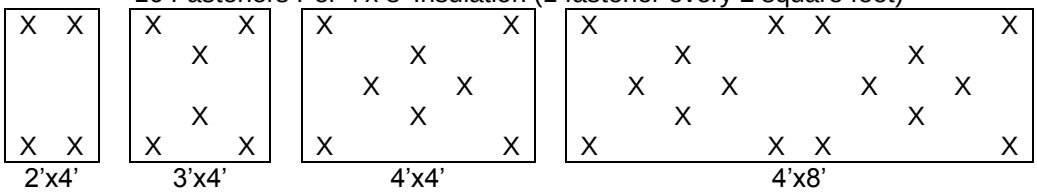
8 Fasteners Per 4'x 8' Insulation (1 fastener every 4 square feet)



12 Fasteners Per 4'x 8' Insulation (1 fastener every 2.67 square feet)



16 Fasteners Per 4'x 8' Insulation (1 fastener every 2 square feet)



Mule-Hide's minimum fastening requirements for the field of the roof for fully adhered systems is as follows:

2' by 4' boards shall be 4 per board
4' by 4' boards shall be 4 per board
4' by 8' boards shall be 16 per board (for boards up to 2" thick)
4' by 8' boards shall be 8 per board (for boards 2" thick or greater)

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 with a maximum of one (1) fastener every one (1) square feet.

Corners – insulation attachment to be increased 50% over the field attachment requirements with a maximum of one (1) fastener every one (1) square feet.

All of the insulation must be pre-fastened to the deck with Mule-Hide fasteners and plates at a minimum as shown above. All fasteners must be at least six (6) inches from the edge of the board and centered as shown.

See attached details MHFM-208, MHFM-212, & MHFM-216 for examples of Factory Mutual Attachment patterns for those projects requiring Factory Mutual Approval.

Fasteners Available From Mule-Hide

Typical Fasteners - Refer to Mule-Hide website at www.mulehide.com for most current information.

Fastener (1) (2)	**Uses**	**Roof Deck** (3)
Mule-Hide DP #12	Insulation attachment	Steel, Wood
Mule-Hide HDP-14	Insulation attachment System attachment	Steel, Wood, Concrete
Mule-Hide EHD-15 (4)	System attachment	Steel, Wood, Concrete

Notes:

1. Heavier gauge fasteners may be required to meet Factory Mutual or code requirements.
2. Other fasteners may be considered, submit request to Mule-Hide prior to bidding.
3. Contact Mule-Hide Technical Department for non-standard roof decks.
4. Required for Factory Mutual, mechanically attached systems

Attachment of Wood Nailers

A. Wood nailers shall be firmly attached to the deck, wall or existing structurally sound surface, so as to resist a force of 200 pounds per linear foot in any direction (fastening 16 inch o.c. maximum is recommended for most applications). See below the Factory Mutual Loss Prevention Data Bulletin 1-49 for recommended type and size of fasteners, nailers and spacing:

Factory Mutual
Loss Prevention Bulletin 1-49 and Other Nailer Attachment

	Fastener Type			
Deck Type	Mule-Hide Fastener	1/2" Dia. Anchor Bolts	3/8" Dia. Anchor Bolts	3/4" Dia. Structural Steel Posts
1/2" to 5/8" Plywood	12" o.c.	N/A	N/A	N/A
5/8" or Greater Plywood	16" o.c.	N/A	N/A	N/A
Wood Plank	16" o.c.	N/A	N/A	N/A
Existing 2X Wood Nailers	16" o.c.	N/A	N/A	N/A
Steel Deck	16" o.c.	N/A	N/A	N/A
Concrete	16" o.c.	4'0" o.c.*	2'8" o.c.**	N/A
Structural Steel	N/A	N/A	N/A	4'0" o.c.
Lightweight Concrete	16" o.c.	N/A	N/A	N/A

* Within 8' of all corners, spacing shall be 2'0" o.c.
** Within 8' of all corners, spacing shall be 16" o.c.