

# System Specifications

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## Self-Adhering Modified Bitumen Specification

June 2020

### PART 1 – GENERAL

#### 1.01 Description

##### A. Scope:

1. Furnish and install an SBS or APP Self-Adhering Roofing Membrane with flashings and accessories necessary to comprise a roofing system. The Mule-Hide self-adhering membrane 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. Systems may be attached directly to certain approved deck types or may be installed over an approved insulation or coverboard/overlay. Work includes installation of self-adhering flashing material to roof edges, parapet walls, curbs, pipes, drains and scuppers and other various penetrations and terminations necessary to provide a watertight roofing system.

##### 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. Fasteners
6. Roof Membrane
7. Roof Membrane Flashings
8. Metal Flashings
9. Adhesives
10. Sealants
11. 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 limitations. 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 48 hours after the termination of the most recent rain event 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. Small incidental areas of ponded water will not impact the performance of this roofing system; however, in accordance with industry standards, the roofing assembly should be designed to prevent ponding of water on the roof for prolonged periods (longer than 48 hours). Good roofing practice dictates proper drainage to prevent possible excessive live load and, in the event of a roof leak, to minimize potential interior damage to the roofing assembly and to the interior of the building.
7. 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.
8. 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 Standard or Premium 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 with 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 Mule-Hide 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.**

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.

### 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.

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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, a Heat-Weld System Warranty Application to be reviewed by the Mule-Hide Technical Service Department to determine the acceptability of the project based on the information provided.
  1. The Self-Adhering Modified Bitumen System Warranty Application ("Warranty Application") must be completely filled out and should be accompanied by 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. All materials are to be stored in their original, unopened packaging. Roll goods shall be stored on end (selvage edge up) on clean, flat surfaces.
- D. Store membranes at room temperature whenever possible, until just prior to installing the rolls. Materials shall be stored in a tidy and safe manner to avoid exceeding the allowable live load of the storage area. Do not double stack pallets of Mule-Hide self-adhering modified bitumen membrane.
- E. 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.
- F. 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:

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1. The installation of any Mule-Hide Roof System is in a coastal area or high wind zone.
  2. If the Mule-Hide Roof System should exceed the structural load conditions as determined by an architect or Engineer.
  3. When chemical or hazardous materials are discharged onto the Mule-Hide Roof System.
- B. The minimum application temperature for Mule-Hide SAMB materials is 40°F and rising for 48 consecutive hours.
1. In order to perform properly, Mule-Hide SAMB materials require a minimum application temperature of 40°F and rising for 48 consecutive hours. This applies to the roofing materials and approved substrate. During installation, the membrane must be promptly rolled with a minimum 75# roller. Failure to abide by these requirements may result in poor adhesion or cracking issues.
  2. During periods of colder weather, the Mule-Hide SAMB materials should always be stored at room temperature (60°F to 80°F) until just prior to use. Materials that are not stored at room temperature (or not used within 4 hours) should be restored to room temperature prior to use.
- 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 SBS or APP Self-Adhering Modified Bitumen Roofing System is specified, 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 securement 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 Self-Adhering Modified Bitumen Roofing Membrane 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 the Mule-Hide Self-Adhering Modified Bitumen Roofing Membrane. Contact the Mule-Hide Technical Service Department for recommendations if such conditions exist.

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- 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. 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.
- 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) and 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.
  2. 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 Service Department if any of the following conditions exist:
  - a. Roof heights greater than 100 feet.
  - b. Geographical location in a 100 mph or greater wind zone, per the ANSI 100 year mean recurrence interval wind isotach.
  - c. Location with Exposure D as determined in ANSI A58.1.

### 1.06 Warranties

All Mule-Hide warranties are available for commercial projects. A Roofing Membrane Limited Warranty for a maximum of 20 years is available for residential projects.

#### A. Mule-Hide's Roofing Membrane Limited Warranty

Mule-Hide offers a 10, 12, 15, or 20-year Roofing Membrane Limited Warranty ("Warranty") for a charge. The 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 any associated warranty fee must be submitted to Mule-Hide to obtain this warranty. Proof of purchase may be required.

1. Projects utilizing the SA-SBS Cap Sheet or SA-APP Cap Sheet may only obtain a 10 or 12-year Roofing Membrane Limited Warranty.
2. Projects requesting a 15-year Roofing Membrane Limited Warranty require the use of the SA-SBS Cap Sheet or SA-APP Cap Sheet and one layer of SA-Base applied over an approved substrate. Proof of purchase may be required.
3. Projects requesting a 20-year Roofing Membrane Limited Warranty require the use of the SA-SBS Cap Sheet or SA-APP Cap Sheet and two layers of SA-Base applied over an approved substrate. Proof of purchase may be required.

#### B. Mule-Hide Modified Bitumen System Warranty

Mule-Hide offers a 10, 15, or 20-year Self-Adhering Modified Bitumen System Warranty ("System Warranty") for commercial projects for a charge. The System Warranty is a "No Dollar Limit", labor and material warranty that covers the Mule-Hide labeled membranes, insulation, other components supplied by Mule-Hide and approved products (such as insulation adhesive or other pre-approved accessories) installed by a Mule-Hide Warranty Eligible Contractor. A Mule-Hide Warranty Eligible Contractor must submit a Warranty Application and the appropriate fee to Mule-Hide. Mule-Hide recommends that all Warranty Applications be submitted for review prior to bidding the project. System Warranties require inspections by a Mule-Hide representative.

1. Projects requesting a 10-year Self-Adhering Modified Bitumen System Warranty require the use of the SA-SBS Cap Sheet or SA-APP Cap Sheet applied over an approved Mule-Hide insulation, coverboard or base sheet.
2. Projects requesting a 15-year Modified Bitumen System Warranty require the use of SA-SBS Cap Sheet or SA-APP Cap Sheet and one layer of SA-Base applied over an approved Mule-Hide insulation, coverboard or base sheet.
3. Projects requesting a 20-year Modified Bitumen System Warranty require the use SA-SBS Cap Sheet

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- or SA-APP Cap Sheet and two layers of SA-Base applied over an approved Mule-Hide insulation, coverboard or base sheet.
- 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.
    - 1. 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 Service Department upon request.
    - 2. 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 Self-Adhering Modified Bitumen Membrane Roof System are to be products manufactured or supplied by Mule-Hide Products Co., Inc.
- B. Mule-Hide self-adhering membranes are premium elastomeric roofing products manufactured via patent-pending **Adeso**<sup>®</sup> dual compound technology, whereby the membrane consists of either an APP compound or SBS compound on the top layer and a self-adhesive compound on the bottom layer.
- B. Mule-Hide self-adhering modified bitumen membranes are reinforced with a strong fiberglass or polyester mat to guarantee excellent dimensional stability.
- C. Mule-Hide **SA-SBS Cap Sheets** and **SA-APP Cap Sheets** have side laps that have a patent-pending **SEALLap**<sup>®</sup> feature and a patented roll end featuring **FASTLap**<sup>®</sup>. Cap sheets have a split release film on the bottom surface.
- D. Components other than those supplied or manufactured by Mule-Hide may be submitted for review and acceptance by Mule-Hide's Technical Service 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 Service Department. 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

Following is a list of the membranes and accessories that make up the self-adhering modified bitumen product group:



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### A. SA-APP Cap Sheet

- Reinforced with a polyester mat.
- Available granulated only.
- Fire retardant version available.
- Granulated sheet available in select colors.

### B. SA-SBS Cap Sheet

- Reinforced with a polyester mat.
- Available granulated only.
- Fire retardant version available
- Available in select colors.

### C. SA Base Sheet

- Reinforced with a fiberglass mat.
- Finished with a polyolefin film (with lay lines) on the top surface.
- Split release film on the bottom.
- May be used as a base sheet or inter-ply sheet.
- May be exposed up to 90 calendar days before being covered.
- Fire retardant version available.

### D. Nail Base

- Reinforced with a fiberglass mat.
- Designed for use as a nailable base sheet (where mechanical attachment is required) or over non-acceptable insulations/substrates.
- Polyolefin film (with lay lines) on the top surface and a sand finish on the bottom surface.

E. Refer to the individual Product Data Sheets for additional information and physical properties.

## 2.03 Accessory Materials

- A. Mule-Hide #121 Asphalt Primer – A cutback asphalt primer that meets ASTM D 41 specification. Used for substrates requiring a primer to improve adhesion. Available in 5-gallon pails.
- B. Mule-Hide #421 Mod Bit Flashing Adhesive – An asbestos free, fibrated, trowel grade, rubberized flashing adhesive with bonding strength designed for vertical surfaces, seaming, and detail completion on roofing systems utilizing the Mule-Hide self-adhering modified bitumen membranes.
- C. Mule-Hide #271 Mod Bit Sealant – An asbestos free, cartridge grade rubberized flashing adhesive designed for seaming and detail completion on roofing systems utilizing the Mule-Hide self-adhering modified bitumen membranes.
- D. Mule-Hide offers a complete range of FM Approved fasteners and plates for mechanical attachment of membranes and insulation.
- E. 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.

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- F. 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.
- F. 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:
    - 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.
- G. 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 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 Self-Adhering Modified Bitumen Membranes, Mule-Hide Adhesives, and other Mule-Hide Accessories.
- 3. All surfaces to receive SA membranes are to be clean, dry and free of any contaminants that could adversely affect adhesion of the product, such as gypsum dust or other debris.
- 4. The following insulation/cover boards are acceptable for use with a self-adhering modified bitumen roofing system when a NDL System Warranty is requested:
  - a. 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.
  - b. High Density (HD) Wood Fiberboards

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1. Structodek® HD with Primed Red Coating high density wood fiberboard by Blue Ridge - may be used as an overlay over other insulations. 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.
2. HD Wood Fiberboard – Asphalt impregnated, coated six sides
- c. Expanded Polystyrene (EPS) - Density of boards must be 1.0 PCF certified minimum and meeting ASTM C578, Type II 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. An overlay of a minimum 1/2" thick HD Wood Fiberboard, minimum 1" polyisocyanurate insulation, minimum 1/4" DensDeck, or minimum 1/4" Securock is required. Check local building codes as a layer of gypsum board may be required under the EPS insulation (on steel decks).
- 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. An overlay of a minimum 1/2" thick HD Wood Fiberboard, minimum 1" polyisocyanurate insulation, minimum 1/4" DensDeck, or minimum 1/4" Securock is required. Check local building codes as a layer of gypsum board may be required under the extruded insulation (on steel decks).
- e. DensDeck Prime or Securock - A minimum 1/4" thick layer of DensDeck Prime or Securock Gypsum-Fiber Roof Board may be used as an overlay over an approved insulation or as a thermal barrier over a combustible deck. Priming of DensDeck Prime with #121 Asphalt Primer is not required (unless contaminants such as gypsum dust are present), but if primer is applied it will enhance adhesion.
- f. State and local building codes should be reviewed regarding the installation of expanded or extruded polystyrene insulation directly over a steel deck.
5. Insulation manufacturer shall provide its recommendations for use and attachment to the owner with a copy sent to Mule-Hide's Technical Service Department. In addition, the insulation manufacturer shall provide a copy of their specific warranty conditions.
6. Mule-Hide NDL System Warranties require the use of the Mule-Hide labeled insulation or insulation provided by a Mule-Hide approved manufacturer. Use of other insulations may disqualify the project for consideration of the issuance of an NDL System Warranty. Contact the Mule-Hide Technical Department for specific requirements.
7. Following is a list of **Non-Acceptable** insulations/substrate material.
  - a. Perlite (as a top layer)
  - b. Foil-faced polyisocyanurate insulation
  - c. Direct adhesion to Extruded and Expanded polystyrene
  - d. Cementitious boards
  - e. Wood Fiberboard (standard density)
  - f. DensDeck (standard un-primed board)
  - g. Lightweight Concrete
  - h. Sand surfaced base sheets
  - i. 15 lb. & 30 lb. felts
8. If a substrate or insulation is not listed or not acceptable, the installation of Mule-Hide Nail Base is an option to provide a suitable substrate to build the system on.

### C. UL and FM Approved Assemblies

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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.

### D. 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 Service 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 Mule-Hide Self-Adhering Modified Bitumen roofing products near fire or flame. Do not use open flames for drying of surfaces, sealants or adhesives. **Do not smoke near flammable products.**
- D. Do not use oil-based paint on Mule-Hide Self-Adhering Modified Bitumen membrane. Contact Mule-Hide's Technical Service Department for recommendations.
- E. Do not allow muriatic acid (masonry cleaner) to come in direct contact with the Mule-Hide Self-Adhering Modified Bitumen Membrane or accessory products.
- F. Do not allow Mule-Hide Self-Adhering Modified Bitumen membranes or accessories to come into direct contact with steam or vents that produce temperatures in excess of 160°F.
- G. The minimum application temperature for Mule-Hide SAMB materials is 40°F and rising for 48 consecutive hours.
  1. In order to perform properly, Mule-Hide SAMB materials require a minimum application temperature of 40°F and rising for 48 consecutive hours. This applies to the roofing materials and approved substrate. During installation, the membrane must be promptly rolled with a minimum 75# roller. Failure to abide by these requirements may result in poor adhesion or cracking issues.
  2. During periods of colder weather, the Mule-Hide SAMB materials should always be stored at room temperature (60°F to 80°F) until just prior to use. Materials that are not stored at room temperature (or not used within 4 hours) should be restored to room temperature prior to use.
- H. Cold Weather Application
  1. Mule-Hide self-adhering modified bitumen membranes are to be installed when the ambient air temperature is 40°F and rising for 48 consecutive hours. Mule-Hide self-adhering membranes are not to be installed when temperatures are below 40°F.
  2. When installing Mule-Hide self-adhering membranes in temperatures lower than 60°F, depending on sun and wind conditions, the use of heat may be required to enhance the bond of the material to the substrate. **Do not attempt to torch down the product.**
  3. When working in temperatures below 60°F it is recommended the rolls of self-adhering membrane

are kept stored at room temperature (60°F and higher) until just prior to use. Remember that wind chill will have an effect on the application temperature.

4. Cold rolls of material may become difficult to unroll and may exhibit stress cracking. Should the roll become stiff or difficult to install, it should be immediately replaced with a new roll from a heated storage area.

### PART 3 - EXECUTION

#### 3.01 General

- A. The minimum application temperature for Mule-Hide SAMB materials is 40°F and rising for 48 consecutive hours.
  1. In order to perform properly, Mule-Hide SAMB materials require a minimum application temperature of 40°F and rising for 48 consecutive hours. This applies to the roofing materials and approved substrate. During installation, the membrane must be promptly rolled with a minimum 75# roller. Failure to abide by these requirements may result in poor adhesion or cracking issues.
  2. During periods of colder weather, the Mule-Hide SAMB materials should always be stored at room temperature (60°F to 80°F) until just prior to use. Materials that are not stored at room temperature (or not used within 4 hours) should be restored to room temperature prior to use.
- B. Application of the Helix Max Low-Rise Adhesive shall not proceed during periods of inclement weather. Follow Mule-Hide requirements for application temperatures and humidity levels.
- C. Do not apply Helix Max Adhesive when surface and/or ambient temperatures are below 25°F.

#### 3.02 Substrate Conditions

The following general conditions apply to the substrate that will receive a Mule-Hide Self-Adhering Modified Bitumen Membrane 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 Self-Adhering 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 Self Adhering 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 Self-Adhering Modified Bitumen Membrane Roofing System over the following deck substrates provided that an acceptable insulation is installed over the substrate as needed:
  1. Structural Metal Deck (22-gauge minimum) shall conform to recommendations outlined in Factory Mutual Loss Prevention Data Sheet 1-28 (requires insulation). Contact Mule-Hide's Warranty

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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 Self-Adhering 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 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. Check with local building code requirements as adhering a Self-Adhering Modified Bitumen membrane direct to a wood deck may not meet local fire codes.
  6. Cementitious Wood Fiber Decks - Certain cementitious wood fiber decks may be acceptable to receive a Mule-Hide Self-Adhering 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 Self-Adhering 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.
- F. On certain deck types, such as plywood and structural concrete, the installation of insulation may be optional if the decks are properly sloped. Flat decks shall require tapered insulation systems to provide a minimum 1/4" per foot slope or greater. Structural concrete decks must have smooth trowel finish.

1. 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 Sheet, SA-SBS Cap Sheet, or SA-APP Cap Sheet. Primer must be allowed to dry thoroughly.

- G. Mule-Hide recommends that all roof surfaces have a positive slope to provide adequate drainage. There should not be any ponding water 48 hours after a rainfall.

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 LW. Concrete	Yes <sup>10</sup>	Gravel BUR	Yes <sup>5</sup>
Expanded Polystyrene (EPS)	Yes <sup>1</sup>	NVS LW Concrete	Yes <sup>10</sup>	Mineral Cap Sheet	Yes
Extruded Polystyrene (XPS)	Yes <sup>2</sup>	Gypsum	Yes	Granular Modified-Bitumen	Yes
New Sprayed Foam	No <sup>8</sup>	Cementitious Wood Fiber	Yes	Smooth Modified-Bitumen	Yes
Scarified SPF	No <sup>8</sup>	Plywood/OSB	Yes	Coal Tar Pitch	Yes <sup>6</sup>
DensDeck®	Yes	Painted Steel	Yes	Aluminum-Coated BUR	No <sup>7</sup>
Securock®	Yes	Galvanized Steel	Yes <sup>3</sup>	Acrylic-Coated SPF	No <sup>8</sup>
Oriented Strand Board	Yes	Acoustical Steel	Yes <sup>4</sup>	Silicone-Coated SPF	No <sup>8</sup>
Poly ISO 1-HD	Yes	Wood Plank	Yes	Unoxidized (Shiny) Asphalt	Yes <sup>9</sup>

- Standard EPDM (Non Fleece Back) membrane cannot be installed directly over EPS and requires a suitable overlayment or cover board.
- For insulation attachment only, contact Mule-Hide Technical Department for options.
- For new galvanized steel decks, power-washing is necessary to remove finishing oil residue if present.
- 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.
- A minimum of an approved cover board or insulation is required over properly prepared gravel BUR.
- An insulation providing the necessary R-value must be specified to prevent the coal tar pitch from softening.
- 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.
- SPF roofing assemblies may be considered on a job by job basis, contact Mule Hide Technical Department prior to bidding.
- Requires AeroWeb for all applications.
- 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.

### 3.03 Preparation of Existing Substrate

#### A. General

- To prevent delays or interruptions, coordinate work with other trades or suppliers to ensure that components to be incorporated into the Mule-Hide Self-Adhering Modified Bitumen Membrane Roofing 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 Self-Adhering Modified Bitumen Membrane Roofing System application.
- 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.
- Specifier or roofing contractor shall determine the condition of the existing roof deck and roofing system. Areas with deteriorated decking, 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.
- 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 Self-Adhering 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. As an alternative to mechanical attachment, Helix® Max Low-Rise Adhesive may be used to adhere approved insulations to properly prepared gravel surfaced BUR. Contact Mule-Hide Technical Service Department for specific information regarding the use of the Helix® Max Low-Rise Adhesive.
11. 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 Sheet. Primer must be allowed to dry thoroughly.
12. All lead pipe and drain flashings shall be removed. Recovering over 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. As an alternative to mechanical attachment, Helix Low-Rise Adhesive may be used to adhere approved insulations to properly prepared smooth surfaced existing roof surfaces. Contact Mule-Hide Technical Service Department for specific information regarding the use of the Helix Max Low-Rise Adhesive over specific roof types.
13. 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 Self-Adhering Modified Bitumen Roofing System.
15. 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.



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- 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 or where indicated in Mule-Hide's published Standard 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. Cants are not required with the Mule-Hide self-adhering membranes, but are recommended. Cants are optional.
  - 1. If the architect, design professional or building owner/owner's representative insists on the installation of cants, then they may be incorporated into the deck installation.
  - 2. Cants must be mechanically attached with approved fasteners (and plates, if needed).
  - 3. SA Base Sheets shall extend a minimum of 1" above the top of the cant. SA Cap Sheets shall extend a minimum of 2" above the cant and shall be mechanically attached to the vertical surface with appropriate fasteners spaced 8" on center.

### 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 Self-Adhering Modified Bitumen 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 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 Self-Adhering 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 Self-Adhering 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 Service 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.

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- 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 feet. The minimum width of the perimeter and corner areas shall not be less than three (3) feet. Contact Mule-Hide Technical Service for Factory Mutual projects exceeding 60 foot 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" 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 spray applied 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 Membrane Installation

- A. Commence the installation of the roofing system at the lowest point of the roof (or work area), proceeding up the slope toward the highest. Lap all sheets shingle fashion so as all seams shed water. Apply only when the weather is dry and material interface temperatures (air, roof deck and membranes) are 40°F and rising for 48 consecutive hours. Membranes must be maintained at a minimum of 60°F prior to installation.

#### B. Base Sheet Installation

Mule-Hide offers two base sheets for use with the modified bitumen cap sheets: Nail Base and SA Base Sheet

1. **Nail Base** - This sheet is used when mechanical attachment of the base sheet is the preferred method of attachment. The sheet has the polyolefin film on the top surface (with lay lines) and a sand finish on the bottom.
  - a. Nail Base is typically attached with the appropriate fasteners using the following patterns:
    1. FM 1-60 = 12" on center on the seams, one row 18" on center down the center of the sheet.
    2. FM 1-90 = 12" on center on the seams, two rows 18" on center down the sheet, each row being positioned 12" in for the edge of the sheet with fasteners staggered 9" between rows.
    3. Fasteners used must be specifically designed for the deck type and must meet FM Approval for the specific fastening pattern. Attachment of the Nail Base at the base of all vertical surfaces (walls, parapets and curbs) and angle changes (valleys, saddles and crickets) shall be 12" on center with either the Mule-Hide Insulation Plates or Barbed Seam Plates and Mule-Hide deck Fasteners. If nailing directly to a wood deck, attachment with cap nails is 8" OC.
  - b. Nail Base seams are overlapped 3" for FM 1-60 attachment and overlapped 4" for FM 1-90 attachment. End laps are overlapped 6".
  - c. Nail Base end laps should be staggered at least three feet between courses of sheets.
  - d. Nail Base will shed water but seams are not sealed so it is important to install the cap sheet or inter-ply membranes as soon as possible to make the roof watertight.
  - e. Nail Base is also recommended over plywood 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 the Nail Base should be mechanically attached to the deck prior to the application of the SA Base Sheet or the SA Cap Sheet.

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2. **SA Base Sheet** - This is 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.
  - a. The SA Base Sheet is specifically designed to be applied direct to approved substrates (insulation, deck materials, underlayments, overlay materials). Note: Some substrates may require priming with Mule-Hide #121 Asphalt Primer.
    1. When applying to wood decks with slopes greater than 2" per foot, backnailing along the high side of the membrane (in the 3" wide seam) with fasteners spaced a maximum of 12" on center is required. When applying the self-adhered membranes over insulated decks with slopes greater than 2" per foot, it is recommended that the sheets be installed running with the direction of the slope. Backnailing will then be done in the end laps with Mule-Hide 2" barbed seam plates or 3" dia. insulation plates and Mule-Hide deck fasteners. Contact Mule-Hide if attachment to decks other than wood concrete or steel is necessary.
    2. 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 Sheet. Primer must be allowed to dry thoroughly.
  - b. Unroll the SA Base Sheet and position the membrane in the desired location on the substrate (starting at the lowest point on the roof) and proceed as follows.
    1. 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. 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.
  - c. If installing a full sheet, follow Option 1 or Option 2. If installing a half sheet as the first sheet, follow Option 2.

**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.

**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. 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.
7. 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.
8. 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.
9. 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). Press the top sheet down and roll thoroughly with a silicone roller. 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 a minimum of 3" to provide a watertight seal.
12. Details are completed with the use of hot-air welding equipment or with **#421 Mule-Hide Mod Bit Flashing Adhesive** in combination with the **SA Base Sheet** membranes and cap sheets.
13. The SA Base Sheet may be installed in multiple layers to meet extended warranty requirements.
14. The SA Base Sheet may be left exposed for up to 90 days before the installation of the cap sheets.

### C. Cap Sheet Installation

Mule-Hide offers both APP and SBS self-adhering cap sheets. Both products are installed in a similar manner.

1. Unroll the self-adhering cap sheet and position the membrane in the desired location on the substrate (starting at the lowest point on the roof) and proceed as follows:
  - a. When installing a multi-ply system it is always good to start the installation of the base sheets 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 base sheet as a half sheet, the seams in the cap sheets will not stack directly on top of the seams in the base sheets.
  - b. If full sheets of base sheet were used to start, then the cap sheet will have to be cut so the seams in the cap sheets don't stack on top of the seams in the base sheets.
  - c. When cutting the cap sheet, 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.

# System Specifications

## SELF-ADHERING MODIFIED BITUMEN

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Note: If using the second half of the sheet, seaming shall be required by hot air welding or by using the Mule-Hide Mod Bit Flashing Adhesive as there will not be a selvage edge on the remaining material.

- d. Offset the end laps at least 3 feet apart.
2. If installing a full sheet, follow Option 1 or Option 2. If installing a half sheet as the first sheet, follow Option 2.

**Option 1:** If enough people are available to install the full sheet lengthwise.

- a. 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.
- b. 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.
- c. Repeat the procedure for the other side of the sheet.

**Option 2:** If a "one-person" operation.

- a. After positioning the sheet, carefully re-roll half of the sheet. Leaving half the sheet unrolled will help keep the sheet in position.
  - b. 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.
  - c. 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.
  - d. 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.
  - e. Re-roll the remaining half of the sheet. Gradually remove the release film from the remaining sheet, repeating the procedure.
  - f. 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.
3. 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.
  4. 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". The end of each roll is provided with the patented, granule-free, **FASTLap**<sup>®</sup>.
  5. 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). Align the next sheet so the end of the sheet covers the **FASTLap**. Remove the protective release film from the **FASTLap** and apply firm even pressure to the seam area. Thoroughly roll the end lap with a silicone roller. End laps should be staggered approximately 3 feet apart. When installing the next row (course) of sheets, prior to pressing down the side seam, remove the protective release film from the **SEALLap**<sup>®</sup>, apply a bead of Mule-Hide Mod Bit Sealant along the 45-degree cut edge. This will seal any void along the cut edge when the next sheet is installed over the end lap. Press the top sheet

down and roll the side laps thoroughly with a silicone roller.

Note: Options to complete end laps when the cap sheets must be cut and the **FASTLap** is not available, may be completed with the use of hot air welding equipment or by using the Mule-Hide Mod Bit Flashing Adhesive. In each case, a minimum 6" wide lap is required.

6. Remember to thoroughly roll each sheet with a weighted roller as soon as the sheet is installed.
7. Details are completed with the use of hot air welding equipment or with Mule-Hide Mod Bit Flashing Adhesive in combination with the Mule-Hide self-adhering membranes.

### 3.08 Flashing Installation

- 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 self-adhering modified bitumen cap sheet membrane is mandatory for completing most details and vertical flashings for material warranties and 10 year NDL warranties. Additional layers of SA Base Sheet may be required for longer term warranties. See 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. Cap sheet used as flashing material shall extend (from the base of the vertical surface) a minimum of 6" out onto the field of the roof. If the field sheets are laid in a manner that does not provide a **SEALLap** at the base of the vertical surface, the seaming of the flashing to the field sheet may be completed by either hot air welding (entire 6" width must be welded) or by using the Mule-Hide Mod Bit Flashing Adhesive.
- G. If using the Nail Base as the base-ply, the Nail Base is cut flush to the bottom of the vertical surface. The Cap Sheet is turned up the vertical surface a minimum of 4".
- H. If using the SA Base Sheet as the base-ply or as an inter-ply over the Nail Base, the SA Base Sheet is turned up the vertical surface a minimum of 3". The cap sheet is then turned up the vertical surface a minimum of 4".
- I. When installing the flashing material the 4" of cap sheet adhered to the vertical surface is either heated with hot air to raise the asphalt or Mule-Hide Mod Bit Adhesive is applied to this area. This will ensure 100% adhesion of the flashing material to the cap sheet. Refer to wall/curb details.
- J. Bare masonry surfaces and aged wood shall be primed with Mule-Hide #121 Asphalt Primer and allowed to thoroughly dry before applying the self-adhering cap sheet. Block walls may require a second coat.
- K. The maximum height of the vertical flashing without intermittent attachment is 33". Walls higher than 33" will require intermittent attachment in the seams spaced a maximum of 33" apart. Size of the fasteners used may reduce this distance to provide a sufficient seam width. Fasteners with heads 1" diameter or less will require a minimum 3" wide seam. Fasteners utilizing plates 2" or 3" in diameter shall require a 6" seam. End laps shall be a minimum 6" wide. The maximum length of the flashing should not exceed that which can easily be installed with 2 to 3 applicators without wrinkles, loose areas, voids or fishmouths.
- L. Seams for intermittent attachment, if the **SEALLap**® is not provided, may be completed by hot air welding or with the use of Mule-Hide Mod Bit Adhesive.



- M. Optional method to complete wall flashings is to run the sheets vertically with mechanical attachment in the seams. The material must extend out onto the field 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 and Mod Bit Sealant should be covered with loose granules.

### 3.09 Drains, Expansion Joints, Pipes, Vents, Pitch Pans

#### A. Roof Drains

1. All existing roofing materials and metal flashings shall be removed.
2. Prepare the surface around each drain to prevent any distortion, tenting, or bridging of the membrane. A smooth transition shall be provided from the roof surface to the surface of the drain bowl/clamping ring.
3. Mule-Hide requires the application of a minimum 30' x 30" lead flashing set in a bed of 421 Mod Bit Adhesive at each roof drain prior to the installation of the roofing membrane. Both the top and bottom surface of the lead flashing must be primed with #121 Asphalt primer.
4. Do not run cap sheet field seams through drains or sumps. Roof drains should be centered in the first sheet of cap sheet.
5. Refer to Mule-hide's published standard Self-Adhering Modified Bitumen Details for drain flashings.

#### B. Expansion Joints

1. 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.
2. For general information on both of 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.
3. Refer to Mule-Hide's published Standard Self-Adhering Modified Bitumen Details for application methods for flashing expansion joints.

#### C. Pipes

Pipes may be flashed using one of two typical methods.

1. Using a soft metal flashing (lead)
  - a. 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 a second bed of Mod Bit Flashing Adhesive is applied over the base flange extending at

- least 4" past the edge of the flange (on all sides).
- b. A piece of 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 into the bed of adhesive and then thoroughly rolled to ensure proper contact.
  - c. 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.
2. Using Cap Sheet Material
- a. This method requires two pieces of cap sheet. One will be used for the base and one will be used to wrap around the pipe.
  - b. Starting with the piece to wrap the pipe; cut a piece of cap sheet that will be at least 9" long and wide enough to wrap around the pipe with about 1-1/2" overlap. The 9" length is to provide the 8" minimum height requirement for flashings and when cut will extend out onto the base 1". An option is to cut the cap sheet long enough so there is sufficient material to turn out 1" onto the field and the excess at the top of the pipe can be turned down into the pipe 1" to 1-1/2".
  - c. Once the cap sheet is cut to a proper size, make a series of cuts along the end of the sheet that will turn out onto the field. The cuts should be about 1" long and spaced 1/2" to 1" apart. The smaller the diameter of the pipe the closer the spacing of the cuts should be made.
  - d. Remove the release film and set the sheet with the inside of the cuts tight to the base of the pipe. Tightly wrap the sheet and using a hot air welder, seam the overlap to the sheet pressing firmly with a silicone roller. The welder is then used to seam all the little flanges (created by the cuts) to the field cap sheet. This will complete the first piece.
  - e. Cut the second piece (base) of cap sheet so that it extends a minimum of 6" in all directions from the perimeter of the pipe. Round off the corners of the sheet and cut out the center of the sheet to fit tightly over the pipe.
  - f. The base may be placed over the pipe and hot air welded to the field sheet (welding 100%) or the base may be set in a bed of Mod Bit Flashing Adhesive. In either case, roll the base thoroughly to ensure 100% contact.
  - g. Apply a bead of Mod Bit Flashing Adhesive or Mod Bit Sealant around the base and cover with loose granules to complete the detail. If using Mod Bit Flashing Adhesive to set the base, cover any exposed adhesive with loose granules.

### C. Vents

1. Vents typically have flanges around their base and are set in a bed of Mod Bit Flashing Adhesive.
2. A piece of cap sheet is cut to fit tightly over the vent and extending 4" out past the edge of the flange. Corners of the cap sheet should be rounded. A bed of Mod Bit Flashing Adhesive is applied over the flange of the vent extending at least 4" out on to the field sheet. The cap sheet material should be cut to size to fully cover the bed of Mod Bit Flashing Adhesive. The cap sheet is set over the vent and into the bed of adhesive and 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 adhesive is showing.

### D. Pitch Pans

1. Install and flash pitch pans as indicated in Mule-Hide's published Standard Self-Adhering Modified Bitumen Details. All pitch pans shall be filled with Thermoplastic Pourable Sealant.

### 3.10 Walkway Installation

- A. Walkways help protect the membrane from damage due to routine rooftop service traffic. Walkways may consist of an additional layer of similar Mule-Hide membrane of contrasting color granule surface or another approved walkway material. Contact Mule-Hide Technical Service Department for additional information.
- B. Typical locations for walkways are:
  1. At all access points (ladders, hatches, doorways, etc.) to the roof.
  2. In areas subjected to traffic more frequently than once a month.
  3. Roof areas with high pedestrian traffic or subject to frequent maintenance operations.
- C. It is the responsibility of the building owner to place and maintain walkways at all necessary rooftop areas.

### 3.11 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 Service Department or check the Mule-Hide website ([www.mulehide.com](http://www.mulehide.com)) for the latest updates regarding changes or modifications to this specification.