SECTION 3

MULE-HIDE PRODUCTS CO., INC.

PVC Fully Adhered Specification

PVC Fully Adhered Summary Specification

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MULE-HIDE PRODUCTS CO., INC.
FULLY ADHERED PVC SYSTEM
SPECIFICATION

07 54 00/MUL

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FULLY ADHERED PVC SYSTEM SPECIFICATION

07540/MUL

PART 1 - GENERAL

1.01 Description

A. Scope:

1. Furnish and install a Fully Adhered Mule-Hide Reinforced PVC Roofing Membrane with flashings and accessories necessary to comprise a 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

1.02 Quality Assurance

A. The Mule-Hide Reinforced PVC Membrane Roofing System shall be installed by an independent roofing contractor (Mule-Hide Warranty Eligible Applicator) eligible to apply for Mule-Hide warranties when System Warranties are requested.

B. There shall be no deviations from this specification or the Mule-Hide Products Co. ("Mule-Hide") standard details without prior written approval from Mule-Hide's Customer Service Department.

C. Upon completion of the installation according to the terms and conditions stated in this specification and in accordance with the information provided 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 may perform an on-site inspection of the roof to verify that all installation and material requirements have been met.

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.

2. Samples of each material to be used in the roof system.

3. Specimen copy of Mule-Hide Products Co. warranty.

4. Dimensioned shop drawings to include an outline of the roof and appropriate details for flashings and terminations.

5. Certification from insulation, roofing and accessory components manufacturers that all materials supplied comply with identified ASTM and industry standards.

6. Verification that system specifications meet all identified code and insurance requirements including but not limited to the following:

   a. Factory Mutual Research Laboratories
      Norwood, MA

   b. Underwriters Laboratories
      Northbrook, IL

1.04 Product Delivery, Storage and Handling

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

B. Protect all materials from damage during transit, storage and delivery to the job site. Place all materials on pallets and protect from moisture.

C. Store all materials in a dry, clean area protected from the elements. All rolls of membrane shall be stored flat on pallets.

D. All adhesive and caulking shall be stored at temperatures between 60°F and 80°F.

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

F. All materials determined to have been damaged (confirmed by Mule-Hide) are to be replaced with new materials at no cost to the owner.

1.05 Job Conditions

A. Mule-Hide PVC roofing materials may be installed under certain adverse weather conditions such as high humidity or extreme temperatures, but only after consultation with the Mule-Hide Customer Service Department as special precautions or procedures may be necessary. The performance of the materials, installation costs and production rates may be affected.

B. Only as much new roofing as can be made watertight each day shall be installed each day. This includes all flashing work.

C. All substrates to receive new insulation, membrane or flashing shall be thoroughly dry and free of contaminants. Should surface moisture occur, the contractor shall provide adequate equipment to dry the substrate prior to application of new materials.

D. Prior to and during application, all dirt, debris and dust shall be removed from surfaces to be roofed for both new and reroofing substrates.

E. On all reroof jobs and for all lightweight deck systems, pullout tests shall be performed by the independent roofing contractor, fastener manufacturer or owner's representative to verify the condition of the deck or substrate and to confirm system design pullout values.

A minimum of 10 pullout tests for areas up to 500 squares, thereafter 2 tests per 100 squares is considered sufficient. Tests should be taken approximately 60% in perimeters and 40% from field areas. Additional tests shall be performed in areas where the integrity of the deck is questionable. A written report of pullout test results shall be submitted to Mule-Hide's Customer Service Department for review.

F. 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.

G. 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 Customer Service Department in writing.

H. 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 should be compatible with all materials.

I. Do not install the Mule-Hide PVC Roofing Membrane in direct contact with any product containing asphalt, coal tar pitch, creosote or penta-based materials. Consult the Mule-Hide Customer Service Department for special installation requirements.

J. 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 PVC Roofing Membrane. Contact the Mule-Hide Customer Service Department for recommendations if such conditions exist.

K. The contractor shall follow all safety regulations as recommended by OSHA.

L. 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.

M. 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.

N. 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.

O. Any unusual or concealed conditions discovered during the course of the work are to be reported to the owner and Mule-Hide immediately in writing. Work is to be halted until the owner has responded with a solution to the problems.

P. All local building codes and requirements must 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.

Q. 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.

1.06 Warranties

All Mule-Hide warranties are available for commercial projects. A Roofing Membrane Limited Warranty for a maximum of 10 years is available for residential projects.

A. Mule-Hide's Roofing Membrane Limited Warranty

Mule-Hide offers a 10, 15 or 20-year Roofing Membrane Limited Warranty ("Warranty") for a charge. The Warranty covers only the Mule-Hide PVC membrane (or portion thereof) determined by Mule-Hide to be defective and resulting in roof leaks. This Warranty does not cover workmanship or other components not supplied by Mule-Hide. Mule-Hide does not perform inspections of the installation before issuing the Roofing Membrane Limited Warranty. A Mule-Hide Warranty Application and the appropriate fee must be submitted to Mule-Hide to obtain this warranty. Proof of purchase may be required.

Note: Projects requesting a 20-year Roofing Membrane Limited Warranty require the use of the 60-mil thick PVC membrane and shall incorporate additional design enhancements as outlined in the 20-year Design Enhancements for PVC Fully Adhered Roofing System Specification. Mule-Hide recommends that Warranty Applications be submitted for review prior to bidding the project.

B. Mule-Hide's Standard System Warranty

Mule-Hide offers a 10, 15 or 20-year Standard System Warranty ("Standard") for commercial projects for a charge. The Standard warranty is a "No Dollar Limit", labor and material warranty that covers the Mule-Hide labeled membrane and other components supplied by Mule-Hide installed by a Mule-Hide Warranty Eligible Applicator. The Standard warranty does not cover insulation or its attachment system. Metal flashing components are not covered under this warranty. A Mule-Hide Warranty Eligible Applicator must submit a Warranty Application and the appropriate fee to Mule-Hide. Standard warranties require inspections by a Mule-Hide representative.

Note: Projects requesting a 20-year Standard System Warranty require the use of the 60-mil thick PVC membrane and shall incorporate additional design enhancements as outlined in the 20-year Design Enhancements for PVC Fully Adhered Roofing System Specification. Mule-Hide recommends that Warranty Applications be submitted for review prior to bidding the project.

C. Mule-Hide Premium System Warranty

Mule-Hide offers a 10, 15 or 20-year Premium System Warranty ("Premium") for commercial projects for a charge. The Premium warranty is a "No Dollar Limit", labor and material warranty that covers the Mule-Hide labeled membrane, insulation, other components supplied by Mule-Hide and approved products (such as metal flashing, insulation adhesive or other pre-approved accessories) installed by a Mule-Hide Warranty Eligible Applicator. A Mule-Hide Warranty Eligible Applicator must submit a Warranty Application and the appropriate fee to Mule-Hide. Premium warranties require inspections by a Mule-Hide representative.

Note: Projects requesting a 20-year Premium Warranty require the use of the 60-mil thick PVC membrane and shall incorporate additional design enhancements as outlined in the 20-year Design Enhancements for PVC Fully Adhered Roofing System Specification. Mule-Hide recommends that Warranty Applications be submitted for review prior to bidding the project.

D. Standard and Premium System warranties are not available for residential projects.

E. PVC tie-ins to built-up (BUR) or any other type of roof system are not covered by Mule-Hide warranties.

F. Contact Mule-Hide for other extended warranties that may be available.

G. Terms and Conditions of Warranties

Mule-Hide's obligations under the Roofing Membrane Limited Warranty, the Standard System Warranty, and the Premium System Warranty are limited to the specific terms and conditions of the respective Warranties. Sample copies of the Mule-Hide Warranties are available from Mule-Hide upon request.

PART 2 - PRODUCTS

2.01 General

A. The components of the Fully Adhered Mule-Hide PVC Membrane Roof System are to be products manufactured or supplied by Mule-Hide Products Co., Inc. as specified in the contract documents.

B. Components other than those supplied or manufactured by Mule-Hide may be submitted for review and acceptance by Mule-Hide's Customer Service Department. Mule-Hide's acceptance of any other product is based on chemical compatibility and published performance data. Mule-Hide does not guarantee such products or their performance. Other components may be considered on a job-by-job basis and must be approved in writing by Mule-Hide's Customer Service Department. The specifications, installation instructions, limitations, and/or restrictions of the respective manufacturers must be reviewed by the designer for acceptability for use with Mule-Hide PVC roofing products.

2.02 Roofing Membrane

The Mule-Hide Reinforced PVC Membrane is available 50 mils (.050-inch) thick, 60 mils (.060-inch) thick or 80 mils (.080-inch) thick. The Mule-Hide PVC membrane is a polyester scrim reinforced thermoplastic roofing membrane that meets and exceeds the requirements of ASTM D4434 (Type III) Standard Specification for Poly (Vinyl Chloride) Sheet Roofing. Refer to the Product Data Sheets for physical properties and additional information.

2.03 Accessory Materials

A. PVC Cut Edge Sealant - a liquid PVC sealing compound, shall have a consistency equal to that of "honey" at room temperature, and shall be furnished in 16 oz. bottles.

B. PVC Bonding Adhesive - a solvent-based adhesive for bonding the Mule-Hide PVC Membrane to various vertical substrates and insulation boards.

C. Termination Caulk - a single-component, non-sag elastomeric polyurethane caulk. Contact Mule-Hide for acceptable brands.

D. Aluminum Foil Tape - a 3-mil tape with acrylic adhesive used over Mule-Hide PVC roofing system metal joints prior to PVC Flashing strips being welded over the joints.

E. Slip sheets - Mule-Hide offers a variety of slip sheets dependent upon the particulars of an application. Some of these are the following:

1. A laminated kraft paper with fiberglass scrim reinforcement.
2. Polyester Mat Protection Material - needle-punched polyester fabric.

F. PVC Membrane Cleaner - a clear liquid available in 5 gallon cans used for cleaning asphalt and dirt from membrane surface.

G. PVC Non-Reinforced Flashing – an 80-mil PVC Flashing (unreinforced) membrane can be used to complete flashing details.

H. PVC Coated Metal - 24-gauge galvanized steel to which is laminated 35-mils of Mule-Hide's PVC Non-Reinforced Flashing (white) used for flashing and edge metal detailing.

I. Mule-Hide All-Purpose Bar - an extruded aluminum bar 50 mils thick used to terminate adhered, reinforced membrane base flashings in certain constructions.

J. Membrane Fasteners and Plates - Mule-Hide offers a variety of membrane fasteners and plates to meet specific job conditions and substrates.

1. Mule-Hide Steel/Wood Deck Fasteners

a. Drill Point-Coated

b. Thread Point-Coated

c. Stainless Steel Drill Point

2. Mule-Hide Concrete Fasteners - For Structural Concrete Decks

3. TL (2 Piece) - (High Density Nylon Auger & Metal Plate) - For Cementitious Fiber Substrates (Tectum, etc.) and Lightweight Concrete or Gypsum Decks

4. Mule-Hide Metal Plates - Mule-Hide offers a variety of metal plates for membrane and insulation attachment.

K. PVC Walkway Roll - a 90-mil (.090 inch) thick textured, polyester reinforced PVC membrane for traffic areas.

L. Prefabricated Details - PVC Universal (inside/outside) Corners, PVC Pre-Molded Pipe Seal in sizes to fit pipes from 1" – 6", PVC Molded Sealant Pockets.

M. Thermoplastic Pourable Sealer - a one-part thermoplastic sealant for use in PVC Molded Sealant Pockets.

2.04 Related Materials By Others

A. Wood Nailers

1. Nailers shall be #2 or better lumber and shall be pressure treated for rot resistance. Creosote and asphaltic preservatives are not acceptable.

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. Vapor Retarders

1. Vapor retarders shall meet specified code and/or insurance requirements.

2. Vapor retarders shall be compatible with insulation and other accessories.

3. The use and placement of a vapor retarder should be determined by an architect or engineer. 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 percent or greater.

C. 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 PVC Membrane Adhesive and the Mule-Hide PVC Membrane.

3. The following insulation boards are acceptable for use in a Mule-Hide Fully Adhered Roofing System when a standard warranty is requested:

   a. Polyisocyanurate insulations having nonasphaltic facers meeting or exceeding the physical property requirements of Fed. Spec HH-I-1972 and having a minimum compressive resistance of 18 psi. Thickness minimum is 1" or greater as required by insulation manufacturer to span flutes on steel decks.

   b. High Density wood fiberboard with nonasphaltic binders. Boards with asphalt binders or have been coated with asphalt cannot be used in direct contact with the PVC membrane. Contact the insulation manufacturer for minimum thickness requirements when installing this board directly over a steel deck.

   c. Expanded polystyrene requires an acceptable cover board to which the PVC membrane may be adhered. Minimum density of EPS boards must be 1.25 PCF and meeting ASTM C578, Type II physical properties. Check with the EPS (expanded) manufacturer for minimum thickness requirements to span flutes on steel decks.

   d. Extruded polystyrene meeting ASTM C578, Types IV, VI or VII physical properties. An acceptable cover board shall be required over the extruded polystyrene to which the PVC membrane may be adhered. Check with the EPS (extruded) manufacturer for minimum thickness requirements when spanning flutes on steel decks.

4. Insulation manufacturer shall provide its recommendations for use and attachment to the owner with a copy to Mule-Hide Products Co. In addition, the insulation manufacturer shall provide a copy of their specific warranty conditions if required by the building owner.

D. Insulation Adhesive

1. Insta-Stik™ - A single component polyurethane, construction grade, low-rise expanding foam adhesive used for attaching approved insulations to concrete, cellular lightweight insulating concrete, gypsum or cementitious wood fiber decks.

2. PLIODECK® – A one part urethane low-rise adhesive. Used for attaching approved insulations to concrete, cellular lightweight insulating concrete, gypsum or cementitious wood fiber decks.

3. OlyBond™ - A dual-component, low-rise, reaction-cure, polyurethane foam spray adhesive system. Used for attaching approved insulations to concrete, cellular lightweight insulating concrete, gypsum or cementitious wood fiber decks.

4. Insulation adhesives are alternative methods of attachment of insulation to various deck types and for multi-layers of insulation. Contact Mule-Hide's Customer Service Department for acceptable uses.

2.05 Precautions

A. Consult Material Safety Data Sheets and container labels for specific safety instructions prior to use.

B. Avoid breathing vapors of solvent, sealant and adhesives. Use with adequate ventilation. Avoid prolonged contact of solvents, sealants and adhesives with skin.

C. Do not use Mule-Hide PVC roofing products near fire or flame.

D. Do not use open flames for drying of surfaces, sealants, or adhesives.

E. Do not use oil-based paint on Mule-Hide’s PVC Coated Metal or membrane. Contact Mule-Hide's Customer Service Department for recommendations.

F. Do not allow muriatic acid (masonry cleaner) to come in direct contact with the Mule-Hide PVC Membrane or accessory products.

PART 3 - EXECUTION

3.01 General

When installing a Fully Adhered Mule-Hide Reinforced PVC Membrane Roofing System in cooler weather, it is recommended that liquids such as solvents, sealants, etc., be stored at temperatures between 60°F and 80°F until just prior to use in order to facilitate the installation. Liquid products, if stored outdoors, should be brought up to room temperature prior to use.

3.02 Substrate Conditions

The following general conditions apply to the substrate that will receive a Fully Adhered Mule-Hide PVC Membrane Roofing system for both reroof and new construction:

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 imperative that the roofing contractor make test cuts at each roof area prior to reroofing. The condition of the substrate must be suitable to receive a Fully Adhered Mule-Hide PVC Membrane Roofing System. Wet insulation must be removed and replaced. See Single-Ply Roofing Institute's guidelines for determining wet insulation.

C. A determination must be made regarding the presence or absence of coal tar pitch within the existing roof assembly. The presence of coal tar pitch requires a separation layer of insulation a minimum of 1-1/2" thick, having a minimum "R" value of 5.0 if the coal tar pitch is 10 years or older. All joints must be butted tightly together or have joints completely taped to prevent volatiles from damaging roof membrane. If the existing assembly is less than 10 years old, specific procedures must be followed. Contact the Mule-Hide Customer Service Department for specific requirements.

D. Contact Mule-Hide Customer Service Department when the substrate is exposed to excessively high humidity and/or a corrosive environment. Special fasteners (i.e., stainless steel) or details may be required.

E. It is acceptable to install a Fully Adhered Mule-Hide PVC Membrane Roofing System over the following deck substrates in new construction, provided that an acceptable insulation or barrier board is installed over the substrate as needed:

1. Structural Metal Deck (24-gauge minimum) shall conform to recommendations outlined in Factory Mutual's Loss Prevention Data Sheet 1-28. Pullout tests are required on all decks less than 22 gauge. An insulation or barrier board is required to provide a smooth surface and shall be of sufficient thickness to span steel flutes without damage by traffic.

2. Plywood should conform to Factory Mutual's requirements should tested (for uplift) assemblies be required. For non-FM assemblies, plywood minimum thickness shall be determined by local code requirements but shall not be less than 15/32" thick. Contact Mule-Hide for maximum membrane sheet widths, fastener sizes and spacing when using plywood, as requirements will change with thickness used. Insulation or cover/barrier board may be required under the membrane.

3. Structural concrete and pre-cast, pre-stressed concrete (3,000 psi minimum) shall be cured and dry to industry standards. Surfaces shall be smooth and free of moisture or frost. All sharp ridges or other projections above the surface shall be removed before roofing. Insulation or cover/barrier board may be required under the membrane.

4. Lightweight Insulating Concrete Fill and Metal Formwork (minimum 24-gauge metal formwork) – 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 Fully Adhered Mule-Hide PVC Membrane Roofing System after pull-out tests have been completed and appropriate fasteners have been selected. Insulation or a cover/barrier board is required under the membrane.

5. Wood plank (1" minimum) shall conform to Factory Mutual's requirements for Class I impregnated decks. Insulation or cover/barrier board may be required under the membrane.

6. Cementitious Wood Fiber Decks - Certain cementitious wood fiber decks may be acceptable to receive a Mule-Hide Fully Adhered Roofing System after pull-out tests have been completed and appropriate fasteners have been selected. Insulation or cover/barrier board is required under the membrane.

7. Gypsum Concrete Deck - shall be cured and dry to manufacturer's and/or industry standards. The surface of the deck shall be smooth and free from ridges and depressions. These decks may be acceptable to receive a Fully Adhered Mule-Hide PVC Membrane Roofing System after pull-out tests have been completed and appropriate fasteners have been selected. Insulation or cover/barrier board may be required under the membrane.

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.

3.03 Preparation of Existing Substrate

A. General

1. To prevent delays or interruptions, coordinate work with other trades or suppliers to ensure that components to be incorporated into the Fully Adhered Mule-Hide PVC 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 PVC Roofing System application. Do not permit voids greater than 1/4" width 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.

2. Large blisters on existing roof systems shall be cut and patched to provide a reasonably level substrate surface.

3. Gravel over existing nailers must be totally removed prior to installing new nailers and flashings. Verify that the existing nailers are securely anchored to the roof decks.

4. When an additional thickness of insulation is being added, new nailers must be added to match the height of the new insulation. Nailers must be securely anchored to the roof deck per Section 3.05 of this specification.

5. All roof surfaces shall be free of ponded water, ice, or snow and drain properly. Drainage is the responsibility of the roofing contractor and designer/specifier.

6. Specifier and/or roofing contractor shall determine the condition of the existing roof deck and roofing. Areas with deteriorated decking or wet insulation or other materials shall have those affected materials removed and replaced.

7. When removing an existing roof during reroofing, remove only that amount of roofing and flashing that can be made watertight with new Mule-Hide PVC materials in a one-day period or prior to the onset of inclement weather.

3.04 Vapor Retarder Installation (where specified)

General

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, 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. Air barriers 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. The National Roofing Contractor's 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.

Contact Mule-Hide Customer Service Department for questions regarding compatibility with Mule-Hide products.

3.05 Wood Nailers

A. Install nailers at the perimeter of the roof and around all roof penetrations and projections (unless otherwise shown on Mule-Hide standard details).

B. Nailers shall be firmly anchored to the decks at a maximum 2'-0" o.c. 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.

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.

3.06 Insulation Installation

A. Mule-Hide accepted roof insulations shall be installed in accordance with Mule-Hide specifications or the insulation manufacturer's current published specifications and recommendations (whichever is more stringent) for use with Fully Adhered Single-Ply Roof Systems.

1. Mule-Hide accepted roof insulations, as a minimum requirement, shall be attached per the current Factory Mutual Approval Guide, utilizing Mule-Hide fasteners, approved low-rise foam adhesive or hot asphalt and with tight joints in parallel courses with end joints staggered. 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 staggered. The appropriate method of attachment is determined by the project requirements and deck type.

2. If the first layer is mechanically attached and succeeding layers are adhered, the first layer must be at a thickness and attached at a fastener rate and pattern equivalent to the that required to meet the uplift requirements for the project.

3. All roof insulation shall be neatly cut to fit around all penetrations and projections with a maximum allowable gap of 1/4".

4. Open joints greater than 1/4" wide shall be repaired with like insulation material.

5. Insulation shall be feathered or tapered to provide a sump area a minimum of 36" x 36" where possible at all drains.

6. Install no more roof insulation in one day than can be covered with the Mule-Hide PVC 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 or maintenance traffic.

8. Tapered insulation shall be installed in accordance with tapered fabricator's shop drawings.

B. Mechanical Attachment

1. All insulation boards must be mechanically attached to "standard" decks unless specifically accepted for hot asphalt or adhesive securement for the particular application by Mule-Hide Products Co. and the insulation manufacturer.

2. "Standard" decks shall be defined as 22-gauge or heavier steel decks, poured structural concrete 3000 psi or greater, 5/8" or greater plywood, and 1" minimum wood plank. Other deck types may be accepted by Mule-Hide for mechanical attachment of insulation in certain, specific applications. Contact the Mule-Hide Customer Service Department in these cases.

3. All insulation must be secured to the structural deck with approved fasteners at rates published by the insulation manufacturer and recommendations published by Factory Mutual Research Corp. for fully adhered applications as a minimum standard. An approved low-rise foam adhesive may be an acceptable alternate for certain deck types.

4. Contact Mule-Hide for specific fastening patterns and quantities for uplift compliance and for those projects where FM approved assemblies are requested. FM 1-90 or greater compliance may require the installation of additional membrane attachment in the perimeter and corner areas. This should be determined for each specific project.

C. Hot Asphalt Attachment

1. In some applications Mule-Hide may permit the use of ASTM D 312, Type III, steep asphalt, to attach roof insulation to structural concrete or base sheets. The insulation manufacturer must recommend and approve the application in writing for Mule-Hide's consideration. Mule-Hide Products Co. will not accept the use of hot asphalt for insulation attachment without Mule-Hide's prior written approval.

2. Insulation must be attached in accordance with the guidelines established by the Factory Mutual Research Corp., National Roofing Contractors Association, and specific insulation manufacturer's requirements as minimums.

3. The proposed insulation board must be accepted by Mule-Hide's Warranty Department for use with the Fully Adhered Mule-Hide PVC Membrane Roofing System and must be approved by the insulation manufacturer for hot asphalt attachment.

   a. Maximum insulation board size for hot asphalt attachment shall be 4' x 4'. All concrete decks must be primed prior to installing the insulation. The insulation board must be set in a solid mopping of asphalt and "stepped in" to ensure maximum adhesion. Do not slide the roof insulation into the hot asphalt. **Spot-, sprinkle- or strip-mopping is not acceptable.**

   b. Care must be taken to prevent excess asphalt from seeping out at the insulation joints when the boards are "stepped in". If the asphalt should seep out at the joints, aluminum tape must be applied over the asphalt to completely separate the asphalt from the Mule-Hide PVC Membrane.

4. Mule-Hide will not accept hot asphalt attachment of insulation on slopes greater than 1": 12" without Mule-Hide's prior written approval. Hot asphalt is not acceptable for use to attach insulation direct to a steel or cementitious wood fiber deck.

D. High Humidity Applications

1. Certain high humidity applications will require the use of a vapor retarder. It is the sole responsibility of the design professional to determine the type and location of the vapor retarder in the roofing system.

E. Lightweight Cementitious Decks

1. Certified fastener pull-out tests must be performed by the fastener manufacturer and test results submitted to the Mule-Hide Customer Service Department for evaluation. Mule-Hide's acceptance or non-acceptance of a particular project will be based on actual project conditions and fastener pull-out test results.

3.07 Membrane Installation

The surface of the insulation must be inspected prior to the application of the Mule-Hide PVC membrane to verify that the surface is clean, smooth, free of contaminants or delaminated insulation facers, and that all fasteners are properly installed.

A. General - Unroll Mule-Hide sheet roofing and position without stretching the membrane. Allow the membrane to relax at least 15 minutes when the temperature is above 60°F, or 30 minutes when the temperature is below 60°F, prior to installation. Inspect and remove any damaged membrane. Lap sheets a minimum of 3" to allow for a minimum 1-1/2" continuous weld area. Membrane overlaps shall be shingled or run parallel with the flow of water. **Backwater seams are not permitted.**

1. The Fully Adhered Mule-Hide PVC Membrane must be mechanically secured at roof edges, parapet walls, curbs, penetrations and all valleys, peaks and slope intersections where the net change in slope exceeds 1-1/2" in 12". Contact Mule-Hide's Customer Service Department for specific recommendations.

B. Mule-Hide PVC Bonding Adhesive

1. After carefully positioning several sheets of the PVC membrane, one-half of the first sheet's length shall be folded back to expose the substrate and the bottom side of the sheet. Apply the adhesive to the exposed substrate and to the back side of the PVC membrane using a solvent resistant medium nap roller ensuring 100% coverage of the surface to be bonded. The application must be uniform with no globs or puddles. The adhesive shall be applied at a finished (both surfaces) rate of 60 sf per gallon. This equates to applying the adhesive to each surface at a rate of 120 sf per gallon. This is an approximate coverage rate and may vary depending on the type of substrate (porosity of surface) and climatic conditions.

2. When the adhesive on the membrane has dried sufficiently to be tacky but not produce adhesive legs or strings with a light touch of a dry finger, the coated membrane shall be rolled onto the previously coated substrate in such a manner as to eliminate wrinkles and trapped air. If the adhesive on either surface has dried excessively, then the surface in question must be recoated with adhesive. The adhesive must show complete transfer between the substrate and membrane surfaces when peeled back as evidenced by adhesive legs and strings.

3. After the adhesive coated substrate and membrane surfaces have been mated, the bonded surface must be rolled or broomed to promote 100% adhesion. The remaining unadhered half of the first sheet shall be folded back and the adhering procedure repeated. On each succeeding sheet of PVC Membrane, sheet alignment, adhesive application, adhering and rolling procedures shall be repeated. **Do not apply adhesive to seam areas that will be hot air welded.**

C. Application Precautions

1. No adhesive shall be applied to lap areas that are to be welded. All sheets shall be aligned to provide adequate lap area as required by welding techniques.

2. Adhesive coverage rates can vary dramatically depending on the particular substrate and environmental conditions. Coverage rates stated herein are approximate only.

3. Adhesive "open time" will vary dramatically depending on the particular substrate and environmental conditions.

3.08 Welding of Lap Areas

A. General

1. All laps/seams shall be hot air welded.

2. All surfaces to be welded shall be clean and dry. No adhesive shall be present within the lap areas.

B. Hot-air Welding

1. Machines for hot air welding are available from several different sources. Each welder manufacturer's instructions for use shall be followed, as well as all local codes regarding electric grounding, supply and other related functions. Since most automatic welding machines require 218 to 230 volts, the use of a portable generator on the roof is recommended for greater flexibility. Consult the welding machine manufacturer for minimum requirements on the appropriate size of a portable generator. **Mule-Hide requires the use of automatic welding machines for all field seams where possible. Only those areas that cannot be completed with an automatic welder may be welded with a hand welder. The seam width must be as wide as one created with an automatic welder (approximately 1-1/2” wide).**

2. Hand-held welding machines are also available to weld membrane but should only be used where an automatic welded cannot be used (such as but not limited to flashings, vertical or steep sloped seams or areas where an automatic welded cannot be used). After the preheated nozzle tip is applied in the overlap area and the material starts to flow, immediately follow with a hand roller to press the heated membrane surfaces together with slow, even movements. Keep the roller within one inch of the nozzle tip. Angle the hot-air tool so that the flowing air faces the roller. The temperature of the hot-air tool shall be adjusted so that a minimum of smoke is developed and material from the bottom of the sheet begins to soften and flow from the seam. Seam strength may be tested when cool. For best results, testing seams 8 hours after hot air welding is recommended.

3. The roofing contractor shall check all welded seams for continuity and integrity using a rounded screwdriver or other suitable blunt object. Sample test seams shall be made daily by the contractor. Prior to welding field seams, the contractor shall, using scrap material, run at least two test seams, each a minimum of 2' long. Each test seam shall be used to determine adequate seam strength and to ensure the equipment has warmed up and is operating properly. This should be done each time the equipment is turned on after a cool down period.

C. Quality Control of Seams

After heat welding, the seams are checked for integrity with a blunt-ended probe. Any openings or "fishmouths" are to be repaired with a hand-held hot-air tool fitted with a narrow nozzle tip and with a roller. Each day the contractor shall attempt to pull apart several sections of welded seams to test the quality of the welds. Should the welds be deficient, a more thorough examination of the work performed must be carried out and necessary repairs made. PVC Cut Edge Sealant is used to seal the membrane edges (after the seam is welded) where reinforcing fabric is cut and exposed.

3.09 Flashing Installation

A. PVC Coated Metal Flashing

1. Mule-Hide’s PVC Coated Metal Flashing shall be installed in accordance with Mule-Hide Roofing Systems' standard details.

2. Complete all metalwork concurrently with roofing and flashings so that a watertight condition exists daily.

3. PVC Coated Metal may be used at all peaks, valleys and slope intersections where the net change in slope exceeds 1-1/2" in 12". In some cases, reinforced membrane may be sufficient for ridges, but should be fastened securely at all transition areas. Contact the Mule-Hide Customer Service Department for specific recommendations.

4. PVC Coated Metal shall be installed to provide adequate resistance to bending and to allow for normal thermal expansion and contraction.

5. All metal joints are to be watertight and staggered over nailer joints to prevent joints in nailers and joints in metal from lining up.

6. Base flashings shall extend a minimum of 8" up vertical surfaces where possible.

7. All metal flashings and terminations shall be securely fastened in the plane of the roof deck with fasteners recommended by Mule-Hide.

8. Fasteners used to secure flashings to wood nailers shall be stainless steel, galvanized metal or other corrosion-resistant material, with a head diameter of not less than 3/8", and with fastener penetration into the wood nailer of at least 3/4".

9. Scuppers and metal overflows are to be assembled using Mule-Hide's PVC Coated Metal.

10. All PVC Coated Metal shall be fabricated to form hemmed edges to prevent sharp metal edges from cutting the membrane, except when used in conjunction with wood nailers.

B. PVC Membrane Flashings

1. All membrane flashings are to be installed concurrently with the roof membrane as the job progresses. Temporary flashings are not allowed without prior written approval from the Mule-Hide Customer Service Department. Should any water penetrate the new roofing because of incomplete flashings, the affected areas shall be removed and replaced at the contractor's expense.

2. All PVC Membrane flashings shall be fully adhered using Mule-Hide's PVC Bonding Adhesive. The following conditions must be met:

   a. All surfaces to be fully adhered should be compatible, dry and smooth with no excessive surface roughness. If an existing asphalt surface is present, a 1/2" minimum plywood, 9 oz. polyester felt, acceptable insulation board or 26-gauge minimum galvanized metal barrier must be placed over the asphaltic surface.

b. After the proper surface has been prepared and the membrane to be used as flashing has been cut to a workable length, Mule-Hide's PVC Bonding Adhesive shall be applied to the prepared substrate and back side of the flashing where it contacts the substrate. Apply the PVC Bonding Adhesive using a minimum 1/2" nap paint roller at a finished rate of approximately 60 sf per gallon. This equates to 120 sf per gallon applied to each surface. **Coverage rate may vary depending on the type of substrate and climatic conditions.** Apply adhesive in smooth even coats, avoiding globs, puddles or other types of irregularities. **Do not apply adhesive to seam areas that will be hot air welded.**

c. Let adhesive dry sufficiently to be tacky but not produce strings when touched with a dry, clean finger. Carefully mate the flashing to the coated substrate.

d. Avoid wrinkling the flashing when applying to substrate. After mating membrane to the substrate, carefully roll the membrane with a 2" wide rubber hand roller to promote maximum positive contact between the membrane and the substrate. Overlap all adjacent flashing sheets a minimum of 2". The PVC Membrane flashings shall extend a minimum of 6" onto the field sheet. There shall be a minimum 1-1/2" hot-air weld in front of the fastener plates. All side laps are to overlap a minimum of 2" and welds shall be 1-1/2" wide.

3. All flashings shall extend a minimum of 8" above roof membrane level where possible unless previously accepted by the Owner or his representative and the Mule-Hide Warranty Department.

4. All flashings shall be hot air welded at their connections with the roofing membrane and other PVC flashings.

5. Apply PVC Cut Edge Sealant at all welded edges.

6. All flashings shall be properly terminated according to Mule-Hide's published Standard Details.

3.10 Walkway Installation

Walkways must be provided in areas where routine rooftop maintenance occurs and in areas where regular rooftop traffic is expected.

A. Mule-Hide PVC Walkway Roll Installation

1. Install PVC Walkway Rolls over clean, dry surfaces.

2. Layout areas where PVC Walkway material is to be installed with most of the material being oriented so that it is placed between field seams in maximum lengths of 30 feet with each adjacent and abutting section gapped a minimum of 6".

3. Heat weld the perimeter of the properly positioned PVC Walkway material. Check seams for any voids or inconsistencies that might prevent watertightness.

4. Apply PVC Cut Edge Sealant at all welded edges.

5. PVC walkways should be installed at all traffic concentration points (such as but not limited to hatches, access doors, rooftop ladders, equipment service panels) and regular maintenance paths used to access service areas.

B. Precast Pavers

1. Install precast paver systems acceptable to Mule-Hide over one layer of a Polyester Mat Protection Material or other acceptable slip sheet material.

2. A sheet of PVC membrane may be used as a protection layer under the precast pavers.

3. Set precast pavers so that they do not cover field seams.

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. Straighten the insulation line using pieces of insulation loosely laid, and seal the Mule-Hide sheet membrane to the deck or existing membrane. Use a heavy application of roof cement or hot asphalt at least six inches in width overlayed with an embedded reinforcement. Remove the temporary seals completely when work resumes, cutting out and removing the contaminated PVC membrane. Remove all sealant, contaminated membrane, insulation fillers, etc., from the work area and properly dispose off-site.

B. Other methods of temporary tie-ins may be used. Mule-Hide does not recommend a specific method. This is the 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 or check the Mule-Hide website (www.mulehide.com) for the latest updates regarding changes or modifications to this specification.

MULE-HIDE PRODUCTS CO., INC
Fully Adhered Roofing System
SUMMARY SPECIFICATION

PVC Systems

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

Part 1 General

1.01 Description

The Mule-Hide Fully Adhered Reinforced PVC Roofing System utilizes a (maximum) 81" wide, scrim reinforced Mule-Hide PVC membrane in thickness of 50, 60, or 80 mil. Approved insulation is attached to the substrate with either Mule-Hide Insulation fasteners and plates or an approved insulation adhesive, and the PVC membrane is bonded to the insulation with PVC Bonding Adhesive. The adjoining sheets are overlapped approximately 2" and seamed together with a min 1.5" wide heat weld.

1.02 Quality Assurance

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

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

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

1.03 Submittals

A. To ensure compliance with Mule-Hide's warranty requirements contact the Mule-Hide Warranty Department if any of the following conditions exist.
   1. Specified wind speed warranty greater than 55 MPH.
   2. Building height > 200'
   3. Projects located in coastal or high wind zones.
   4. Pressurized buildings
   5. Cold Storage or Freezer Buildings
   6. Membrane exposed to chemicals

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

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

1.04 Product Delivery, Storage, and Handling

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

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

1.05 Job Conditions

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

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

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

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

1.06 Warranty.

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

Part 2 Products

2.01 General

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

2.02 Membrane

Mule-Hide White reinforced 50, 60, or 80-mil thick Polyvinyl Chloride (PVC) membrane is used for this system. The membrane is available in of widths of 40.5" and 81" and in lengths up to 100' (White membrane). Refer to our Product Data Sheet for physical properties and other information.

2.03 Related Materials

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

Part 3 Execution

3.01 General

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

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

3.02 Roof Deck Criteria

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

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

3.03 Substrate Preparation

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

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

3.04 Installation

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

A. Insulation Attachment

Attach roof insulation with Manufacturer supplied roofing fasteners and plates. Attachment rates and insulation requirements will vary depending upon substrate and desired wind uplift. Consult Mule-Hide Warranty Department for attachment requirements.

B. Membrane Installation and Hot Air Welding

Place membrane over substrate with minimum 2" overlap at lap seams and positioned so that laps will shed water. Allow membrane to relax. After membrane has relaxed, fold membrane back so that half of the underside is exposed. Apply PVC Bonding Adhesive as per manufacturer's instructions. Fold back the unbonding half of membrane and repeat bonding procedure. Hot-air weld seams with automatic welder to achieve a min 1.5" wide heat weld.

C. Additional Membrane Securement

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

D. Membrane Flashing

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

E. Other Related Work

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

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

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

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

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