

System Specifications

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APP MODIFIED BITUMEN ROOF SYSTEM SPECIFICATION TABLE OF CONTENTS

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November 2020

PART 1 – GENERAL

1.01 Description

A. Scope:

1. Furnish and install a Mule-Hide APP Modified Bitumen ("APP MB") Roof System complete with flashings and accessories. Mule-Hide products and accessories shall be installed in strict compliance with current specifications and drawings as published by Mule-Hide Products Co., Inc. ("Mule-Hide").
2. The Mule-Hide APP MB Roof System utilizes APP modified bitumen torch applied membranes in conjunction with torch applied, self-adhering or mechanically attached base sheets. The torch applied, weather resistant cap sheets are installed over a suitable substrate or over layers of base sheet that have been applied to a suitable substrate.

B. Related Work:

The work includes, but is not necessarily limited to the installation of:

1. Vapor Retarder (where specified)
2. Wood Blocking (nailers)
3. Insulation
4. Slip Sheet (where required)
5. Coverboards
6. Fasteners
7. Base Sheets
8. Mid-Ply/Inter-Ply Sheets
9. Cap Sheets
10. Mod Bit Flashings
11. Metal Flashings
12. Adhesives and Mastics
13. Sealants
14. Walkways

Note: Mule-Hide recommends adherence to industry standards (SMACNA) for the installation of any metalwork.

C. General Design Considerations

1. It is the responsibility of the specifier to review local, state and regional codes to determine their impact on the specified Mule-Hide Roofing System.
2. It is the responsibility of the building owner or his/her designated representative to verify structural load limitation. In addition, a core cut may be taken to verify weight of existing components when the roofing system is to be specified on an existing facility.
3. On new construction projects, especially in cold climate regions, moisture generated due to the construction process could adversely impact various components within the roofing assembly if not addressed. Refer to SPRI Advisory Bulletin included in the Design Reference DR-03-11 "Construction Generated Moisture".
4. Drainage must be evaluated by the specifier in accordance with all applicable codes. Slopes may be provided by tapering the structure or through the use of tapered insulation; a sufficient number of roof drains should also be specified and properly located to allow for positive drainage. Significant ponding that could remain after 48 hours should be eliminated with the addition of auxiliary drains in low areas where ponding is anticipated.

5. Mule-Hide specifically disclaims responsibility for the design and selection of an adequate drainage system and drain accessories. Selection must be made by the building owner or the owner's design professional.
6. The removal of existing wet insulation and membrane must be specified. The specifier shall select an appropriate and compatible material as filler for voids created by removal of old insulation or membrane.
7. Regardless of the type of membrane or assembly selected, any loose flashings at the perimeter, roof drains and roof penetrations must be removed.

1.02 Quality Assurance

- A. When a project requires a System Warranty (NDL), the Mule-Hide Roofing System must be installed in compliance with Mule-Hide published Specifications and Details by an independent Mule-Hide Warranty Eligible Contractor.
- B. There shall be no deviations from this specification or the Mule-Hide Products Co., Inc. ("Mule-Hide") standard details without prior written approval from Mule-Hide's Technical Service Department.
- C. Upon completion of the installation according to the terms and conditions stated in this specification and in accordance to the information given in the Warranty Application and Pre-Job survey form and any additional approvals which might have been given by Mule-Hide, an authorized representative of Mule-Hide shall perform an on-site inspection of the roof (commercial projects only) to verify that all installation and material requirements have been met.

Note: Inspections are only conducted on projects where a "System Warranty" is requested. Inspections are not conducted on projects not requiring a System Warranty or when only a "Roofing Membrane Limited Warranty" is requested. The sole purpose of an inspection by a Mule-Hide Representative is not to be a final inspection for the benefit of the building owner/owner's representative. It is for the benefit of Mule-Hide to determine if a System Warranty may be offered for the project.

- D. Mule-Hide reserves the right to reject any roof system and refuse to issue any warranty on roofs which do not comply with Mule-Hide's specifications or current policies.
- E. The roofing contractor must ensure that all applicators with the application of heat welded modified bitumen's are properly trained and carry a valid Certified Roofing Torch Applicator card (**CERTA**) as evidence of training. All applicators must carry, review, understand and adhere to the safety information and guidelines contained in the "Torch Applied/Do's and Don'ts" as published and supplied by the Asphalt Roofing Manufacturers Association from time to time. After installation, to minimize the risk of fire, applicators should thoroughly inspect all areas of the roof where torches have been used (preferably with thermometers), as well as all return air ducts and cross beams. Applicators should provide a minimum of a four-hour fire watch after torching to minimize the risk of fire. Applicators must keep fire extinguishers readily available on site and must follow all relevant federal, state and local laws and rules applicable to the project and the product(s) being used, particularly those relating to safety and fire prevention.

1.03 Submittals

- A. Prior to the time of bidding, the roofing contractor shall submit to the owner or owner's representative the following items:
 1. Copies of Mule-Hide specifications and published Product Data Sheets.
 2. Samples of each material to be used in the roof system.
 3. Specimen copy of Mule-Hide Products Co., Inc. Warranty.
 4. Dimensioned shop drawings to include an outline of the roof and appropriate details for flashings and terminations.
 5. Certification from insulation, roofing and accessory components manufacturers that all materials supplied comply with identified ASTM and industry standards.

6. Verification that system specifications meet all identified code and insurance requirements including but not limited to the following if required:
 - a. Factory Mutual Research Laboratories
Norwood, MA
 - b. Underwriters Laboratories
Northbrook, IL

Note: It is the building owner/owner's representative's responsibility to determine what submittals are required for the project.

- B. Submit to Mule-Hide, prior to the job start, an APP Torch Modified Bitumen Warranty Application to be reviewed by the Mule-Hide Technical Department to determine the acceptability of the project based on the information provided.
 1. The APP Torch Modified Bitumen System Warranty Application ("Warranty Application") must be completely filled out and should be accompanied with a copy of the written roof specification provided by the building owner/designer (if available). Also included should be any requests for deviations to Mule-Hide's standard published specification and details.
 2. A roof drawing shall be submitted with the Warranty Application indicating all dimensions and locations of all penetrations.

1.04 Product Delivery, 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.
- C. Store all materials in a dry, clean area protected from the elements. All rolls of membrane shall be stored flat on pallets.
- D. 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 the above temperature prior to use.
- E. 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.
- F. All materials determined as being damaged (confirmed by Mule-Hide) due to improper storage on the job site are to be replaced with new materials.

1.05 Job Conditions

- A. This specification shall not be considered applicable without the appropriate additional specifications approved by Mule-Hide if it should be determined that any of the following conditions exist:
 1. The installation of any Mule-Hide APP Modified Bitumen Roof System is in a coastal area or high wind zone.
 2. If the Mule-Hide APP Modified Bitumen Roof System should exceed the structural load conditions as determined by an architect or Engineer.
 3. When chemical or hazardous materials will be discharged onto the Mule-Hide APP Modified Bitumen

Roof System.

- B. Contractor shall follow Mule-Hide application recommendations, including low temperature requirements and precautions.
- C. The General Contractor or the building owner shall be responsible for providing adequate surfaces and structures to receive the insulation, Mule-Hide Roof System and related sheet metal necessary for the successful completion of the project.
- D. Only as much new roofing as can be made watertight shall be installed each day. This includes all flashing work.
- E. All substrates to receive new insulation, membrane or flashing shall be thoroughly dry. Should surface moisture occur, the contractor shall provide adequate equipment to dry the substrate prior to application of new material.
- F. Prior to and during application, all dirt, debris and dust shall be removed from surfaces to be roofed for both new and reroofing substrates.
- G. On all projects where the Mule-Hide APP Modified Bitumen Roof System will be installed, it is the responsibility of the independent roofing contractor to have the owner or owner's representative verify the condition of the deck or substrate and to confirm the roof deck can withstand the additional load.
- H. Precautions shall be taken to prevent wind blow-off or wind damage during the course of the roofing application. This may necessitate additional securing of temporary construction, materials and equipment.
- I. The contractor shall verify and ensure that all roof drain lines are unblocked before starting work. Any blockages found shall be reported to the owner's representative and Mule-Hide's Technical Service Department in writing.
- J. Temporary waterstops shall be installed at the end of each day's work. Temporary waterstops shall be removed at the start of the next day's work and disposed of properly. Waterstops shall be compatible with all materials.
- K. Do not install the Mule-Hide APP Modified Bitumen Roof Membranes in direct contact with any product containing coal tar pitch, creosote or penta-based materials. Consult the Mule-Hide Technical Service Department for special installation requirements.
- L. Do not allow contaminants such as petroleum, grease, acid, solvents, vegetable or mineral oil, animal oil, animal fat, etc. or direct steam venting to come into direct contact with Mule-Hide APP Modified Bitumen Roof Membranes. Contact the Mule-Hide Technical Service Department for recommendations if such conditions exist.
- M. The contractor shall follow and comply with all safety regulations as recommended by OSHA.
- N. All work shall be scheduled and executed without exposing interior building areas to the effects of inclement weather. The existing building and its contents shall be protected against all risks.
- O. Arrange work sequence to avoid use of newly constructed roofing for storage, walking surfaces and equipment movement. Contractor shall provide all necessary protection and barriers to segregate the work areas and prevent damage to adjacent areas. If excessive traffic over newly installed membrane is necessary, contractor shall provide plywood or polyester felt protection to prevent damage. All damaged materials shall be replaced with new materials.
- P. All existing roofing materials to be removed for construction shall be immediately removed from the construction site to a dumping area authorized to receive such debris. Any hazardous materials such as asbestos or materials containing asbestos fibers shall be removed and disposed of in accordance with applicable City, State and Federal requirements.

- Q. Any unusual or concealed condition discovered during the course of the work is to be reported immediately in writing to the owner and Mule-Hide's Technical Service Department. Work is to be halted until the owner has responded with a solution to the problems.
- R. Vapor Retarders
1. Mule-Hide does not require a vapor retarder for the protection of the membrane; however, it should be considered by the specifier for the protection of the roofing assembly (i.e. primarily insulation, underlayment and adhesives). The following criteria should be considered by the specifier:
 - a. Use of a vapor retarder to protect insulation and reduce moisture accumulation within an insulated roofing assembly, should be investigated by the specifier. Consult latest publications by ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.), NRCA (National Roofing Contractors Association), local building and energy codes for specific information.
 - b. In the generally temperate climate of the United States, during the winter months, water vapor flows upward from a heated, more humid interior toward a colder, drier exterior. Vapor retarders are more commonly required in northern climates than in southern regions, where downward vapor pressure may be expected and the roofing membrane itself becomes the vapor retarder.
 - c. On cold storage/freezer facilities, the perimeter and penetration details must be selected to provide an air seal and prevent outside air from infiltrating and condensing within the roofing assembly.
 - d. When a vapor retarder is specified, Mule-Hide F5 Air & Vapor Barrier may be used. Refer to F5 Air & Vapor Barrier Product Data Sheet for product installation.
 - S. On structural concrete decks, when a vapor retarder is not used, gaps in the deck along the perimeter and around penetrations must be sealed. If tilt-up panels are present, vertical joints between panels must be sealed as well. Sealing these areas will help prevent infiltration of hot humid air and possible moisture contamination resulting from condensation. This is specifically important when adhesive is used to attach the roof insulation.
 - T. All local building codes, energy codes and requirements should be followed where applicable. It is the roofing contractor's sole responsibility to determine and ensure that the roofing system selected complies with all local codes and requirements.
 - U. Both interior and exterior building areas affected by construction shall be cleaned up and any damaged areas shall be repaired to the owner's satisfaction.
 - V. Certain project conditions may require modifications to this specification. Contact the Mule-Hide Technical Department if any of the following conditions exist:
 1. Roof heights greater than 100 feet.
 2. Geographical location in a 100 mph or greater wind zone, per the ANSI 100 year mean recurrence interval wind isotach.
 3. Location with Exposure Das determined in ANSI A58.1.

1.06 Warranties

All Mule-Hide warranties are available for commercial projects, term limits range from 10 to 20-years, and subject to enhancements as required such as multiple membrane plies. A Roofing Membrane Limited Warranty, for a maximum of 20 years is available for residential projects

Material Ply Requirements				
Warranty Term	Securement Ply	Base Sheet	Inter-ply Sheet	Cap Sheet
10-Year	Optional (Nail Base or G-2)	N/A	N/A	APP Torch S Premier
	Optional (Nail Base or G-2)	Torch Base SA ¹	N/A	APP Torch Base/Cap
12-Year	Optional (Nail Base or G-2)	N/A	N/A	APP Torch S Premier (coated) or APP Torch Premier or KoolCap
15-Year	Optional (Nail Base or G-2)	SA Base Sheet ¹ or APP Torch Base Premier	N/A	APP Torch Premier or KoolCap
20-Year	Optional (Nail Base or G-2)	SA Base Sheet ¹ or APP Torch Base Premier	SA Base Sheet ¹ or APP Torch Base Premier	APP Torch Premier or KoolCap

¹ Self Adhered Base Sheets can be used under torch products, but cannot be installed over G-2 Base or Torch Base.

A. Mule-Hide Modified Bitumen Membrane Limited Warranty

The Modified Bitumen Membrane Limited Warranty ("Warranty") covers only the Mule-Hide membrane (or portion thereof) determined by Mule-Hide to be defective and resulting in roof leaks. This Warranty does not cover workmanship or other components not supplied by Mule-Hide. Mule-Hide does not perform inspections of the installation before issuing the Roofing Membrane Limited Warranty. A Mule-Hide Warranty Application and the appropriate fee must be submitted to Mule-Hide to obtain this warranty. Proof of purchase may be required.

B. Mule-Hide's Modified Bitumen Roof NDL System Warranty for Commercial Buildings

The System warranty is an NDL ("No Dollar Limit"), labor and material warranty that covers only the Mule-Hide labeled membrane and accessories that comprise the Mule-Hide Roof System, other components supplied or approved in writing by Mule-Hide and exclusively installed by an independent Mule-Hide Warranty Eligible Contractor. Contractor must submit a Warranty Application and the appropriate fee to Mule-Hide. System warranties require inspections by a Mule-Hide representative.

C. Mule-Hide is under no obligation to issue warranties on projects completed prior to submittal to the Mule-Hide Technical Service Department of a properly completed Warranty Application.

D. Metal flashing products supplied by Mule-Hide (Mule-Hide Metal Accessories) and installed by a Mule-Hide Warranty Eligible Contractor will be covered under the NDL System Warranty. The finish on the Mule-Hide labeled metal components are covered for a maximum warranty period for up to 25 years independent of the terms of the issued warranty (see the Mule-Hide 25 years Limited Metal Warranty for specific warranty coverage).

E. NDL System warranties are not available for residential projects.

F. Tie-ins are not covered by Mule-Hide warranties.

G. Contact Mule-Hide Technical Service Department for other extended warranties that may be available.

H. Terms and Conditions of Warranties.

- Mule-Hide's obligations under the Roofing Membrane Limited Warranty and the NDL System Warranty are limited to the specific terms and conditions of the respective Warranties. Sample copies of the Mule-Hide Warranties are available from the Mule-Hide Technical Department upon request.
- Mule-Hide does not warrant products incorporated or utilized in the installation that were not furnished or approved by Mule-Hide.

PART 2 - PRODUCTS

2.01 General

- A. The components of the Mule-Hide APP Modified Bitumen Roof System are to be products manufactured or supplied by Mule-Hide.
- B. Components other than those supplied or manufactured by Mule-Hide may be submitted for review and acceptance prior to the project start by Mule-Hide's Technical Department. Mule-Hide's acceptance of any other product is based solely on chemical compatibility and published performance data provided by the component manufacturer. Other components may be considered on a job-by-job basis and must be approved in writing by Mule-Hide's Technical Department prior to the start of the project. Mule-Hide offers no warranty or guarantee for the performance or suitability of any component not supplied or manufactured by Mule-Hide.

2.02 Roofing Membrane

Mule-Hide APP Modified Bitumen (MB) materials are available as torchable cap sheets and base sheets. Accessory items such as mechanically attached and self-adhering base sheets are also available. Refer to the Product Data Sheets for physical properties and additional information.

- A. APP MB Membranes
 - 1. APP Torch S Premier – A premium, polyester reinforced APP modified bitumen roofing membrane designed for application as either a heat-welded (torch applied) base sheet or inter-ply sheet. APP Torch S has a smooth top surface with a polyolefin film on the bottom surface. Meets ASTM D6222 Type I, Grade S. Each roll contains 1 square of material. Approximate roll size is 3 feet 3-3/8 inches wide by 32 feet 10 inches long (1m x 10m) with a nominal thickness of 4.0 mm (160 mils).
 - 2. APP Torch G Premier– A premium, polyester reinforced APP modified bitumen roofing membrane designed for application as a heat-welded (torch applied) cap sheet. APP Torch G has a granulated top surface with a polyolefin film on the bottom surface. Meets ASTM D6222 Type I, Grade G. Each roll contains 1 square of material. Approximate roll size is 3 feet 3-3/8 inches wide by 32 feet 10 inches long (1m x 10m) with a nominal thickness of 4.5 mm (180 mils).
 - 3. APP Torch G FR Premier– A premium, fire resistant, polyester reinforced APP modified bitumen roofing membrane designed for application as a heat-welded (torch applied) cap sheet. APP Torch G FR has a granulated top surface with a polyolefin film on the bottom surface. Meets ASTM D6222 Type I, Grade G. Each roll contains 1 square of material. Approximate roll size is 3 feet 3-3/8 inches wide by 32 feet 10 inches long (1m x 10m) with a nominal thickness of 4.5 mm (180 mils).
 - 4. APP Torch G KoolCap - A premium, highly reflective, polyester reinforced APP modified bitumen roofing membrane manufactured for heat-welded (torch) applications, with a burn off bottom layer film. APP Torch G KoolCap has a highly reflective granule surface which meets or exceeds most standards for "Cool Roofing" and has a SRI of 96.
 - 5. APP Torch G FR KoolCap - A premium, highly reflective, polyester reinforced APP modified bitumen roofing membrane with fire retardant additives, manufactured for torch applications, and a burn off bottom layer film. APP Torch G KoolCap FR has a highly reflective granule surface which meets or exceeds most standards for "Cool Roofing" and has a SRI of 96.
 - 6. APP Torch Base/Cap - A polyester reinforced APP modified bitumen roofing membrane designed for heat-welded (torch) applications. APP Torch Base/Cap has a smooth surface and a polyolefin backing. Meets ASTM D6222 Type 1 requirements. Limited to a maximum 10-year Modified Bitumen Membrane Limited Warranty.
 - 7. APP Torch G - A polyester reinforced APP modified bitumen roofing membrane designed for heat-

welded (torch) applications. APP Torch G has a granule surface that is available in several colors, and a polyolefin backing. Meets ASTM DG6222 Type 1 requirements. Limited to a maximum 10-year Modified Bitumen Membrane Limited Warranty.

B. Base Sheets

1. APP Torch Base Premier– A fiberglass reinforced, APP saturated base sheet designed for application either as a mechanically attached or heat-welded (torch applied) base sheet or inter-ply sheet. The top and bottom surfaces are finished with a polyolefin film. Meets ASTM D6509, Type I. Each roll contains 2 square of material. Approximate roll size is 3 feet 3-3/8 inches wide by 65 feet 8 inches long (1m x 20m) with a nominal thickness of 2.0 mm (80 mils).
2. Nail Base – A premium, fiberglass reinforced, SBS saturated base sheet designed for mechanical attachment. Nail Base has a polyolefin film on the top surface and a sand finish on the bottom surface. Meets ASTM D 6163, Type I. Each roll contains 2 squares of material. Approximate roll size is 3 feet 3-3/8 inches wide by 65 feet 8 inches long (1m x 20m) with a nominal thickness of 2.0 mm (80 mils).
3. G2 Base – A premium, fiberglass reinforced, oxidized asphalt blend saturated, base sheet designed for mechanical attachment. G2 Base has a sand finish on the top surface and on the bottom surface. Meets ASTM D 4601, Type II. Each roll contains 3 squares of material. Approximate roll size is 3 feet 3-3/8 inches wide by 99 feet 2 inches long (1m x 30.2m) with a nominal thickness of 2.0 mm (80 mils).
4. SA Base Sheet – A premium fiberglass reinforced base sheet consisting of an SBS modified asphalt compound on the top and a pressure-sensitive adhesive compound on the bottom. The SA Base sheet is finished with a polyolefin film with printed lay lines on the top surface and a split release liner covering the bottom side. Meets ASTM D6163 Type I, Grade S and ASTM D1970. Each roll contains 2 squares of material. Approximate size of the roll is 3 feet 3-3/8 inches wide by 65 feet 8 inches long (1m x 10m) with a nominal thickness of 2.0 mm (80 mils).
5. SA Base Sheet FR – A premium fiberglass reinforced, fire resistant base sheet consisting of an SBS modified asphalt compound on the top and a pressure-sensitive adhesive compound on the bottom. The SA Base sheet is finished with a polyolefin film with printed lay lines on the top surface and a split release liner covering the bottom side. Meets ASTM D6163 Type I, Grade S and ASTM D1970. Each roll contains 2 squares of material. Approximate size of the roll is 3 feet 3-3/8 inches wide by 65 feet 8 inches long (1m x 10m) with a nominal thickness of 2.0 mm (80 mils).
6. Torch Base SA - A self-adhered, fiberglass reinforced, modified bitumen membrane. Torch Base SA is manufactured using Adeso® dual-compound technology, where the membrane consists of Styrene Butadiene Styrene (SBS) modified asphalt compound on top and a pressure sensitive adhesive compound on the bottom and the top surface is a polyolefin film with printed lay lines. Meets ASTM D4601 Type II / ASTM D1970.

2.03 Accessory Materials

The following Mule-Hide materials must be used to install Mule-Hide Roof Systems. Mule-Hide will not warrant any application where another manufacturer's product is substituted for a Mule-Hide product. **All products listed below are physically and chemically compatible with each other.**

- A. Helix® Max Low-Rise Adhesive, Helix® Max Low-Rise Adhesive 5-Gallon Jug, Helix® Max Low-Rise Adhesive Dual Tank, and Helix® Max Low-Rise Adhesive Dual Cartridge (Helix Max Low-Rise Adhesive) are a two-component, low-rise, construction grade, polyurethane foam adhesive designed to adhere approved roof insulations, thermal barriers, cover boards and fleece backed single-ply membranes to acceptable substrates. This VOC, CFC, HCFC and solvent free adhesive is quickly and easily applied.

1. Depending on the packaging and delivery option selected, these products can be installed in continuous beads, full spray, or splatter applications. Not all products have the same options so review of the product data sheets is required to ensure proper use.
- B. Helix® Low-Rise Adhesive is a two-component, low-rise, construction grade, polyurethane foam adhesive designed to adhere approved roof insulations, thermal barriers, or cover boards to acceptable substrates, and is available in multiple packaging options; 15 and 50 gallon drums, Dual Tanks, and Dual Cartridges.
- C. Mule-Hide #121 Asphalt Primer – A general purpose penetrating asphalt primer used to promote adhesion prior to the application of hot-mopped, cold-applied, torched and self-adhesive membrane systems, as well as roof cements, mastics, and asphalt-based adhesives. Meets ASTM D41 requirements.
- D. Mule-Hide #271 Mod Bit Sealant – A fibrated, cartridge grade, rubberized adhesive with bonding strength designed for use with modified bituminous products. It sets by loss of solvent content through evaporation. Because of its ease of application and vertical bonding strength, it is recommended for membrane seaming, flashing and detail work. Mule-Hide #271 Mod Bit Sealant has excellent low temperature flexibility. Meets or exceeds requirements of ASTM D4586 AND D3409. Required when sealing end laps (along 45° angle cut) and completing various SAMB or APP details.
- E. Mule-Hide #251 Premium Wet/Dry Elastomeric Flashing Cement – A high quality formulation that may be used as a topical application on smooth or granulated APP products. Meets requirements of ASTM D4586 and D3409. Can be used to bond SAMB membrane to granulated surfaces. It is recommended for flashing and detail work. Not to be used to adhere APP membranes with a burn-off film.
- F. Mule-Hide #401 Premium Fibrated Aluminum Roof Coating – Provides premium, high-performance protection for asphalt-based roofs. Mule-Hide #401 Premium Fibrated Aluminum Roof Coating is a heavy bodied formulation produced with 3 lbs. of aluminum pigment per gallon with special reinforcing fibers that “push” the aluminum flakes to the surface for long lasting reflectivity and greater durability. In addition, this formula is non-destructive to asphalt based roofing membranes.
- G. Mule-Hide All-Purpose Bar ("A-P Bar") – An extruded aluminum bar, 50 mils (.050") thick, used to terminate adhered reinforced membrane vertical flashings in certain constructions. Mule-Hide A-P Bar may also be used to anchor the field sheet at the base of vertical angle changes.
- H. Membrane Fasteners and Plates – Mule-Hide offers a variety of membrane fasteners and plates to meet specific job conditions and substrates.
- I. Mule-Hide Insulation – Mule-Hide Poly ISO 1 and Poly ISO 2 polyisocyanurate insulation (flat or tapered) is a closed-cell polyisocyanurate foam core laminated to heavy, black (non-asphaltic) glass fiber reinforced felt facers.
- J. F5 Air & Vapor Barrier – A 40-mil thick composite consisting of 35-mil self-adhering rubberized asphalt membrane laminated to a 5-mil UV resistant poly film with an anti-skid surface which is fully compatible with Helix Max Adhesive. A white poly film is available for summer time exposure and a black poly film is available for winter time exposure. F5 Air & Vapor Barrier can also function as a temporary roof for up to 120 days. Available in rolls 39" wide by 75' long (244 square feet).
 1. The use and placement of a vapor retarder should be determined by an architect or engineer. Mule-Hide does not require the use of vapor retarders. However, Mule-Hide recommends that a vapor retarder be considered when both of two conditions are anticipated or when required by local building or energy code:
 - a. The outside average January temperature is below 40°F, and
 - b. The expected interior winter relative humidity is 45% or greater
 2. Mule-Hide must be contacted for buildings that are refrigerated (freezers or cold storage) or have a high interior humidity such as, but not limited to, swimming pools, produce storage or locker rooms

- K. AeroWeb Low-VOC Aerosol Contact Adhesive/Primer – A low VOC contact adhesive used to adhere membranes to various substrates, and prime surfaces prior to the application of F5 Air & Vapor Retarder. It features a quick dry time and ease of application from the self-contained pressurized cylinder.

2.04 Related Materials By Others

A. Wood Nailers

1. Nailers shall be #2 or better lumber. Creosote and asphaltic preservatives are not acceptable. Pressure treated lumber is not required on new construction unless specified by the architect.
2. Wood nailers shall conform to Factory Mutual's Loss Prevention Data Sheet 1-49.
3. Wood nailers shall be installed as specified on the project drawings and shall be of a height sufficient to match the thickness of the insulation being used.

B. Insulation

1. Insulation shall be installed as a protection layer over the existing substrate or to obtain a desired thermal value.
2. Insulation shall be compatible with the Mule-Hide APP Modified Bitumen Membranes, Mule-Hide Adhesives, Mule-Hide APP Modified Bitumen Flashings and other Mule-Hide Accessories.
3. The following is a list of acceptable insulations and minimum requirements. These insulations may also be used as an overlay for non-approved substrates:
 - a. Mule-Hide Poly ISO 1 or Poly ISO 2 polyisocyanurate insulation or equal.- Requires the application of an approved cover board, mechanically attached base sheet or the application of the SA Base Sheet prior to installing any heat-weldable (torch applied) APP Torch membranes.
 - b. Mule-Hide Poly ISO 1 or Mule-Hide Poly ISO 2 polyisocyanurate insulation meeting the physical property requirements of Fed. Spec HH-I-1972 and having a minimum compressive resistance of 18 psi. Thickness minimum is 1.0" or greater as required to span steel deck flutes.
 1. Requires the application of a mechanically attached base sheet or an approved cover board manufactured by U.S. Gypsum (USG) or Georgia-Pacific (GP).
 - c. Structodek HD with Primed Red Coating high density wood fiberboard by Blue Ridge. 1/2-inch thick is the minimum requirement when used as an overlay. Mule-Hide requires a minimum 1-inch thick board when installing directly over steel decks. Wood and concrete decks require a minimum 1/2-inch thick board. Minimum thicknesses and attachment rates will vary with wind requirements and deck types.
 1. Requires the application of an approved cover board, mechanically attached base sheet or the application of the SA Base Sheet or Torch Base SA prior to installing any heat-weldable (torch applied) APP Torch membranes.
 - d. Extruded polystyrene meeting ASTM C578, Types IV, VI or VII physical properties. Minimum thickness shall be 1.0 inch. When installing directly over a steel deck the minimum thickness shall be as required by insulation manufacturer to span flutes. Check local building codes as a layer of gypsum board may be required under the extruded insulation (on steel decks). Contact Mule-Hide Technical Department regarding attachment of extruded polystyrene with the Helix® Max Low-Rise Adhesive. Not all extruded products are approved for use with the Helix® Max Low-Rise Adhesive.
 1. Requires the installation of an approved (minimum 1/2" thick) cover board manufactured by

U.S. Gypsum (USG) or Georgia-Pacific (GP).

- e. Perlite – This product is **not** an acceptable top layer component in a Mule-Hide roofing assembly. Must be overlaid with an acceptable insulation or cover board. Perlite cannot be adhered, or adhered to using any low-rise adhesive.
- f. Lightweight Insulating Concrete (LWIC) – Decks and fill must have a minimum density of 22 lbs. per cubic foot (PCF) and a minimum compressive strength of 125 pounds per square inch (psi). Decks not meeting these minimums are not eligible for any warranties. Mule-Hide requires a minimum thickness of 2" over the polystyrene insulation or the deck. The roof deck manufacturer must confirm in writing, to the Mule-Hide Technical Department, that the roof deck meets the minimum requirements as stated above and is suitable for application of the roof assembly. LWIC requires the installation of a mechanically attached base sheet with sufficient approved fasteners installed to meet the uplift requirements of the local building code. New decks must be confirmed by the roofing contractor to be sufficiently dry prior to the installation of the Mule-Hide roofing system. Mule-Hide shall not be responsible for damage or any failures of the roofing system caused by the lightweight insulating concrete deck or fill. Mule-Hide will not be responsible for any failure to follow installation or venting recommendations.
- g. Rockwool – Either mechanically attach a base sheet or heat weld (torch apply) APP Torch Base Sheet directly to the Rockwool. Consult the manufacturer's product data sheets/ installation guidelines for compatibility and proper application.

C. Coverboards/Thermal Barriers

- 1. Torch Applied Modified Bitumen – The following is a list of approved coverboards/thermal barriers that may be used in the Mule-Hide APP Torch MB Roof Systems:
 - a. **DensDeck Prime by Georgia-Pacific (GP)** – Field priming of this product is not required. APP Torch and SA Base Sheets may be applied directly to the surface. Minimum thickness of the Dens-Deck Prime is dependent on local wind conditions. Contact the Mule-Hide Technical Department for details, regarding acceptable thicknesses and fastening patterns.
 - b. **Securock Gypsum-Fiber Roof Board by United States Gypsum (USG)** – Field priming of this product is not required. APP Torch Base Sheet may be heat-welded (torch applied) directly to the surface. SA Base Sheet may also be applied directly to the surface. A third option is to mechanically attach a G2 base Sheet or Mule-Hide Nail Base.
- 2. When attempting to install Mule-Hide Modified Bitumen membranes to a non-acceptable substrate/insulation, Mule-Hide requires the installation of an acceptable material as an overlay before the installation of an appropriate Mule-Hide base sheet.

D. UL and FM Approved Assemblies

Contact Mule-Hide Technical Department for proper insulated assemblies when projects require compliance with UL or FM requirements. The components may change with the slope, deck type and classification requested.

E. Sheet Metal

- 1. Metal flashing products supplied by Mule-Hide (Mule-Hide Metal Accessories) and installed by a Mule-Hide Warranty Eligible Contractor will be covered under an NDL System Warranty.
- 2. Metal components such as gravel stops, drip aprons, counterflashings, copings, etc., should be fabricated and installed in accordance ES-1 recommendations and requirements.
- 3. Sheet metal components supplied by others are not covered by the Mule-Hide warranties. Contact Mule-Hide's Technical Department for specific requirements.

2.05 Precautions

- A. Consult Safety Data Sheets and container labels for specific safety instructions prior to use.
- B. Avoid breathing vapors of solvents, cleaners, primers, sealants and adhesives. Use with adequate ventilation. Avoid prolonged contact of solvents, sealants, cleaners, primers and adhesives with skin. Solvent resistant rubber gloves should always be worn during use.
- C. Do not use oil-based paint on Mule-Hide APP Modified Bitumen membrane. Contact Mule-Hide's Technical Department for recommendations.
- D. Do not allow muriatic acid (masonry cleaner) to come in direct contact with the Mule-Hide APP Modified Bitumen Membrane or accessory products.
- E. Do not allow Mule-Hide APP Modified Bitumen membranes or accessories to come into direct contact with steam or vents that produce temperatures in excess of 160°F.
- F. The Mule-Hide SA Base Sheet may NOT be installed in temperatures below 50°F. Temperatures must be 50° F and rising.

PART 3 - EXECUTION

3.01 General

- A. General: Do not install modified bitumen membranes at temperatures lower than 40-45°F wherever practicable. Where work is unavoidable at such temperatures the following precautions be taken:
 - 1. Take extra care during cold weather installation at ambient temperatures of 40-45°F or below and when ambient temperatures are affected by wind or humidity, to ensure adequate bonding is achieved between the surfaces to be joined. This applies to both material seam welds and adhesion of the applied product to the appropriately prepared substrate as the substrate can be affected by such temperature constraints as well.
 - 2. In addition, unrolling of cold materials, under very low ambient conditions must be avoided to prevent the likelihood of unnecessary stress cracking. Rolls must be at least 40°F at the time of application. Should the membrane roll become stiff or difficult to install, it should be replaced with a new roll from the heated storage area.
- B. When installing a Mule-Hide APP Modified System Roof System in cooler weather, it is recommended that liquids such as solvents, sealants, etc. be stored at warmer temperatures (60°F or more but not exceeding 80°F) until just prior to use in order to facilitate the installation.
- C. If using the SA Base Sheet, it must be installed in temperatures above 50°F. Temperatures must be 50°F and rising.

3.02 Substrate Conditions

The following general conditions apply to the substrate that will receive a Mule-Hide Modified Bitumen Roofing System for both new construction and reroof applications:

- A. The roof deck must be structurally sound to provide proper securement for mechanical fasteners. Areas showing a loss of integrity due to corrosion, rotting, warping, concrete spalling, etc., must be repaired or replaced prior to installing the roofing system.
- B. It is the responsibility of the roofing contractor to perform test cuts at each roof area prior to reroofing. The condition of the substrate must be suitable to receive a Mule-Hide APP Modified Bitumen Roofing

System. Wet insulation must be removed and replaced. See Single-Ply Roofing Institute's guidelines for determining wet insulation.

- C. Contact the material manufacturer when the substrate is exposed to excessively high humidity and/or a corrosive environment. Special fasteners (e.g. stainless steel) or details may be required.
- D. A determination must be made regarding the presence or absence of coal tar pitch within the existing roof assembly when considering a recover of the old roof system. The presence of coal tar pitch requires the use of a 6-mil poly slipsheet under the new insulation unless the coal tar pitch is 10 years or older and is separated from the Mule-Hide Modified Bitumen membrane by a layer of insulation a minimum of 1-1/2" thick having a minimum "R" value of 5.0. All joints must be butted tightly together or have joints completely taped to prevent volatiles from damaging roof membrane.
- E. It is acceptable to install a Mule-Hide APP Modified Bitumen Roof System over the following deck substrates in new construction, provided that an acceptable insulation or base sheet is installed over the substrate as needed:
 - 1. Structural Metal Deck (22-gauge minimum) shall conform to recommendations outlined in Factory Mutual's Loss Prevention Data Sheet 1-28 (requires insulation). Contact Mule-Hide's Warranty Department for attachment requirements for decks less than 22-gauge in thickness. All FM testing is based on attachment to a 22-gauge steel deck.
 - 2. Structural concrete and pre-cast, pre-stressed concrete (2,500 psi minimum) shall be cured and dry to industry standards and surface shall be smooth and free of moisture or frost. All sharp ridges or other projections above the surface shall be removed before roofing. An approved insulation board is recommended. Minimum deck thickness shall be 2 inches with 3 inches preferred due to possible spalling damage that may occur to the underside of the deck when using fasteners for insulation and membrane attachment. Insulation may be attached with Type III or IV hot asphalt, approved adhesive or approved fasteners. The membrane may be adhered directly to structural concrete decks that have been trowel finished and are completely cured (28 day minimum). Gaps in the deck along the perimeter and around penetrations must be sealed along with vertical joints between tilt-up panels, if present, to prevent infiltration of hot humid air and possible moisture contamination resulting from condensation.
 - 3. Lightweight Insulating Concrete Fill and Metal Form Work (minimum 24-gauge) – the roof deck shall be cured and dry to the deck manufacturer's and/or industry standards and shall be smooth and free of ridges and depressions. All necessary venting as recommended by the roof deck manufacturer shall be accomplished. These decks may be acceptable to receive a Mule-Hide APP Modified Bitumen Membrane Roofing System after pullout tests have been completed and appropriate fasteners have been selected. Attachment must be through the insulating concrete into the steel or concrete deck. Insulation board is required. Vapor barriers may be required when installing insulation over new decks.
 - 4. Wood Plank (1" minimum) shall conform to Factory Mutual's requirements for Class 1 impregnated decks (insulation is required). FM approved wood decks are a minimum, nominal 2-inch thick, tongue and groove planks.
 - 5. Plywood (15/32" minimum) shall be exterior grade (minimum CDX grade). A layer of an approved insulation is required for reroof applications. On new construction, while insulation board is recommended, adhering directly to the plywood or Oriented Strand Board ("OSB") deck is acceptable if the decking is secured with screws or back-out resistant fasteners. Decks attached with common or cement coated nails or staples shall be covered with an approved insulation. Torching APP Modified Bitumen directly to a combustible deck is not approved.
 - 6. Cementitious Wood Fiber Decks - Certain cementitious wood fiber decks may be acceptable to receive a Mule-Hide APP Modified Bitumen Membrane Roofing System after pullout tests have been completed and appropriate fasteners have been selected. This deck type requires an acceptable insulation.

7. Gypsum Deck - shall be cured and dry to manufacturers' and/or industry standards. The surface of the deck shall be smooth and free from ridges and depressions. Certain gypsum concrete decks may be acceptable to receive a Mule-Hide APP Modified Bitumen Membrane Roofing System after pullout tests have been completed and appropriate attachment methods have been selected. This deck type typically requires an acceptable insulation
8. Oriented Strand Board (OSB) shall be a minimum 7/16" thick. Contact Mule-Hide for acceptable sheet sizes, fastener types and spacing when using OSB as requirements will change with thickness used. Minimum thickness or usage restrictions may change depending on local code requirements. Pullout tests must be performed and submitted to Mule-Hide Technical Department prior to bidding the project.

Helix® Max Substrate Compatibility					
Insulation/Underlayments		Roof Decks		Existing Roofing Materials	
Poly ISO 1 & 2	Yes	Concrete	Yes	Smooth BUR	Yes
StructoDek® High Density	Yes	Cellular Lt.Wt. Concrete	Yes ¹⁰	Gravel BUR	Yes ⁵
Expanded Polystyrene (EPS)	Yes ¹	NVS Lt.Wt. Concrete	Yes ¹⁰	Mineral Cap Sheet	Yes
Extruded Polystyrene (XPS)	Yes ²	Gypsum	Yes	Granular Modified-Bitumen	Yes
New Sprayed Foam	No ⁸	Cementitious Wood Fiber	Yes	Smooth Modified-Bitumen	Yes
Scarified SPF	No ⁸	Plywood/OSB	Yes	Coal Tar Pitch	Yes ⁶
DensDeck®	Yes	Painted Steel	Yes	Aluminum-Coated BUR	No ⁷
Securock®	Yes	Galvanized Steel	Yes ³	Acrylic-Coated SPF	No ⁸
Oriented Strand Board	Yes	Acoustical Steel	Yes ⁴	Silicone-Coated SPF	No ⁸
Poly ISO 1-HD	Yes	Wood Plank	Yes	Unoxidized (Shiny) Asphalt	Yes ⁹

1. Standard EPDM (Non Fleece Back) membrane cannot be installed directly over EPS and requires a suitable overlayment or cover board.
2. For insulation attachment only, contact Mule-Hide Technical Department for options.
3. For new galvanized steel decks, power-washing is necessary to remove finishing oil residue if present.
4. For acoustical steel decks, fill the flutes with fiberglass or other suitable fill insulation and tack in place with strips of duct tape 3' OC, or other adhesive, prior to spraying the deck with Helix® Max Adhesive.
5. A minimum of an approved cover board or insulation is required over properly prepared gravel BUR.
6. An insulation providing the necessary R-value must be specified to prevent the coal tar pitch from softening.
7. Aluminum coatings must be removed by power-washing or by physical abrasion prior to the application of Helix® Max Adhesive. Adhesion tests are required to confirm sufficient preparation of the substrate.
8. SPF roofing assemblies may be considered on a job by job basis, contact Mule Hide Technical Department prior to bidding.
9. Requires AeroWeb for all applications.
10. Cellular or air-entrained lightweight substrates are acceptable. Lightweight concrete containing expanded aggregate such as perlite or vermiculite is not acceptable. New lightweight concrete must be confirmed by the contractor to be thoroughly dry. Existing substrates will require adhesion tests.

F. Mule-Hide recommends that all roof surfaces have a positive minimum slope of ¼" per foot to provide adequate drainage. There should not be any ponding water 24 hours after a rainfall. Ponding is not acceptable. Roofs exhibiting ponding conditions shall not receive a warranty of any type from Mule-Hide.

3.03 Preparation of Existing Substrate

A. General

1. To prevent delays or interruptions, coordinate work with other trades or suppliers to ensure that components to be incorporated into the Mule-Hide APP Modified Bitumen Roof System are available as the work progresses. Examine substrates to which the roofing materials are to be applied to ensure that their condition is satisfactory for the Mule-Hide APP Modified Bitumen Roof System application.
2. Do not permit voids greater than 1/4" wide in the substrate. Concrete substrates shall be cured and free of laitance and curing compounds. Substrates for roofing materials shall be dry and free of oil, dirt, grease, sharp edges and debris. Inspect substrates and correct defects before application of

roofing membrane.

3. Specifier or roofing contractor shall determine the condition of the existing roof deck and roofing system. Areas with deteriorated decking or wet insulation or other failed materials shall have those affected materials removed and replaced. Make sure all decking is securely fastened. The roofing contractor has the final responsibility to ensure an acceptable deck is provided to receive the new roof system.
4. Large blisters shall be cut and patched to provide a reasonably level surface.
5. On recover projects, tear off all existing base flashings, cant strips and projection flashings down to the substrate. The flashing substrate shall be dry and free of oil, dirt, grease, sharp edges and debris.
6. Gravel over existing nailers must be totally removed prior to installing new nailers and flashings. Verify that the existing nailers are in good condition and securely anchored to the roof decks.
7. When an additional thickness of insulation is being added, new nailers must be added over existing nailers to match the height of the new insulation. Nailers must be securely anchored to the roof deck per Section 3.05 of this specification.
8. All roof surfaces shall be free of ponded water, ice, or snow. Significant ponding that remains after a period of 48 hours should be eliminated by either installing tapered insulation to create positive drainage of the roof surface or by installing new drains in the low areas where the ponding remains. Positive drainage shall also eliminate the possibility of excessive live loads caused by ponding water that could cause structural damage or failure.
9. When removing an existing roof during reroofing, remove only that amount of roofing and flashing that can be made watertight with new Mule-Hide APP Modified Bitumen materials in a one-day period or prior to the onset of inclement weather.
10. Recovering over a gravel surfaced BUR system requires the installation of an acceptable insulation. Loose gravel must be removed prior to mechanically attaching a new layer of insulation. All lead pipe and drain flashings shall be removed.
11. Smooth Surfaced BUR and smooth Modified Bitumen roofing systems may be suitable substrates after priming with #121 Asphalt Primer, however the installation of a suitable insulation or base sheet is recommended. All lead pipe and drain flashings shall be removed. All lead pipe and drain flashings shall be removed. Single-ply membranes such as EPDM, Hypalon, PVC or CPA must have all existing flashings removed, the field sheet must be cut up into sections no larger than 10' by 10' and an acceptable layer of insulation shall be mechanically attached over the existing field membrane.
12. Polyurethane Foam roofing systems ("PUF") are not acceptable for recover applications. The PUF system must be completely removed and new insulation installed prior to the installation of the new APP Modified Bitumen Roofing System.
13. If a Mule-Hide NDL System Warranty is requested, the existing roof system **must be removed to the deck** prior to the installation of the new roofing system or a moisture survey by an independent third party must be taken, all wet areas removed and a copy of the survey submitted to Mule-Hide with the warranty application. In no event shall the Mule-Hide NDL System warranty cover the existing roof system or problems created by the existing roof system.

3.04 Vapor Retarder Installation (where specified)

- A. Specific climatic and job 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 (which may be required by local building or energy codes) and its type and location in the roofing system. A vapor retarder may often act as an "air barrier" which may have a positive effect in reducing internal air pressure. Vapor retarders

should be strongly considered for buildings subject to high internal air pressures such as airplane hangars and buildings with many loading bays such as warehouse facilities.

- B. The National Roofing Contractors Association recommends the installation of vapor retarders when interior relative humidity is 45% or greater and the outside mean average January temperature is below 40°F.
- C. Install a vapor retarder over a suitable substrate with all side and end laps and all penetrations sealed in accordance with the manufacturer's instructions. The vapor retarder may be loosely laid or adhered with the manufacturer's recommended adhesive.
- D. In reroofing where the existing built-up roof is to remain, the built-up roof may be an adequate vapor retarder as long as all splits or tears are repaired in order to provide a total barrier to vapor penetration.
- E. Projects utilizing Mule-Hide's F5 Air & Vapor Barrier must follow Mule-Hide's installation instructions and details for the F5 Air & Vapor Barrier.

3.05 Wood Nailers

- A. Wood nailers are required at all roof perimeter edges where metal edging and gutter systems are specified, openings and penetrations or where indicated in Mule-Hide's published details.
- B. Nailers shall be firmly anchored to the decks at a maximum 2'-0" OC and shall resist a pullout force of 200 lbs. /linear foot in any direction. A 1/2" vent space shall be provided between adjacent lengths of nailers. Fasteners shall be installed within 6 inches of each end. Spacing and fastener embedment shall conform to Factory Mutual Loss Prevention Data Sheet 1-49.
- C. Height of nailers shall match the surface level of the insulation and roof membrane. The width of the wood nailer shall extend beyond the metal flange to prevent damage to the membrane.
- D. All woodwork to be reused shall resist a minimum force of 200 lbs. /linear foot in any direction and shall be free of rot.
- E. Wood nailers with creosote and asphaltic preservatives are not acceptable. Pressure treated lumber is not required on new construction unless specified by the architect.
- F. Wood nailers (also known as Insulation Stops and Back-Nailing Strips) are required in the field of the roof with slopes greater than 1-1/2" per foot.

1. Nailers must be a minimum of 3-1/2" wide and of the same thickness as the insulation.
2. Nailers must be attached to resist a force of 200 lbs. per linear foot minimum. Fasteners used to anchor the nailers shall be spaced no more than 2' apart.
3. For slopes from 1-1/2" per foot to 3" per foot, nailers must be installed perpendicular to the direction of the slope and spaced a maximum of 32' apart (see Figure 1) when the insulation is attached with fasteners or an approved low rise foam adhesive (as determined by deck type).
4. For slopes from 1-1/2" per foot to 3" per foot, nailers must be installed perpendicular to the direction of the slope and spaced a maximum of 16' apart (see figure 1) when insulation is attached with hot asphalt (as determined by deck type).
5. For slopes greater than 3" per foot to slopes to 6" per foot,

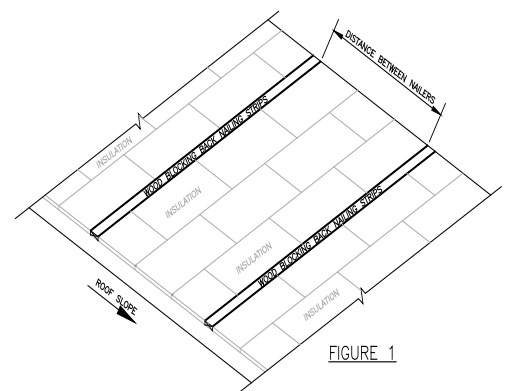


FIGURE 1

ROOF SLOPE	INSULATION ATTACHMENT	DISTANCE BETWEEN NAILERS
1 1/2" - 3" PER FOOT	FASTENERS OR APPROVED LOW RISE FOAM ADHESIVE	32'-0"
1 1/2" - 3" PER FOOT	ADHERED WITH HOT ASPHALT	16'-0"
3" - 6" PER FOOT	FASTENERS OR APPROVED LOW RISE FOAM ADHESIVE	16'-0"
3" - 6" PER FOOT	ADHERED WITH HOT ASPHALT	8'-0"

nailers must be installed perpendicular to the direction of the slope and spaced a maximum of 16' apart (see Figure 1) when insulation is attached with fasteners or an approved low rise foam adhesive (as determined by deck type).

6. For slopes greater than 3" per foot to slopes to 6" per foot, nailers must be installed perpendicular to the direction of the slope and spaced a maximum of 8' apart (see Figure 1) when insulation is attached with hot asphalt (as determined by deck type).
 7. Non-insulated projects on decks determined to be nailable do not require the use of nailers in the field of the roof.
 8. Non-insulated projects on decks determined to be non-nailable must have nailers installed flush with the deck surface.
- G. Wood Nailers should be provided on all prefabricated curbs and hatches for attachment of membrane base flashings
- H. Slope changes and rooftop-mounted equipment should be provided with adequate nailer fastening and support.

3.06 Insulation Installation

A. General

1. Mule-Hide accepted roof insulations shall be installed in accordance with Mule-Hide specifications.
2. Mule-Hide accepted roof insulations shall be secured to the roof deck in accordance with Mule-Hide's requirements.
3. All roof insulation shall be neatly cut to fit around all penetrations and projections with a maximum allowable gap of 1/4-inch.
4. Open joints shall be repaired with like insulation material.
5. Insulation shall be feathered or tapered to provide a minimum sump area of 36" x 36" where possible at all drains. Crickets and saddles may be installed beneath the specified insulation where possible. Crickets and saddles made from non-compatible insulations materials must be overlaid with an acceptable insulation or underlayment.
6. Install no more roof insulation in one day than can be covered with the Mule-Hide APP Membrane or when the onset of inclement weather is anticipated.
7. Insulation installed over steel decks shall be checked so that no edges are left unsupported along the flutes. All insulations shall be of sufficient thickness and density to prevent breakage under normal roof construction traffic.
8. When installing insulation, the end joints of each row of insulation shall be offset against the previous row. When more than one layer of insulation is to be used, succeeding layers are to be laid staggered in relation to the previous layer of insulation and all joints shall be offset.
9. When a Mule-Hide NDL System Warranty is requested, only Mule-Hide labeled insulation may be used unless written approval is obtained, prior to job bid, for an alternative insulation.
10. Insulation other than Mule-Hide labeled insulation must be an FM approved insulation and acceptable to Mule-Hide for use under the Mule-Hide APP Modified Bitumen Roofing System. Refer to the insulation manufacturers guidelines for the appropriate type, size and thickness of the insulation needed for use over the respective substrate and under the Mule-Hide APP Modified Bitumen

Roofing System.

B. Mechanical Attachment

1. Insulation fastening density will vary based on insulation type, thickness, and required warranty
2. For code compliance, increased fastening density may be required depending upon project wind speed and wind uplift requirement.
3. Mule-Hide's minimum attachment rates shall be as follows:

Insulation Type or Overlay	Fasteners per 4' x 8' board		
	Field	Perimeter	Corner
Approved Polyisocyanurate - Min 2" thick (top layer)	8	12	16
Approved Polyisocyanurate - Min 1.5" up to 2" thick	12	18	24
Approved Polyisocyanurate - Min 1.0" up to 1.5" thick	16	24	32
1/2" HD Poly-ISO - Installed over Approved Insulation	16	24	32
HD Fiberboard - Min 1/2" thick- Installed over Approved Insulation	16	24	32
DensDeck Prime or Securock - Min 1/4" thick - Installed over Approved Insulation	12	18	24
OSB - Min 7/16" thick - Installed over Approved Insulation	17	25	32
Approved OSB/Polyisocyanurate Composite - Min 2" thick	17	25	32

Contact Mule-Hide's Technical Department for FM approvals and required attachment rates that are determined by deck type, insulation brand, type and thickness. When using multiple layers of insulation or more than one type of insulation, the number of fasteners required per board is determined by the top layer of insulation.

4. 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:

- a. The minimum width of the perimeter and corner areas shall not be less than eight (8) feet.
- b. **Perimeters** – insulation attachment to be increased 50% over the field attachment requirements with a maximum of one (1) fastener every one (1) square feet.
- c. **Corners** – insulation attachment to be increased 100% over the field attachment requirements with a maximum of one (1) fastener every one (1) square feet.
- d. 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.

C. Adhesive Attachment

Adhesive attachment substrate preparation

1. The surface to which adhesive is to be applied shall be dry, clean and free of fins, protrusions, sharp edges, loose and foreign materials, oil and grease. Depressions greater than 1/4" (6 mm) shall be filled with Helix Max Adhesive or other approved patching material. All sharp projections shall be removed. Previously unexposed (shiny) asphalt must be primed with AeroWeb.
2. Seal gaps between the wall/penetration and concrete deck with Mule-Hide F5 Air & Vapor Barrier, FROTH-PAK, or other suitable material, to avoid condensation issues and positive pressure from air infiltration.

3. Apply Helix Max Adhesive when the substrate and ambient temperatures are 25°F or above when spraying or extruding with heated or non-heated equipment. Dispense the adhesive between 300-800 psi depending on the equipment used. Consult Mule-Hide Technical Department for more details.

Adhesive installation

1. Apply Helix Max Adhesive to the substrate.
 - a. For fully adhered applications, spray adhesive to obtain full coverage (approx. 1/8" to 1/4" thick after foaming).
 - b. For bead applications, apply adhesive at 4", 6", or 12" on center with a **minimum 1/2" wide wet bead**. For steel decks, bead attachment of Helix Max Adhesive must run parallel with and be on top of the steel deck flutes.

Bead Spacing Requirements				
Building Height	Perimeter Width	Bead Spacing		
		Field	Perimeter	Corner
0-25'	4 Feet	12" OC	6" OC	6" OC
26'-49'	8 Feet	12" OC	6" OC	6" OC
50'-74'	12 Feet	12" OC	6" OC	6" OC
75'-100'	16 Feet	12" OC	6" OC	6" OC
101' or greater	Contact Mule-Hide Technical Department			

2. Factory Mutual bead spacing guidelines in the perimeter and corner may differ from the table above. Beads at 12" OC are not acceptable at perimeters and corners.
3. Allow adhesive to rise and develop "string/body" (approx. 1.5 - 2 min.). String time will vary based on environmental conditions like temperature and humidity. Do not allow the adhesive to over-cure (lose tack) prior to setting insulation boards.
4. Place insulation boards (maximum 4' x 4'), or cover boards (DensDeck Prime or Securock may be 4' x 8') into adhesive after allowing it to rise and develop "string/body".
5. Designate one person to walk boards into place and then roll the boards between 5-7 minutes from the initial adhesive application. Boards may be temporarily weighted or relief-cut where necessary to keep the boards in constant contact with the adhesive until the adhesive cures.
6. At the beginning of the insulation attachment process and periodically throughout the day, check the adhesion of boards to ensure a tight bond is created and maximum contact is achieved.

CAUTION: Gaps between horizontal and vertical surfaces of the roof area as well as gaps around penetrations must be sealed to prevent interior warm air from infiltrating and condensing within the roofing assembly. Condensing moisture could weaken bottom insulation facer and eventually result in dislodgement or loose boards when adhesive is used.

NOTE: Projects utilizing Mule-Hide's F5 Air & Vapor Barrier must comply with Mule-Hide's installation requirements and published details.

3.07 Cants Strips

- A. Cant strips are required to be installed at the intersection of the roof and all walls, curbs, or transitions in the roof surface having an angle change greater than 45°F.
- B. For insulated roof systems, the cant strips must be installed on top of the insulation/coverboard.

- C. Cants must be mechanically attached with approved fasteners (and plates, if needed) where applicable. Otherwise they may be set in an approved roof mastic.
- D. Fibrous cant strips shall be non-combustible perlite or glass fiber.
- E. All cants must have approximate vertical and horizontal dimensions of 4 inches. The face of the cant shall have an incline of not more than 45 degrees.
- F. If using wood cants, they must be covered with either a nailable base sheet or the SA Base Sheet prior to heat-welding any APP Torch base or cap sheet.
- G. Field base and cap sheets shall extend to the top of the cant strip.

3.08 Nailable Base Sheet Installation

A nailed base sheet does not count as a waterproofing layer in a warranted system and should not be left exposed overnight nor exposed to inclement weather.

- A. Nail Base and G2 Base Sheets – These sheets are used when mechanical attachment of the base sheet is the preferred method of attachment. The Nail Base sheet has a polyolefin film on the top surface (with lay lines) and a sand finish on the bottom. The G2 Base Sheet has a sand finish on the top and bottom. The Nail Base is to be used prior to the application of the SA Base Sheet or the APP Torch Base or cap sheets. The G2 Base Sheet is for torch applications only and cannot be used as a nailable base sheet prior to installing the SA Base Sheet.
 - 1. When the insulation/coverboard is mechanically attached on slopes up to 1-1/2" per foot, the nailable base sheets may be installed either perpendicular or parallel to the roof slope.
 - 2. When the insulation/coverboard is mechanically attached on slopes greater than 1-1/2" per foot up to 6" per foot, the nailable base sheets must be installed parallel to the roof slope and mechanically attached to the deck.
 - 3. Mechanical attachment of the nailable base sheets on nailable decks shall follow the following attachment patterns:
 - a. For FM 1-60 or equivalent the fastening shall be 12" on center on the seams and one row down the center of the sheet spaced 18" on center. (See detail MH-MB-NB-FM-1-60)
 - b. For FM 1-90 or equivalent the fastening shall be 12" on center on the seams and two rows with fasteners spaced 18" on center positioned 12" in from the edge of the sheet with fasteners staggered 9" between rows. (See detail MH-MB-NB-FM-1-90)
- B. Fasteners used must be specifically designed for the deck type and must meet FM Approval for the specific fastening pattern. Nailable base sheets must be attached at the base of all vertical surfaces (walls, parapets and curbs) and angle changes (valleys, saddles and crickets).
- C. Nailable base sheet seams are overlapped 3" for FM 1-60 attachment and overlapped 4" for FM 1-90 attachment. End laps are overlapped 6".
- D. All nailable base sheet end laps should be staggered at least three feet between courses of sheets.
- E. Nailable base sheets will shed water but seams are not sealed so it is important to install the heat-weldable (torch applied) cap sheet or inter-ply sheets (torchable or self-adhering) as soon as possible to make the roof watertight.
- F. Nailable base sheets are also recommended over plywood or OSB decks when the ventilation of the air space below the deck is questionable. If installing the self-adhering membranes over a plywood or OSB deck and it cannot be confirmed that the airspace below the deck is properly vented, then an approved

nailable base sheet should be mechanically attached to the deck prior to the application of the SA Base Sheet, the APP Torch Base Premier, the APP Torch S Premier or APP Torch G Premier cap sheets.

3.09 Waterproofing

Base Sheet Installation

Waterproofing Base Sheet – A torch or SA base sheet is considered to be a waterproofing layer in a warranted system and may be exposed to the elements for short periods of time. It is recommended they be covered as quickly as possible to prevent dust, dirt, debris or other contamination from accumulating on the surface which would require cleaning prior to the installation of additional plies or cap sheets. Consult the appropriate product data sheet for additional information.

A. Self-Adhering Base Sheet options

1. Self-Adhered Base Sheet – A fiberglass mat reinforced modified bitumen membrane consisting of an SBS compound on the top layer and a self-adhesive compound on the bottom layer. The SA Base Sheet is finished with a polyolefin film (with lay lines) on the top surface and a split release film on the bottom surface.
2. Torch Base SA –An economical version of the Self-Adhered Base Sheet, primarily for use in a “stick one torch one” application.
3. SA Base Sheets are specifically designed to apply direct to approved substrates (insulation, deck materials, nail base, overlay materials). Note: some substrates may require priming with Mule-Hide # 121 Asphalt Primer.
4. Application direct to structural concrete, aged wood (plywood, OSB), metal, metallic surfaces, smooth BUR, smooth Modified Bitumen and DensDeck Prime require the application of Mule-Hide # 121 Asphalt Primer prior to application of the SA Base Sheets. Primer must be allowed to dry thoroughly.
5. Unroll the SA Base Sheet selected and position the membrane in the desired location on the substrate (starting at the lowest point on the roof) and proceed as follows.
6. When installing a multi-ply system it is always good to start the installation of the SA Base Sheet with a half width sheet as the bottom course followed by full sheets working up the roof to the high point. By installing the first sheet as a half sheet, the seams in the cap sheet will not stack directly on top of the seams in the SA Base Sheet.
7. While the sheet is open, slit the sheet down the middle the entire length of the sheet creating two 18" wide sheets. Position the first half sheet in the desired location. The second half of the sheet may be used as the next adjoining sheet to be installed along the low point (or edge) of the roof.
8. If installing a full sheet, follow Option 1 or Option 2. If installing a half sheet as the first sheet, follow Option 2.
 - a. Option 1: If enough people are available to install the full sheet lengthwise.
 1. After positioning the first sheet of material, fold the material back onto itself (lengthwise), remove the split back release paper from the exposed side and gradually push the material into place.
 2. Apply even pressure along the entire length of the sheet (from the center to the outer edges) to avoid air inclusions or wrinkles. Roll edges firmly with a silicon rubber or other suitable roller to ensure 100% adhesion. Thoroughly roll the sheet to ensure full contact to the substrate.
 3. Repeat the procedure for the other side of the sheet.

- b. Option 2: If a "one-person" operation.
1. After positioning the sheet, carefully re-roll half of the sheet. Leaving half the sheet unrolled will help keep the sheet in position.
 2. Carefully slice the release film with a razor knife across the top of the roll. Great care should be taken so as not to cut into or through the sheet.
 3. After slicing the release film, slowly begin to pull off the release film. The sheet will begin to unroll into place. By slowly rolling up the release film with a consistent, even tempo, the sheet will be gently pulled into place, minimizing air pockets that often occur when utilizing other installation techniques.
 4. Press the sheet into place with firm even pressure. Roll the edges firmly with a silicon rubber or other suitable roller to ensure 100% adhesion.
 5. Re-roll the remaining half of the sheet. Gradually remove the release film from the remaining sheet, repeating the procedure.
 6. After adhering the sheet, it is required that uniform pressure be applied to the entire roll area by using a minimum 75 lb. linoleum roller, water filled lawn roller or similar weighted roller. Care must be taken to prevent injury when rolling membrane, especially on sloped surfaces.
 7. Position the next sheet by overlapping seams and line up the overlap of the top sheet edge with the inside of the bottom sheet's factory selvage edge (3" overlap). Overlap end laps a minimum of 6". Lay lines are provided on the SA Base Sheet 3" in from the edges of the sheet for aligning the overlap of the side seams.
 8. When completing end laps, cut the top corner of the top sheet on a 45-degree angle (start the cut approximately 3 inches in from the top edge and finishing down 3 inches from the top edge). See Figure #2. Press the top sheet down and roll thoroughly with a silicone roller.
 9. When installing the next row of sheets, prior to pressing down the seam, apply a bead of Mule-Hide Mod Bit Sealant along the cut edge. This will seal any void along the cut edge when the next sheet is installed over the end lap. End laps should be staggered approximately 3 feet apart.
 10. Remember to thoroughly roll each sheet with a weighted roller as soon as the sheet is installed.
 11. SA Base Sheet should be turned up vertical surfaces to the top of the cant strip.
 12. The SA Base Sheet may be installed in multiple layers to meet extended warranty requirements.
 13. The SA Base Sheet may be left exposed for up to 90 days before the installation of the cap sheets.

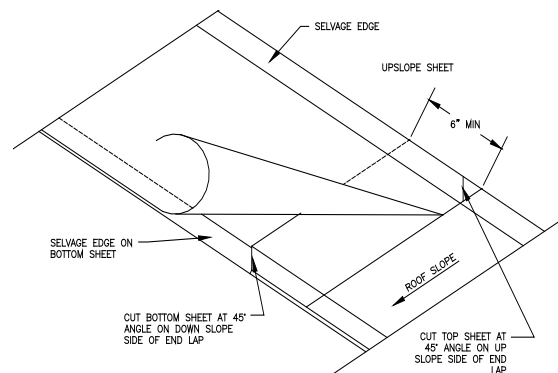


FIGURE 2

- B. APP Torch Base Premier Sheet – The use of shielded "Dragon-wagons", or moveable, flame-resistant wind shields are recommended to keep all surfaces and materials at a suitably warm temperature during torch application.

1. Start at the low point of the roof. The APP Torch Base Premier Sheet is specifically designed to apply direct to approved substrates (cover boards, nailable base sheets, approved deck materials, and overlay materials). Note: Some substrates may require priming with Mule-Hide # 121 Asphalt Primer.
2. Application direct to structural concrete, metal, metallic surfaces, smooth BUR, smooth Modified Bitumen and Dens-Deck Prime require the application of Mule-Hide # 121 Asphalt Primer prior to application of the APP Torch Base Premier Sheet. Primer must be allowed to dry thoroughly.
3. Application directly to wood decking is not permitted and requires the installation of an approved base sheet or cover board as a substrate.
4. Unroll the material and allow to relax in the sun for at least 15 minutes.
5. When installing a multi-ply system it is always good to start the installation of the APP Torch Base Premier Sheet with a half width sheet as the bottom course followed by full sheets working up the roof to the high point. By installing the first sheet as a half sheet, the seams in the cap sheet will not stack directly on top of the seams in the nailable base sheet. While the sheet is open, slit the sheet down the middle the entire length of the sheet creating two 18" wide sheets. Position the first half sheet in the desired location. The second half of the sheet may be used as the next adjoining sheet to be installed along the low point (or edge) of the roof. (see roof layout patterns in the Mule-Hide APP MB Roof System details).
6. When completing end laps, cut the top of the top sheet on a 45-degree angle (start approximately 3 inches in from the top edge finishing down 3 inches from the top edge). Figure #2. Torch the top sheet down and thoroughly with a silicone roller. End laps be staggered approximately 3 feet apart.
7. Install with traditional torch roofing techniques ensuring proper heating of the material as not to expose the reinforcement.
8. Do not heat the substrate.
9. Position successive rolls providing a minimum 6" end lap and 3" side lap. Asphalt bleed out shall be 1/4" to 3/8" on all seams.
10. Laps shall be rolled with a 6" wide roller immediately after heat welding.
11. APP Torch Base Premier Sheet should be turned up to the top of the cant.
12. Details are completed with the use of hot-air welding equipment (torch) combination with the APP Torch Base Premier Sheet membranes and cap sheets.
13. The APP Torch Base Premier Sheet may be installed in multiple layers to meet extended warranty requirements.
14. The APP Torch Base Premier Sheet may be left exposed for up to 90 days before the installation of the cap sheets.

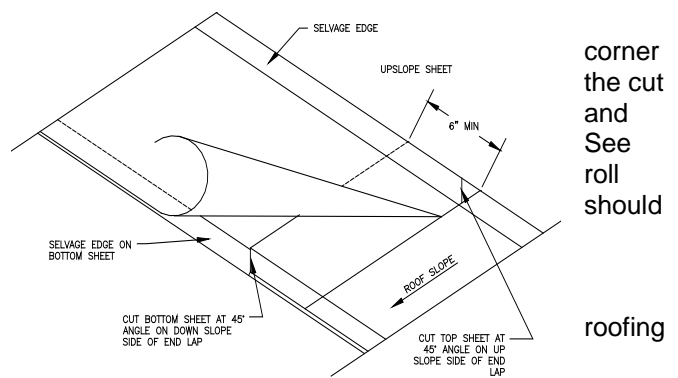


FIGURE 2

3.10 Cap Sheet Installation

- A. APP Torch cap sheets – The APP Torch cap sheet (APP Torch S Premier, APP Torch G Premier, APP Torch G FR Premier, APP Torch G KoolCap, and APP Torch G FR KoolCap), the final top layer of an

APP Torch MB Roof System is the weathering surface. An APP Torch MB Roof System must always have a cap sheet installed as the top surface.

- B. The use of shielded "Dragon-wagons", or moveable, flame-resistant wind shields are recommended to keep all surfaces and materials at a suitably warm temperature during torch application.
- C. Always start at the low point of the roof. Unroll the sheet and allow it to relax in the sun for at least 15 minutes. When installing a multi-ply system it is always good to start the installation of the Cap Sheet with a full width sheet as the bottom course followed by full sheets working up the roof to the high point.
- D. By installing the first sheet as a full sheet, the seams in the cap sheet will not stack directly on top of the seams in the base sheets. Install with traditional torch roofing techniques ensuring proper heating of the roofing material as not to expose the reinforcement.
- E. Do not heat the substrate.
- F. Position successive rolls providing a minimum 6" end lap and 3" side lap. Asphalt bleed out shall be 1/4" to 3/8" on all seams. Laps shall be rolled with a 6" wide roller immediately after heat welding.
- G. End laps should be staggered approximately 3' apart. Do not stack end laps in the cap sheet on top of the end laps in underlying plies. Refer to the Mule-Hide published details for the proper completion of the end laps.
- H. When completing end laps, cut the top corner of the top sheet on a 45-degree angle (start the cut approximately 3 inches in from the top edge and finishing down 3 inches from the top edge). See Figure #3. Torch the top sheet down and roll thoroughly with a silicone roller.

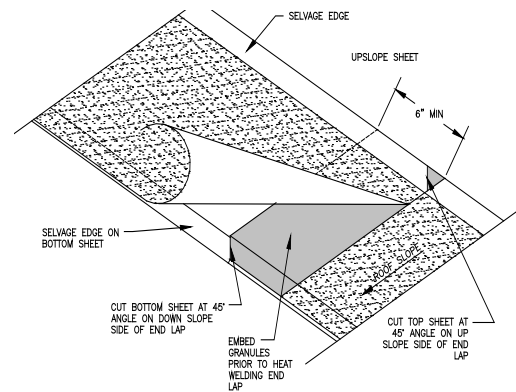


FIGURE 3

3.11 Flashings

- A. Perimeter, protrusions and termination of the field membrane require the application of a flashing system to satisfactorily seal the roofing system. Such areas include but are not limited to walls, curbs, expansion joints, drains and scuppers, pipes, other penetrations and edge details.
- B. Refer to the Mule-Hide published details for information on specific detail assembly and completion.
- C. One ply of the nailable, self-adhering or heat-weldable base sheet is mandatory for completing most details and vertical flashings followed by the APP Torch cap sheet for material warranties and 10 year system warranties. Additional layers of SA Base Sheet or APP Torch Base sheet may be required for longer term warranties. See Mule-Hide published flashing details for specific information.
- D. Mule-Hide follows NRCA guidelines and requires a minimum flashing height of at least 8" where possible for completing all vertical details. Refer to each detail for specific guidelines and requirements.
- E. Where a minimum height of 8" cannot be achieved, the architect shall provide acceptable details or agree that the detail is a maintenance item and will not be covered by the warranty. Damages to the roofing system caused by such a detail will not be covered by the Mule-Hide warranty.
- F. All base and cap field sheets are turned up and run to the top of the cant strips.
- G. Bare masonry surfaces shall be primed with Mule-Hide #121 Asphalt Primer and allowed to thoroughly dry before applying a base or cap sheet. Block walls may require a second coat.
- H. All vertical surfaces must be smooth to accept the MB flashing components. Contact Mule-Hide for

recommendations regarding the preparation of irregular surfaces.

- I. Wood surfaces
 1. Self-Adhering Membranes – Self-Adhering Membranes may be bonded directly to new wood surfaces, but priming is recommended and will increase adhesion. Aged wood must be primed with Mule-Hide #121 Asphalt Primer and allowed to thoroughly dry before applying the self-adhering membrane.
 2. Torch Applied Membranes – Wood surfaces must be covered with either an approved base sheet or Cover Board.
- J. Install flashings using Mule-Hide base and cap sheets as indicated in Mule-Hide's published details.
- K. Heat and embed granules when welding or adhering at cut areas and seams to granular surfaces at all flashings.
- L. Complete all flashing terminations in compliance with Mule-Hide's published details.
- M. Wall/curb flashings are to be completed by running sheets vertically. The wall/curb flashings must extend out onto the field (past the base of the cant) a minimum of 6" and shall lap adjoining sheets a minimum of 3". If plates and fasteners are required for mechanical attachment, the side laps must be increased to 6".
- N. Mule-Hide is not responsible for failure of wall flashings to adhere to vertical surfaces where the exterior side of those vertical surfaces has not been properly sealed from wind and moisture.
- O. The top edge of the flashing sheet shall be secured using a termination bar (only when the wall surface above the point of termination is waterproofed), or fastened 8" on center and covered with an approved counterflashing. Termination bar shall be attached at a maximum spacing of 6" on center. The top of the bar shall be caulked with an approved urethane caulking to seal the top edge of the termination.
- P. Do not extend any flashings over "thru-wall" flashings or weep holes.
- Q. Exposed Mod Bit Flashing Adhesive, Mod Bit Sealant and bleed out should be covered with loose granules.
- R. When seaming flashing materials onto a granulated surface it is necessary to scrape off all loose granules and heat the surface of the cap sheet to be seamed to raise the asphalt to the surface of the cap sheet prior to heat welding the flashings to the granulated surface.

3.12 Roof Drains and Drainage

- A. The IBC (International Building Code) requires that a minimum roof slope of 1/4" per foot be obtained to promote proper drainage and maximize long-term performance of the roof system. Mule-Hide follows these recommendations. Drains shall be of sufficient number, size and located to provide satisfactory and rapid drainage of the entire roof surface (within 24 hours of precipitation).
- B. Adequacy of drainage provisions, placement, sizing and number of drains required is the responsibility of the building owner/owner's representative, or its design professional. Drainage should meet the requirements of codes as well as standard industry recommendations.
- C. In re-roofing or re-cover situations, analysis of the existing drainage conditions is also the responsibility of the building owner/owner's representative or its design professional.
- D. Existing deck deflection, or ponding water may necessitate upgrading of the drainage system, including possible addition of new drains, increased deck support, etc.
- E. Mule-Hide does not design roof drainage systems or assume any liability for the adequacy of (or lack of) the roof drainage systems or facilities.

- F. Refer to Mule-Hide's standard details for information regarding flashing of roof drains.

3.13 Expansion Joints, Area Dividers, Metal Work and Terminations

- A. The determination of necessity for expansion joints or area dividers is a project specific requirement that is the responsibility of the architect, designer, or owner.
- B. For general information on these important, roof stress, relief mechanisms consult the NRCA Roofing and Waterproofing Manual (Fourth Edition). Minimum design requirements and recommendations are covered by the NRCA's document.
- C. Metal Work
1. Metal work including flashings, counterflashings, parapet coping, etc. is not considered a component of the approved Mule-Hide roof system unless the components are supplied by Mule-Hide.
 2. It is recommended that any metal work be installed in accordance with the practices outlined in the SMACNA manual or the NRCA Roofing and Waterproofing Manual.
 3. Adequate provisions should be provided for the attachment, securement and embedment of the metal flashings where specified.
 4. Thru-wall flashings must never be covered with roofing membrane or flashing materials. Use and specification of thru-wall flashings are the responsibility of the architect or the building owner/owner's representative or its design professional.
 5. Metal work shall be properly fastened and sealed by the roofing contractor or others. It is the owner's responsibility to maintain sheet metal work in a watertight condition.
 6. Ensure that the membranes are not in contact with sharp edges and corners and that all metal burrs are removed. Refer to Mule-Hide's published details for proper flashing methods.
 7. Refer to the Mule-Hide published details for proper flashing of drip apron and gravel stop.
 8. When flashing to metal surfaces, the metal shall be primed with Mule-Hide #121 Asphalt Primer or fast drying primer in aerosol cans meeting ASTM D41 may be used.
- D. A metal termination bar or approved top edge securement is necessary at the point of termination of all flashing sheets, walls or curbs. If using a termination bar, the bar shall be fastened to achieve constant compression (maximum 6" OC). Approved caulking is required along the top edge of the termination bar.

3.14 Pipes and Vents

- A. Pipes may be flashed using the following method:
1. A soft metal sleeve (typically lead) with a base flange is set over the pipe with the base set in a bed of Mule-Hide Mod Bit Flashing Adhesive. After pressing firmly in place and rolled with a hand roller, the top surface of the flange is primed with #121 Asphalt Primer and allowed to dry.
 2. A piece of torch applied cap sheet is cut to fit tightly over the sleeve and extending 4" out past the edge of the flange. Corners of the cap sheet should be rounded. The cap sheet is set over the sleeve and heat fused (torch) to the flange and field membrane. The seam area is then thoroughly rolled to ensure proper contact.
 3. A bead of adhesive or Mod Bit Sealant is applied around the base of the sleeve. Loose granules should be applied over the bead of sealant and around the edge of the cap sheet where any bitumen is showing.

B. Vents

1. Vents typically have flanges around their base and are set in a bed of Mule-Hide Mod Bit Flashing Adhesive.
2. A piece of APP Torch cap sheet is cut to fit tightly over the vent and extending 4" out past the edge of the flange (on all 4 sides) onto the field membrane. Corners of the cap sheet should be rounded. The top of the flange is primed with #121 Asphalt Primer and allowed to dry completely. The APP Torch cap sheet material is set over the vent and heat welded (torched) to the flange and field membrane. Roll the cap sheet to ensure 100% welding to the flange and field membrane. Be sure to scrape away the loose granules and heat the surface to raise the asphalt prior to heat welding the APP Torch cap sheet to the granulated surface.
3. A bead of adhesive or Mod Bit Sealant is applied around the base of the sleeve. Loose granules should be applied over the bead of sealant and around the edge of the cap sheet where any adhesive is showing.

3.15 Roof Walkway

- A. Walkways help protect the roof system from damage caused by traffic on the roof necessitated by service personnel.
- B. Walkways are required at each access point such as roof hatches, fixed ladders, doorways and any other access point to the roof.
- C. Walkways are also required in areas leading from access points to and around equipment that is serviced on a regular basis (monthly or greater).
- D. Walkways must consist of an additional layer of similar Mule-Hide APP MB membrane of a contrasting color granule surface or an approved walkway material.
- E. It is the responsibility of the building owner to place and maintain walkways at all necessary rooftop areas.

3.16 Temporary Tie-ins

- A. Install temporary cutoffs around incomplete edges of roofing assembly at the end of each day's work and when work must be postponed due to inclement weather. Temporary tie-ins shall be positioned so any sealed membrane edge will not buck or pond water. Ensure drainage is not restricted.
- B. Remove all gravel, dirt, debris or other contaminants from the tie-in area and make sure all surfaces are clean and dry.
- C. All loose membrane edges should be sealed downslope with products compatible with the existing substrate and membrane type being installed. Provide continuous pressure along the sealed edge to prevent water migration under the finished roof sections.
- D. When work resumes, remove the temporary seals completely including contaminated membrane, sealants, insulation fillers, etc. from the work area and properly dispose.

Note: Mule-Hide does not warrant or guarantee the water tightness of any nightly tie-in. Temporary night seals and their performance are the sole responsibility of the roofing contractor.

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 Technical Department or check the Mule-Hide website (www.mulehide.com) for the latest updates regarding changes or modifications to this specification.