SECTION 07 52 00

MODIFIED BITUMINOUS ROOFING SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Modified bituminous membrane torch applied (heat welded) roofing.

B. Modified bituminous membrane Self adhered roofing.

C. Modified bituminous membrane mechanically attached.

D. Roof Insulation.

1.2 **RELATED SECTIONS**

A. Section 03510 – Cast Concrete Decking: Decking and decking substrate preparation

B. Section 05300 - Metal Decking: Decking and decking substrate preparation.

C. Section 06100 - Rough Carpentry.

D. Section 06114 - Wood Blocking and Curbing: Wood nailers and cant strips.

E. Section 07220 - Insulation Board: Insulation and fastening.

F. Section 07620 - Sheet Metal Flashing and Trim: Weather protection for base flashings.

G. Section 07710 - Manufactured Roof Specialties: Counter flashing gravel stops, and fascias.

H. Section 07724 - Roof Hatches: Frame and integral curb; Counter flashing.

I. Section 08620 - Unit Skylights: Skylight frame and integral curb and counter flashing.

J. Section 08630 - Metal-Framed Skylights: Skylight frame and integral curb and counter flashing.

K. Section 08950 - Translucent Wall and Roof Assemblies: Counter flashing

L. Section 08960 - Sloped Glazing Assemblies: Counter flashing.

M. Section 15120 - Piping Specialties: Roof Drains, Sumps.

1.3 **REFERENCES**

A. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

B. ASTM D41 - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.

C. ASTM D312 - Standard Specification for Asphalt used in Roofing.

D. ASTM D1970 - Specification for Sheet Materials, Self-Adhering Polymer Modified Bituminous, Used as Steep Roofing Underlayment for Ice Dam Protection.

E. ASTM D6162 - Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.

F. ASTM D6163 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.

G. ASTM D6164 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.

H. ASTM D6222 - Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using Polyester Reinforcements.

I. ASTM D6223 - Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.

J. ASTM D6757 - Standard Specification for Underlayment Felt Containing Inorganic Fibers Used in Steep-Slope Roofing.

K. ASTM D7897 - Standard Practice for Laboratory Soiling and Weathering of Natural Exposure on Solar Reflectance and Thermal Emittance.

L. NRCA - The NRCA Roofing and Waterproofing Manual. National Roofing Contractors Association (NRCA) - Roofing and Waterproofing Manual.

M. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal Manual.

N. ANSI-SPRI ES-1 Wind Design Standard for Edge Systems used with Low Slope Roofing Systems.

O. UL - Fire Resistance Directory.

P. FM Approvals - Roof Coverings.

Q. FBC - Florida Building Code.

R. Miami-Dade Building Code Compliance - N.O.A. (Notice of Acceptance)

1.4 CODE AND TEST REQUIREMENTS

A. Perform work in accordance with all federal, state and local codes.

B. Exterior Fire Test Exposure: Roofing system achieving a UL Class rating for roof slopes indicated on the Contract Drawings.
   1. [UL Class Rating]

C. Windstorm Classification: Roofing system, which will achieve the required uplift resistance as calculated in accordance with the most current revision of ASCE 7-16 or determined by the Design Professional, local Code Agency, or Authority having Jurisdiction (AHJ).

D. Cool Roof Rating Council (CRRC) Reflectivity/Thermal Emittance: Minimum requirements when tested according to CRRC-1
   1. Initial Solar Reflectance Index (SRI): Not less than 96.
   2. Thermal Emittance: Not less than 0.90.

E. LEED: Roof system to meet reflectivity and emissivity criteria to qualify for one point under the LEED credit category, Credit 7.2, Sustainable Sites – Heat Island Reduction (Roofs).

F. Roof system to be tested in compliance with the following codes and test requirements:
   1. FM Approvals: FM Listed and Approved system.
   2. Underwriters Laboratories: Certification TGFU. R13850.
      a. Class A fire-rated
      b. Class 4 Impact Resistance
   3. Florida FBC: For use outside Miami-Dade and Broward Counties.
      a. Membrane Systems FL10497.
      b. Roofing Cements and Coatings FL41936, FL44613, FL46931.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions.

C. Shop Drawings: Shop drawings including installation details of roofing, flashing, fastening and insulation, including notation of roof slopes and fastening patterns of insulation and base modified bitumen membrane, prior to job start.

D. Design Pressure Calculations: Design pressure calculations for the roof area in accordance with ASCE 7-16 and local Building Code requirements. Include a roof system attachment analysis report, certifying the system's compliance with applicable wind load requirements before Work begins. Report shall be signed and sealed by a Professional Engineer registered in the State of the Project who has provided roof system attachment analysis for not less than 5 consecutive years.

E. Verification Samples: As required. For each modified bituminous membrane ply product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

F. Manufacturer's Field Reports: As required.

G. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with NRCA Roofing and Waterproofing Manual.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified with ten years documented experience.

C. As an ISO 9001:2015 Certified Company, MuleHide provides quality products worldwide.

D. Dependent upon the type of warranty requested or specified, roof observations may be required.

MuleHide reserves the right to conduct roof observations to ensure quality of installation.

E. MuleHide provides installers assistance with a qualified team of technical field representatives. Please contact Technical Services or your local sales representative for information regarding the Technical Representative assigned to your region.

1.7 PRE-INSTALLATION MEETINGS

A. Convene minimum one week prior to commencing Work of this section.

B. Review installation procedures and coordination required with related Work.

C. Inspect and make notes of job conditions prior to installation:
1. Record minutes of the conference and provide copies to all parties present.
2. Identify outstanding issues in writing designating the responsible party for follow-up action and the timetable for completion.
3. Installation of roofing system shall not begin until all outstanding issues are resolved to the satisfaction of the Architect.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Ensure all materials are stored in a manner which prevents them being exposed to moisture.

B. Materials should be examined when received. Damaged or unlabeled materials should not be used.

C. Materials must be stored in a dry area with adequate ventilation. Care should be taken to only remove stored materials that can be installed in a reasonable amount of time. All excess materials must be kept in storage.

D. Rolls shall be stored in an upright position with selvage edge up on pallets.

E. Prior to beginning installation, remove all roll wrapping tape by cutting carefully and not ripping the material.

F. MuleHide does allow double stacking of pallets of membranes with the use of slip boards. Please see the Technical Bulletin online at www.mulehide.com for Rotation and Storage of Roll Products.

G. MuleHide self-adhered membranes to be stored at room temperature whenever possible and in an upright position on a flat surface. Avoid storing out of packaging for prolonged periods, especially above 88°F (31°C), in direct sunlight. Do not take the roll out of the packaging until it is ready for application. Refer to technical bulletins found at www.MuleHide.us for more instruction on storage and handling.

H. MuleHide ADESO® membranes shall remain stored in boxes or wraps until time of application.

I. MuleHide Cold Applied Cements, Adhesives and Mastics shelf life is typically 18 months, if stored in original unopened containers – between 40°F–100°F (4°C– 38°C).

J. All containers should be sealed when not in use.

1.9 COORDINATION

A. Coordinate Work with installing associated metal flashings as work of this section proceeds.

1.10 PROJECT CONDITIONS

A. This specification shall not be considered applicable without the appropriate additional specifications approved by MuleHide if it should be determined that any of the following conditions exist:

1. The installation of any MuleHide APP Modified Bitumen Roof System is in a coastal area or high wind zone.

2. If the MuleHide 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 MuleHide APP Modified Bitumen Roof System.

B. Contractor shall follow MuleHide 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, MuleHide 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 MuleHide APP Modified Bitumen Roof 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 MuleHide'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 MuleHide APP Modified Bitumen Roof Membranes in direct contact with any product containing coal tar pitch, creosote or penta-based materials. Consult the MuleHide 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 MuleHide APP Modified Bitumen Roof Membranes. Contact the MuleHide 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 MuleHide's Technical Service Department. Work is to be halted until the owner has responded with a solution to the problems.

R. Vapor Retarders

1. MuleHide 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, MuleHide 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 MuleHide 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.

1.11 WARRANTY

All MuleHide 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

A. MuleHide's Roofing Membrane Limited Warranty For Commercial Projects

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

1. Projects requesting a 10 or 12-year Roofing Membrane Limited Warranty require the use of the weather resistant APP Torch G, APP Torch S Premier, APP Torch G Premier, or APP Torch G KoolCap cap sheet and one waterproofing base sheet (heat-weldable or self-adhering) applied over an approved substrate. Proof of purchase may be required.
    a. When used APP Torch S Premier sheet must be coated with the MuleHide #401 Premium Fibrated Aluminum Roof Coating at an approximate rate of 1-1.5 gallons per 100 square feet.

2. Projects requesting a 15-year Roofing Membrane Limited Warranty require the use of the weather resistant APP Torch G Premier or APP Torch G FR cap sheet and one waterproofing base sheet (heat-weldable or self-adhering) 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 weather resistant APP Torch G Premier or APP Torch G Premier FR cap sheet and two (2) waterproofing base sheets (heat-weldable or self-adhering) applied over an approved substrate. Proof of purchase may be required.

B. MuleHide's Standard System Warranty

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

1. Projects requesting a 10-year NDL System Warranty require the use of the weather resistant APP Torch G Premier, APP Torch G Premier FR, APP Torch S Premier or APP Torch G KoolCap cap sheet applied over an approved MuleHide insulation, coverboard or base sheet.
    a. When used APP Torch S Premier sheet must be coated with the MuleHide #401 Premium Fibrated Aluminum Roof Coating at an approximate rate of 1-1.5 gallons per 100 square feet.

2. Projects requesting a 15-year NDL System Warranty require the use of a weather resistant APP Torch G Premier, APP Torch G Premier FR or APP Torch G KoolCap cap sheet and one waterproofing base sheet (heat-weldable or self-adhering) applied over an approved MuleHide insulation, coverboard or base sheet.

3. Projects requesting a 20-year NDL System Warranty require the use of a weather resistant APP Torch G Premier, APP Torch G Premier FR or APP Torch G KoolCap cap sheet and two (2) waterproofing base sheets (heat-weldable or self-adhering) applied over an approved MuleHide insulation, cover board or base sheet.

A. MuleHide is under no obligation to issue warranties on projects completed prior to submittal to the MuleHide Technical Service Department of a properly completed Warranty Application.

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

E. Tie-ins are not covered by MuleHide warranties.

F. Contact MuleHide Technical Service Department for other extended warranties that may be available.

G. Terms and Conditions of Warranties.

1. MuleHide'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 MuleHide Warranties are available from the MuleHide Technical Department upon request.

2. MuleHide does not warrant products incorporated or utilized in the installation that were not furnished or approved by MuleHide.

2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Mulehide Products Co., Inc.., which is located at: 1195 Prince Hall Drive.; Beloit, WI 53511; Toll Free Tel: 800-786-1492; Web: www.mulehide.com Email: request info (marketing@mulehide.com).

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 INSULATION

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 MuleHide APP Modified Bitumen Membranes, MuleHide Adhesives, MuleHide APP Modified Bitumen Flashings and other MuleHide 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. MuleHide 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. MuleHide Poly ISO 1 or MuleHide 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. MuleHide 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 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 MuleHide Technical Department regarding attachment of extruded polystyrene with the Helix® or Helix® Max Low-Rise Adhesive. Not all extruded products are approved for use with the Helix® or Helix® Max Low-Rise Adhesive.

1. Requires the installation of an approved (minimum ½" thick) cover board manufactured by U.S. Gypsum (USG) or Georgia-Pacific (GP).

e. Perlite – This product is <u>not</u> an acceptable top layer component in a MuleHide roofing assembly.

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. MuleHide requires a minimum thickness of 2" over the polystyrene insulation or the deck. The roof deck manufacturer must confirm in writing, to the MuleHide 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 shall require pressure relief vents. Contact MuleHide for quantities and locations of pressure relief vents. MuleHide shall not be responsible for damage or any failures of the roofing system caused by the lightweight insulating concrete deck or fill. MuleHide will not be responsible for any failure to follow installation or venting recommendations.

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 MuleHide 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 MuleHide 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 MuleHide Nail Base.

2. When attempting to install MuleHide Modified Bitumen membranes to a non-acceptable substrate/insulation, MuleHide requires the installation of an acceptable material as an overlay before the installation of an appropriate MuleHide base sheet.

D. UL and FM Approved Assemblies

Contact MuleHide 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 MuleHide (MuleHide Metal Accessories) and installed by a MuleHide 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 MuleHide warranties. Contact MuleHide's Technical Department for specific requirements.

2.3 MODIFIED BITUMINOUS ROOFING MEMBRANE

A. Base Sheet:
1. SA Base, APP Torch Base, G2 Base
   a. ASTM: D6163 - Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet
   b. Reinforcement: Fiberglass
   c. Type: I
   d. Thickness: 80 mils [2.0 mm]
   e. Available in FR
2. Method of application: Self Adhered or Heat Welded

B. Interply Sheet (Optional 2 plies can be installed per project specifications):
1. SA Base
   f. ASTM: D6163 - Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet
   g. Reinforcement: Fiberglass
   h. Type: I
   i. Thickness: 80 mils [2.0 mm]
   j. Available in FR
2. Method of application: Self Adhered or Heat Welded

C. Cap Sheet:
1. APP Torch G, APP Torch G Premier, APP Torch S, APP Torch S Premier, APP Torch G KoolCap
   a. ASTM: D6164 - Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet
   b. Reinforcement: Polyester
   c. Type: I
   d. Thickness: 160 mils [4.0 mm], 180 mils [4.5 mm], 145 mils [3.7 mm], 160 mils [4.0 mm]
2. Method of application: Heat Welded

2.4 FLASHINGS

A. WALL FLASHINGS
1. Same as Field: Minimum of 1 ply of base/interply as reinforcement and cap sheet for all flashing systems.

B. **PENETRATION FLASHINGS**
1. Type of flashings: Liquid Applied
   a) Liqui-Flash
      i. Must be installed in 3-course fashion using PolyBrite Reinforcing Polyester Fabric.

2.5 FASTENERS

A. Fasteners and Plates: Provide FM Approved fasteners and plates and other devices as required to suit the system specified.

B. Wood: Roofing nails of galvanized or stainless steel, of length to penetrate the wood by at least 3/4 inch (19 mm) on flashings and parapet walls.

C. Masonry: Nail-in expansion type device with zinc body, plated steel nail, and mushroom head or approved equal and of length to embed into the masonry a minimum of 1 inch (25 mm).

D. Insulation: Mechanical fasteners for securing of insulation to decking shall be approved by the insulation manufacturer for the system specified and shall be FM

Approved and be in compliance with Appendix "E" of FM 4470 for corrosion resistance.

1. Use the same brand fastener throughout the work.
2. Provide the number of fasteners and layout as recommended by the manufacturer and per FM Approvals.
3. Determine length of fastener by the thickness of the decking and any fill and the thickness of the insulation. Fasteners shall be of sufficient length to achieve a minimum of 1 inch (25 mm) penetration.

E. Pre-Assembled Fastener/Plate Combination: Case hardened carbon steel and use specific head, shank and thread diameters, point types and head styles meeting building code and FM approvals for corrosion and simulated wind uplift criteria requirements.

1. Fasteners are designed for the attachment of insulation and membrane to steel (18-24 gauge), wood, and structural concrete.
2. Provide to meet FM requirements, fastener shall penetrate the steel deck 3/4 inch (19 mm). Minimum penetration is 1 inch (25 mm) in wood, 3/4 inch (19 mm) through wood that is less than 3/4 inch (19 mm) thick and 1-1/4 inches (32 mm) in concrete.

2.6 PRIMER

A. Asphalt Primer: MuleHide A121 Asphalt Primer conforming to ASTM D41.

1. Applied on all dissimilar materials except insulation.
2. General purpose penetrating asphalt primer used to promote adhesion prior to the application of hot-mopped, cold-applied, and self-adhesive membrane systems as well as roof cements, mastics, and asphalt-based adhesives.

2.7 ASPHALT

A. Certified in full compliance with requirements of Type III or IV asphalt listed in Table 1, ASTM D312. Each container, or bulk, shipping ticket shall indicate the equiviscous temperature (EVT), the finished blowing temperature (FBT), and the flash point.

2.8 MISCELLANEOUS

A. Adhesive/Sealant:

1. MuleHide 241 Premium Modified Flashing Cement. Meets or exceeds the requirements of ASTM D4586 Asphalt Roof Cement Type I.
2. MuleHide 251 Premium Wet/Dry Elastomeric Flashing. Meets or exceeds the requirements of ASTM D4586 Asphalt Roof Cement Type I.
3. MuleHide 420 or 421 Modified Adhesive Brush/Trowel Grade. Meets or exceeds the requirements of ASTM D3019 Type III Lap Adhesion.

B. Insulation Adhesive:

1. Approved MuleHide low-rise foam adhesive.

C. Roofing Insulation: As specified in Section 07220.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Inspect and approve the deck condition, slopes and fastener backing if applicable, parapet walls, expansion joints, roof drains, stack vents, vent outlets, nailers and surfaces and elements.

C. Verify that work penetrating the roof deck, or which may otherwise affect the roofing, has been properly completed.

D. If substrate preparation and other conditions are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 SUBSTRATE/PREPARATION

The following general conditions apply to the substrate that will receive a MuleHide 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 MuleHide 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. Under the new insulation unless the coal tar pitch is 10 years or older and is separated from the 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 MuleHide 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 MuleHide'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 (PolyISO 1 and PolyISO 2) 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 MuleHide 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") rough side up 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 MuleHide 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 MuleHide 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

Helix® or 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 MuleHide 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® or 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® or 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. Mulehide requires that all roof surfaces have a positive slope (Min 1/4" per foot) to provide adequate drainage. There should not be any ponding water 48 hours after a rainfall.

3.3 INSTALLATION

A. INSULATION INSTALLATION AND ATTACHMENT:

1. Incorrectly installed insulation can lead to roof system loss (blow-offs) and is the responsibility of the insulation installer, not the roof membrane manufacturer.
2. MuleHide does not warrant against improperly attached insulation or insulation failure caused by incorrect application.
3. All joints between layers should be staggered when multiple layers of insulation are installed.
4. Insulation shall be kept dry at all times. Install only as much insulation as can be covered with completed roofing membrane before the end of the day's work (or prior to onset of inclement weather).
5. Edges shall butt tightly, and all cuts shall fit neatly against adjoining surfaces to provide a smooth overall surface. Gaps of greater than 1⁄4" (6 mm) width shall be filled with insulation.
6. Install tapered insulation around roof drains and penetrations to provide adequate slope for proper drainage.
7. Mechanically attached insulation shall be fastened in accordance with Factory Mutual (FM) Approvals requirements for the applicable geographic Zone with the required number (and type) of fasteners and plates. Exception: where MuleHide requirements are more stringent than Factory Mutual (FM) Approvals or third-party manufacturers, MuleHide requirements shall be followed.
8. When asphalt or foam adhesive attachment is selected by the project designer, the proposed insulation shall be compatible with the roof substrate, the proposed bitumen and the requirements of the specific MuleHide membrane. NOTE: Expanded polystyrene (EPS) materials shall not be installed with hot bitumen products.
9. Maximum 4' × 4' (1.2 m × 1.2 m) insulation boards can be attached with hot asphalt.
10. Asphalt for insulation attachment shall meet ASTM D312 Type III or IV criteria, as dictated by the roof slope or other design conditions.

Mulehide'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

Commence installation of the roofing system at the lowest point of the roof (or roof area), working up the slope toward the highest point. Lap sheets shingle fashion so as to constantly shed water. For further information contact Mulehide Technical Services. Follow the recommendations for the specific type of material and layer as outlined below, or as specified. Type II standards, are acceptable for Mulehide roofing systems and should be appropriately installed in a manner approved for the specific product, e.g. fully adhered as self-adhered or with asphalt/or cold adhesive, heat-welded or mechanically attached (per industry

standard fastening pattern) as applicable, and in accordance with specifications.

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 MuleHide 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® or 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 MuleHide F5 Air & Vapor Barrier, FROTH-PAK, or other suitable material, to avoid condensation issues and positive pressure from air infiltration.

3. Apply Helix® or Helix® Max Adghesive 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 MuleHide Technical Department for more details.

Adhesive installation

1. Apply Helix® or 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® or 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 MuleHide 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.

F. NOTE: Projects utilizing MuleHide’s F5 Air & Vapor Barrier must comply with MuleHide’s installation requirements and published details.

B. BASE AND PLY SHEET INSTALLATION:

1. Install in a manner approved for the specific product, e.g. fully adhered as self- adhered or mechanically attached.
2. Base or Inter-ply side laps are to be 3 inch (76 mm) minimum and usually delineated by a “lay line” for self adhered or mechanically attached application. End laps are typically 6 inches (152 mm) in all cases.
3. After adhering the sheet, it is required that uniform pressure be applied to the entire roll area by using a minimum 75# 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. 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 MuleHide 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.

C. APP Torch Base Sheets

1. 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.
2. Start at the low point of the roof. The APP Torch Base 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.

3. 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 Sheet. Primer must be allowed to dry thoroughly.
4. **Application directly to wood decking is not permitted and requires the installation of an approved base sheet or cover board as a substrate.**
5. Unroll the material and allow to relax in the sun for at least 15 minutes.
6. Install with traditional torch roofing techniques ensuring proper heating of the roofing material as not to expose the reinforcement.
7. Do not heat the substrate.
8. 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.
9. Laps shall be rolled with a 6” wide roller immediately after heat welding.
10. APP Torch Base Sheets should be turned up to the top of the cant.
11. Details are completed with the use of hot-air welding equipment (torch) combination with the APP Torch Base Sheets membranes and cap sheets.
12. The APP Torch Base Premier Sheet may be left exposed for up to 90 days before the installation of the cap sheets.

D. CAP SHEET INSTALLATION:

1. MuleHide APP or SBS cap sheet membranes are intended to be used as the primary weathering surface in new and re-roof applications. MuleHide APP or SBS cap sheet membranes are to be applied as the uppermost layer of a multi-ply roof system over a compatible MuleHide base and/or interply sheet. MuleHide APP or SBS cap sheet membranes may be applied directly to approved substrates.
2. Apply over clean, dry, dust and debris-free substrates. Prime concrete decks and required substrates prior to application with A125 Fast-Drying Asphalt Primer. Consult MuleHide Technical Services if alternate primer is allowed.
3. When re-roofing, remove all prior roofing materials down to a clean, dust free substrate. Remove unused or abandoned through-roof penetrations.
4. All substrates shall be designed with proper expansion devices.
5. Wood decks shall have all joints cross blocked and/or properly supported.
6. Installation of the membrane should not adversely affect the ventilation of existing construction.
7. Do not apply directly to existing shingles or other unacceptable roof coverings.
8. While installing MuleHide APP or SBS heat-welded cap sheet membranes:
    a. Start at the lowest point of the roof.
    b. Unroll the material and allow it to relax as membrane is positioned prior to installation.
    c. Install with traditional heat-welding roofing techniques ensuring proper heating of the roofing material.
    d. Do not overheat to expose or compromise the reinforcement.
    e. Position successive rolls using the 5" (13 cm) FASTLap at the end of the rolls, where applicable (only premium MuleHide membranes have FASTLap), or at the granulated endlap. Bleed out of asphalt when heat welding the seam should be 1⁄8" –1⁄4" (3 mm–6 mm) (typical all seams).
    f. Laps may be lightly rolled with a 4"–6" (10 cm–15 cm) wide roller to ensure lap is fused.
    g. Details and flashings may be installed using heat-welding techniques. Do not adhere using cold adhesives or hot asphalt. Refer to manufacturer’s published details for proper design and installation of detail work.
    h. Remember to thoroughly roll each sheet with a 75# weighted roller as soon as a Self-Adhered sheet is installed.

E. COLD WEATHER INSTALLATION

MuleHide advises against installing modified bitumen membranes at temperatures lower than 40°F–45°F (4°C–7°C) (wherever practicable). Where work is unavoidable at such temperatures, we recommend the following precautions be taken:

1. Take extra care during cold weather installation (Below ambient temperatures of 40°F–45°F (4°C–7°C), whereas ambient temperatures are affected by wind, humidity, etc.), 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 (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. The rolls must be at least 40°F (4°C) 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 storage area.
3. To prevent the aforementioned situations and to ease the progress of installation under unfavorable conditions we recommend the following procedures:
   a. The general recommendations of the National Roofing Contractors Association (NRCA) and Asphalt Roofing Manufacturers Association (ARMA) should be taken into account and will be helpful.
   b. Remember that wind chill will have an effect on the application temperature.
   c. Ensure that membrane is only installed to properly dry, clean and primed (where necessary) surfaces as required by the specifications.
   d. Store membrane, until immediately prior to installing the roll. Minimum ambient temperature of the storage area should be 55°F–60°F (13°C– 15°C).
   e. Once rolls of material are taken from the temperature controlled storage area, install before the temperature of the material drops below 40°F– 45°F (4°C–7°C).
4. The following application specific recommendations should be followed:
   a. HEAT-WELDED APPLICATION
      i. The use of shielded “dragon-wagons”, or moveable, flame-resistant wind shields can also be of great help in the effort to keep all surfaces and materials at a suitably warm temperature during heat-welding.

F. VAPOR RETARDERS

1. Adequate moisture vapor control is recommended (when appropriate) as a lack thereof may result in the accumulation of moisture in the roofing assembly.
2. An analysis of dew point and vapor flow should be assessed during an initial project design for the building as well as for re-roofing and re-cover applications as they can alter existing vapor flow.
3. In general, vapor retarders may be required when high interior relative humidity is present. The condition is typically seen with food processing facilities, swimming pools, paper mills, laundry facilities, etc.
4. Vapor retarders are sometimes referred to as temporary or secondary roofs.
5. The necessity for use of a vapor retarder is the responsibility of the design professional and should be reviewed and approved by the building owner. The type, location and method of application is also to be determined by the design professional.
6. The National Roofing Contractors Association (NRCA) as well as the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) may be referenced for recommendations on the necessity of a vapor retarder.

G. SPECIAL APPLICATIONS

1. MuleHide roofing assemblies are sometimes selected for installation over buildings that include unique environments and are deemed special purpose.
2. These would include cold storage facilities, pools, as well as partially enclosed and open buildings such as hangars.
3. These should be carefully reviewed as they pose design and building conditions such as elevated moisture or humidity, unusually elevated or lowered temperatures, and elevated pressure conditions.
4. Special applications also include overburden or plaza deck assemblies. These typically include the addition of additional materials for protection of the newly installed roof.
5. Technical Services should be contacted prior to these installations.

H. DRAINAGE

1. Adequate drainage is required for a well-functioning low-slope roof system. The minimum recommended slope is 1⁄4" (6 mm) per foot.
2. Absence of proper drainage often results in “Ponding”. It is defined by the National Roofing Contractors Association (NRCA) as water that has not dissipated from the roof within 48 hours.
3. Ponding water negatively affects the membrane and can result in premature deterioration, and is not covered by MuleHide warranties.
4. The ideal structural roof deck is designed to provide adequate slope and drainage. When the roof deck has not be constructed to provide proper slope and drainage, the use of tapered insulation is required.
5. Primary and secondary drains shall be of sufficient number and diameter and located so as to provide adequate drainage of the entire roof surface.
6. The adequacy of drainage provisions, placement, sizing and/or number of drains required is the responsibility of the design professional. Drainage conditions should meet the requirements of codes as well as standard industry recommendations.

I. CANTS

1. Cant Strips are required at all horizontal/vertical intersections. They may be mechanically fastened or adhered to the substrate depending upon the deck type.
2. Material type of Cant strip is dependent upon the application method of the roofing assembly. Hot asphalt applied systems may utilize Perlite (conforming to ASTM C728) or wood fiber (conforming to ASTM C209). Heat welded flashing assemblies require the use of Perlite only. Self-Adhered flashing applications are recommended to include wood Cant strip (primed).

J. 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 MuleHide’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.

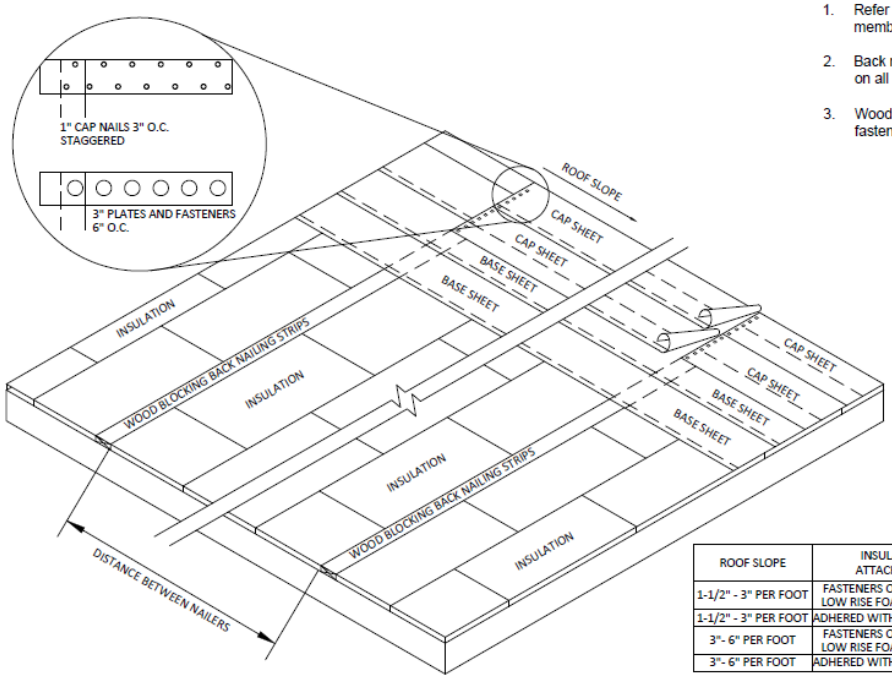
2. Nailers must be attached to resist a force of 200 lbs. per linear foot minimum. Fasteners used to anchor the nailers shall be spaced no more than 2’ apart.

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).

NOTES:

1. Refer to specifications for flashing membrane requirements.
2. Back nailing wod blocking strips are required on all slopes greater than 1-1/2":12".
3. Wood nailers must be installed with proper fasteners to meet applicable building codes.



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"

5. 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 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.

K. EXPANSION JOINTS/AREA DIVIDERS

1. Expansion joints are part of the building, considerations such as design and location must be taken at the time of original building design by design professionals and reviewed by the building owner. The purpose of the expansion joint is to minimize stress on the building from movement.
2. Per typical flashing details, expansion joints must me extended a minimum of 8" (20 cm) above the roof surface on curbs. Sheet metal caps or flexible expansion joint covers are used at the top surface of the expansion joint.
3. Expansion joints must be located so as the typical drainage flow is not blocked.
4. Expansion joints are continuous along the break in the structure. They shall not be terminated short of the end of the roof deck.

L. AREA DIVIDERS

1. Area dividers can be similar to but are not considered expansion joints.
2. Typical uses for dividers are to section off roof sections which were not included in original building design/construction. They can relieve stresses in an existing roofing system, and can server as a separator between two dissimilar roofing materials.
3. Area dividers are typically capped with a coping cap style sheet metal detail.

M. MEMBRANE FLASHINGS

1. Membrane flashings and their locations are particularly volatile and are most susceptible to moisture penetration. Proper installation at these locations is critical to the integrity of the roofing assembly.
2. Flashings, or, “Base Flashing”, are locations on the roof whereby the field of the roof (horizontal surface) intersects with a wall, curb, penetrations (vertical surfaces), etc.
3. Membrane flashings entail the installation of two (2) plies of membrane at flashing locations. The products associated with the flashings may utilize same plies used for the overall roofing assembly.
4. Flashing locations that include irregularly shaped penetrations, low flashing clearance heights, or items too close to be properly flashed with membrane may be treated with Liqui-Flash. Contact MuleHide Technical Services for more information.
5. Minimum flashing height is 8" (20 cm) and the maximum flashing height is 24" (61 cm).
   a. **The use of SA Vertical contact bonding adhesive to promote better adhesion is recommended for any vertical walls.**
6. Base flashings shall me mechanically fastened at the top edge and terminated with a proper termination bar and counterflashing.

N. WALKAWAYS AND PROTECTED MEMBRANES

1. Walkways help protect the membrane from damage due to routine rooftop service traffic. Walkways may consist of an additional layer of similar MuleHide membrane of a contrasting color granulated surface, or another approved walkway system. The following are typical roof locations that utilize walkways:
   a. All roof access points (ladders, hatches, doorways, etc.).
   b. Areas subjected to traffic in excess of one monthly visit.
   c. Areas with high pedestrian traffic or subject to frequent maintenance operations.
   d. In addition to typical locations requiring walkways, the walkway material may also be applied beneath rooftop equipment such as blocking to support gas/plumbing lines, and small non curb mounted HVAC (or other) equipment placed on wood sleepers.

O. TEMPORARY TIE-INS

1. 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.
2. Remove all gravel, dirt, debris or other contaminants from the tie-in area and make sure all surfaces are clean and dry.
3. 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.
4. When work resumes, remove the temporary seals completely including contaminated membrane, sealants, insulation fillers, etc. from the work area and properly dispose.

Note: MuleHide 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.

P. SAFETY AND HEALTH

1. Strict Safety and Health precautions are necessary at all times. PLEASE READ, UNDERSTAND AND FOLLOW ALL INSTRUCTIONS ON LABELS AND PACKAGING AS

WELL AS ANY APPLICABLE INDUSTRY STANDARDS AND REGULATIONS. See also all relevant sections above. All volatile, or potentially volatile, materials such as primers, gas, cleaners, etc., shall be kept away from all ignition sources (e.g. flames, torches, fire, sparks, etc.). Consult product container labels and Safety Data Sheets for specific safety instructions. The application of those products installed with hot asphalt or torch may result in burns and other physical injury. Surfaces which contact the melted bitumen or torch may ignite. The installer should take utmost care when using hot materials such as asphalt or when heat-welding any product. This is especially important when there may be a danger of contact with materials which may smolder, such as cellulose and wood materials, wood fiber, etc. or flammable or highly flammable solvents or chemicals. MuleHide membranes may present a slip and fall hazard. This risk is increased when wet or icy conditions exist. Adequate precautions should be taken when working. Manufacturer recommends the use of OSHA approved fall protection for project conditions.

A. LIMITATIONS
   1. MuleHide membranes should never be applied directly to TPO, EPDM, PVC, or other single ply membranes.
   2. MuleHide Cold Applied membranes are not to be used with organic saturated felts.
   3. Not to be installed over or under polystyrene insulation.

B. Surface Coatings: Apply roof coatings in strict conformance with the specific manufacturer's recommended procedures.

3.2 Provide any corrections to bring the roofing installation into conformance with MuleHide USA, Inc. requirements.

3.3 FIELD QUALITY CONTROL

A. Inspection: Manufacturer shall conduct field observations as deemed necessary by MuleHide for projects requiring MuleHide Roofing Systems Warranty. The number and frequency of field observations shall be as required by MuleHide USA, Inc. Technical Services Department.

B. Contractor shall correct any deficiencies observed by MuleHide Technical Services to bring the roofing installation into specification conformance with MuleHide USA, Inc. warranty requirements.

3.4 CLEANING

A. Clean-up and remove daily from the site all wrappings, empty containers, paper, loose particles and other debris resulting from these operations.

B. Remove asphalt markings from finished surfaces.

C. Repair or replace defaced or disfigured finishes caused by Work of this section.

3.5 PROTECTION

A. Provide traffic ways, erect barriers, fences, guards, rails, enclosures, chutes and the like to protect personnel, roofs and structures, vehicles and utilities.

B. Protect exposed surfaces of finished walls with tarps to prevent damage.

C. Plywood for traffic ways required for material movement over existing roofs shall be not less than 5/8 inch (16 mm) thick.

D. In addition to the plywood listed above, an underlayment of minimum 1/2 inch (13 mm) recover board is required on new roofing.

E. Special permission shall be obtained from the Manufacturer before any traffic shall be permitted over new roofing.

END OF SECTION