

System Specifications

"The name trusted in roofing since 1906"



FULLY ADHERED PVC FLEECE BACK & PVC KEE HP FLEECE BACK PLUS

07 54 00/MUL

Revision Date: Sept 2021

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FULLY ADHERED PVC FLEECE BACK & PVC KEE HP FLEECE BACK SPECIFICATION

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PART 1 - GENERAL

1.01 Description

A. Scope:

1. Furnish and install a Mule-Hide Fully Adhered Mule-Hide PVC Fleece Back or PVC KEE HP Fleece Back Roofing Membrane with flashings and accessories necessary to comprise a roofing system. The Mule-Hide PVC products and accessories shall be installed in strict compliance with current specifications and drawings as published by Mule-Hide Products Co., Inc. ("Mule-Hide").
2. The Mule-Hide Fully Adhered PVC (Polyvinyl Chloride) Fleece Back Membrane Roof System utilizes a 50-mil (.050 inch), 60-mil (.060 inch) or 80-mil (.080 inch) thick reinforced membrane laminated to a 0.055" thick non-woven polyester fleece backing for a total sheet thickness of either 105 mils, 115 mils, or 135 mils. The PVC Fleece Back membrane is fully adhered to the substrate with HydroBond adhesive or Helix® Max Low Rise Adhesive.
3. The Mule-Hide Fully Adhered PVC KEE HP Fleece Back Membrane Roof System utilizes a 50-mil (.050 inch), 60-mil (.060 inch) or 80-mil (.080 inch) thick reinforced membrane laminated to a 0.055" thick non-woven polyester fleece backing for a total sheet thickness of either 105 mils, 115 mils, or 135 mils. The PVC KEE HP Fleece Back membrane is fully adhered to the substrate with Helix® Max Low Rise Adhesive.
4. With both PVC Fleece Back and PVC KEE HP Fleece Back membranes, adjoining sheets are overlapped a minimum of 3 inches and welded with a robotic welder. End laps are butted together and stripped in with standard reinforced PVC or PVC KEE HP membrane. Note: All membrane thicknesses listed in this specification are nominal thicknesses.

B. Related Work:

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

1. Vapor Retarder (where specified)
2. Wood Blocking (nailers)
3. Insulation
4. Slip Sheet (where required)
5. Fasteners
6. Roof Membrane
7. Roof Membrane Flashings
8. Metal Flashings
9. Adhesives
10. Sealants
11. Walkways

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

C. General Design Considerations

1. It is the responsibility of the specifier to review local, state and regional codes to determine their impact on the specified Mule-Hide Roofing System.

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2. It is the responsibility of the building owner or his/her designated representative to verify structural load limitation. In addition, a core cut may be taken to verify weight of existing components when the roofing system is to be specified on an existing facility.
3. On new construction projects, especially in cold climate regions, moisture generated due to the construction process could adversely impact various components within the roofing assembly if not addressed. Refer to SPRI Advisory Bulletin included in the Design Reference DR-03-11 "Construction Generated Moisture".
4. Drainage must be evaluated by the specifier in accordance with all applicable codes. Slopes may be provided by tapering the structure or through the use of tapered insulation; a sufficient number of roof drains should also be specified and properly located to allow for positive drainage. Significant ponding that could remain after 48 hours should be eliminated with the addition of auxiliary drains in low areas where ponding is anticipated.
5. Mule-Hide specifically disclaims responsibility for the design and selection of an adequate drainage system and drain accessories. Selection must be made by the building owner or the owner's design professional.
6. Small incidental areas of ponded water will not impact the performance of this roofing system; however, in accordance with industry standards, the roofing assembly should be designed to prevent ponding of water on the roof for prolonged periods (longer than 48 hours). Good roofing practice dictates proper drainage to prevent possible excessive live load and, in the event of a roof leak, to minimize potential interior damage to the roofing assembly and to the interior of the building.
7. The removal of existing wet insulation and membrane must be specified. The specifier shall select an appropriate and compatible material as filler for voids created by removal of old insulation or membrane.
8. Regardless of the type of membrane or assembly selected, any loose flashings at the perimeter, roof drains and roof penetrations must be removed.

1.02 Quality Assurance

- A. The Mule-Hide PVC Fleece Back or PVC KEE HP Fleece Back Membrane Roofing System shall be installed by an independent roofing contractor eligible (Warranty Eligible) to apply for Mule-Hide system warranties when System Warranties are requested.
- B. There shall be no deviations from this specification or the Mule-Hide Products Co., Inc. ("Mule-Hide") standard details without prior written approval from Mule-Hide's Warranty Department.
- C. Upon completion of the installation according to the terms and conditions stated in this specification and in accordance to the information given in the Warranty Application and Pre-Job Survey Form and any additional approvals which might have been given by Mule-Hide, an authorized representative of Mule-Hide shall perform an on-site inspection of the roof (commercial projects only) to verify that all installation and material requirements have been met.

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

- D. Mule-Hide reserves the right to reject any roof system and refuse to issue any warranty on roofs which do not comply with Mule-Hide's specifications or current policies.

1.03 Submittals

- A. Prior to the time of bidding, the roofing contractor shall submit to the owner or owner's representative the following items:
 1. Copies of Mule-Hide specifications and published Product Data Sheets.
 2. Samples of each material to be used in the roof system.

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3. Specimen copy of Mule-Hide Products Co., Inc. warranty
4. Dimensioned shop drawings to include an outline of the roof and appropriate details for flashings and terminations.
5. Certification from insulation, roofing and accessory components manufacturers that all materials supplied comply with identified ASTM and industry standards.
6. Verification that system specifications meet all identified code and insurance requirements including but not limited to the following:
 - a. Factory Mutual Research Laboratories
Norwood, MA
 - b. Underwriters Laboratories
Northbrook, IL

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

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

1.04 Product Delivery, Storage and Handling

- A. All products delivered to the job site shall be in their original unopened containers or wrappings and clearly labeled with the manufacturer's name, product identification and date of manufacture.
- B. Protect all materials from damage during transit, storage and delivery to the job site. Place all materials on pallets and protect from moisture.
- C. Store all materials in a dry, clean area protected from the elements. All rolls of membrane shall be stored flat on pallets.
- D. All adhesive and caulking shall be stored at temperatures between 60°F and 80°F. Materials exposed to lower temperatures affect the workability and performance of the product. Products shall be restored to the above temperature prior to use.
- E. All flammable materials shall be stored in a cool, dry area away from open flames and sparks. Follow precautions outlined on containers or supplied by the material manufacturer/supplier.
- F. All materials determined as being damaged (confirmed by Mule-Hide) due to improper storage on the job site are to be replaced with new materials.

1.05 Job Conditions

- A. This specification shall not be considered applicable without the appropriate additional specifications approved by Mule-Hide if it should be determined that any of the following conditions exist:
 1. The installation of any Mule-Hide Roof System is in a coastal area or high wind zone.

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2. If the Mule-Hide Roof System should exceed the structural load conditions as determined by an architect or engineer.
3. When chemical or hazardous materials are discharged onto the Mule-Hide Roof System.
- B. Mule-Hide PVC roofing materials may be installed in temperatures below 40°F but only after consultation with the Mule-Hide Technical Department as special precautions or procedures may be necessary. The performance of the materials, installation costs and production rates may be affected.
- C. The General Contractor or the building owner shall be responsible for providing adequate surfaces and structures to receive the insulation, Mule-Hide Roof System and related sheet metal necessary for the successful completion of the project.
- D. Only as much new roofing as can be made watertight shall be installed each day. This includes all flashing work.
- E. All substrates to receive new insulation, membrane or flashing shall be thoroughly dry. Should surface moisture occur, the contractor shall provide adequate equipment to dry the substrate prior to application of new materials.
- 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 Fully Adhered PVC Fleece Back or PVC KEE HP Fleece Back 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 securing of temporary construction, materials and equipment.
- I. The contractor shall verify and ensure that all roof drain lines are unblocked before starting work. Any blockages found shall be reported to the owner's representative and Mule-Hide's Technical Department in writing.
- J. Temporary waterstops shall be installed at the end of each day's work. Temporary waterstops shall be removed at the start of the next day's work and disposed of properly. Waterstops shall be compatible with all materials.
- K. Do not install the Mule-Hide PVC or PVC KEE HP Roofing Membrane in direct contact with any product containing asphalt, coal tar pitch, creosote or penta-based materials. Consult the Mule-Hide Technical Department for special installation requirements.
- L. Do not allow contaminants such as petroleum, grease, acid, solvents, vegetable or mineral oil, animal oil, animal fat, etc. or direct steam venting to come into direct contact with the Mule-Hide PVC Roofing Membrane. Contact the Mule-Hide Technical 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.

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- 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 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.
- R. Vapor Retarders
1. Mule-Hide does not require a vapor retarder for the protection of the membrane; however, it should be considered by the specifier for the protection of the roofing assembly (i.e. primarily insulation, underlayment and adhesives). The following criteria should be considered by the specifier:
 - a. Use of a vapor retarder to protect insulation and reduce moisture accumulation within an insulated roofing assembly, should be investigated by the specifier. Consult latest publications by ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.), NRCA (National Roofing Contractors Association), local building and energy codes for specific information.
 - b. In the generally temperate climate of the United States, during the winter months, water vapor flows upward from a heated, more humid interior toward a colder, drier exterior. Vapor retarders are more commonly required in northern climates than in southern regions, where downward vapor pressure may be expected and the roofing membrane itself becomes the vapor retarder.
 - c. On cold storage/freezer facilities, the perimeter and penetration details must be selected to provide an air seal and prevent outside air from infiltrating and condensing within the roofing assembly.
 2. When a vapor retarder is specified, Mule-Hide F5 Air & Vapor Barrier may be used. Refer to the 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 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.
- U. Both interior and exterior building areas affected by construction shall be cleaned up and any damaged areas shall be repaired to the owner's satisfaction.
- V. Certain project conditions may require modifications to this specification. Contact the Mule-Hide Warranty 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 D as determined in ANSI A58.1.

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- W. When using heat-welding equipment, always review the equipment manufacturer's instructions, precautions and warnings.
- X. Consideration should be given in the project design to problems that can precipitate from the smooth surface characteristic of the Mule-Hide Reinforced PVC or PVC KEE HP membrane

1.06 Warranties

All Mule-Hide warranties are available for commercial projects, term limits range from 10 to 30-years, and subject to enhancements as required such as membrane thicknesses. A Roofing Membrane Limited Warranty for a maximum of 20 years is available for residential projects

A. Mule-Hide's Roofing Membrane Limited Warranty For Commercial Projects

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

B. Mule-Hide's Standard System Warranty

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

C. Mule-Hide Premium System Warranty

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

Warranty Table I

Fleece Back Adhered Systems Warranty Options							
Warranty Term	Minimum Membrane Thickness	Warranty Wind Speed			Hail Coverage*		
		55, 72 or 80 mph	90 or 100 mph	110 or 120 mph	1" Dia. Hail	2" Dia. Hail	3" Dia. Hail
10 or 15-year	Fleece Back PVC 115	√	√	√	N/A	N/A	N/A
10, or 15-year	Fleece Back PVC KEE 105-mil	√	√	√	√	√	N/A
20-year	Fleece Back PVC 115	√	√	√	N/A	N/A	N/A
20-year	Fleece Back PVC KEE 105-mil	√	√	√	√	√	√
25-year	Fleece Back PVC 135-mil	√	√	√	N/A	N/A	N/A
25-year	Fleece Back PVC KEE 115-mil	√	√	√	√	√	√

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30-year	Fleece Back PVC KEE 135-mil	√	√	√	√	√	√
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*See Technical Data Bulletin for specific requirements for coverages

Warranty Table II

Insulation/Cover Board & Required Attachment for Assemblies Up to 20-Year Warranty Term					
Peak Gust Wind Speed Warranty ⁹	Minimum Membrane Underlayment (Mule-Hide Supplied Only) ⁹	Insulation/Underlayment Attachment ⁹			Metal Edging
		# of Fasteners per 4' x 8' board size ¹	Adhesive Ribbon Spacing for 4' x 4' size board		
			Field	Perimeter/Corner	
55 MPH	1" (20 psi) Poly ISO 1 or 2	16, 24, 32	12" ^{4,5}	6" ⁴	Mule-Hide Gravel Stop, Skirted Drip Edge, 2-Piece Snap-On Compression, 1-3/4" Fascia Cover ³
	1-1/2" (20-psi) Poly ISO 1 or 2	12, 18, 24	12" ^{4,5}	6" ⁴	
	2" (20 -psi) Poly ISO 1 or 2	8, 12, 16	12" ^{4,5}	6" ⁴	
72 OR 80 MPH	1/4" Dens-Deck ²	12, 18, 24	12" ^{4,6}	6" ^{4,6}	Mule-Hide Gravel Stop ³ , Skirted Drip Edge ³ , 2-Piece Snap-On Compression ³ , 1-3/4" Fascia Cover ³
	1/4" Securock ²				
	1/2" STRUCTODEK ²	16, 24, 32	6" ^{4,6}	6" ^{4,6}	
	1/2" Poly ISO 1 or 2-HD ²				
	1-1/2" (20-psi) Poly ISO 1 or 2				
2" (20 -psi) Poly ISO 1 or 2	8, 12, 16	6" ^{4,5,6}	6" ^{4,5,6}		
90 MPH	1/2" Dens-Deck (2)	12, 18, 24	6" ^{6,7,8}	6" ^{6,7,8}	Mule-Hide Gravel Stop ³ , Skirted Drip Edge ³ , 2-Piece Snap-On Compression ³ , 1-3/4" Fascia Cover ³
	1/2" Securock (2)				
	1/2" Poly ISO 1 or 2-HD (2)	24, 32, 32	6" ^{6,7,8}	6" ^{6,7,8}	
	1-1/2" Hunter CGF Poly ISO (20 psi)	16, 24, 32	6" ^{5,6,7,8}	6" ^{5,6,7,8}	
	2" Hunter CGF Poly ISO (20 psi)	8, 12, 16	6" ^{5,6,7,8}	6" ^{5,6,7,8}	
100 MPH	5/8" Dens Deck (2)	16, 24, 32	FS	FS	Mule-Hide Gravel Stop ³ , Skirted Drip Edge ³ , 2-Piece Snap-On Compression ³ , 1-3/4" Fascia Cover ³
	5/8" Securock (2)				
	2" Hunter CGF Poly ISO (20 psi)				
110 MPH	5/8" Dens Deck (2)	16, 24, 32	FS	FS	EclipsEdge ³
	5/8" Securock (2)				
120 MPH	5/8" Dens Deck (2)	24, 32, 32	FS	FS	EclipsEdge ³
	5/8" Securock (2)				

FS = Full Spray or Ribbons @ 4" OC

- Order of fasteners required are field, perimeter and corners.
- Cover boards must be installed over a min. 1" thick approved Mule-Hide Insulation.
- Mule-Hide #14HD or #15EHD fasteners are required for attachment to perimeter wood nailers.
- Gravel Surface BUR - Field @ 6" OC / Perimeter @ 4" OC
- Steel Decks - Field & Perimeter @ 6" OC Must adhere to top of deck flutes
- Cementitious Wood Fiber - Field @ 6" OC / Perimeter @ 4" OC
- Smooth BUR - Field @ 6" OC / Perimeter @ 4" OC
- Gravel Surface BUR – FS
- See Design Enhancements for term specific requirements.

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Warranty Table III

Insulation/Cover Board & Required Attachment for Assemblies with 25 or 30-Year Warranty Term					
Peak Gust Wind Speed Warranty	Minimum Membrane Underlayment	Insulation Attachment			Metal Edging
		# of Fasteners per 4' x 8' board size ⁶	Adhesive Ribbon Spacing for 4' x 4' size board		
			Field	Perimeter/Corner	
55 MPH	1-1/2" to 2-1/2" (25-psi) Poly ISO 1 or 2	16, 24, 32	6" ^{2,4}	6" ^{2,4}	Mule-Hide Gravel Stop, Skirted Drip Edge, 2-Piece Snap-On Compression, 1-3/4" Fascia Cover ³
	1/2" STRUCTODEK ¹				
	1/4" Dens-Deck ¹				
	1/4" Securock ¹				
72 or 80 MPH	1-1/2" to 2-1/2" Hunter CGF Poly ISO (25 psi)	16,24, 32	6" ^{2,4,5}	6" ^{4,5}	Mule-Hide Gravel Stop ³ , Skirted Drip Edge ³ , 2-Piece Snap-On Compression ³ , 1-3/4" Fascia Cover ³ .
	1/2" Dens-Deck ¹				
	1/2" Securock ¹				
90 or 100 MPH	1/2" Poly ISO (1 or 2)-HD ¹	16, 24, 32	FS	FS	EclipsEdge ³
	5/8" Dens Deck ¹				
	5/8" Securock ¹				

FS = Full Spray or Ribbons @ 4" OC

1. Hail coverage offered with substrate.
2. Structural Concrete - Field @ 12" OC / Perimeter @ 6" OC
3. Mule-Hide #14HD or #15EHD fasteners are required for attachment to perimeter wood nailers.
4. Cementitious Wood Fiber & Wood - FS
5. 80-mph over Gypsum Decks – FS
6. Order of fasteners required are field, perimeter and corners.

Warranty Table IV

Adhesive/Bead Spacing for Fleece Back Membrane Installation									
Peak Gust Wind Speed Warranty	Warranty Length in Years								
	5 to 15 years			20 years			25 years		
	Field	Perimeter	Corner	Field	Perimeter	Corner	Field	Perimeter	Corner
55 MPH	12"	6"	6"	6"	6"	6"	FS	FS	FS
72 MPH	6"	6"	FS	6"	FS	FS	FS	FS	FS
80 to 120 MPH	FS	FS	FS	FS	FS	FS	FS	FS	FS

FS = Full Spray or Ribbons @ 4" OC

Warranty Table V

Minimum Perimeter Width	
Building Height	Perimeter Width
0-25'	4 Feet
26'-49'	8 Feet
50'-74'	12 Feet
75'-100'	16 Feet
101' or greater	Contact Mule-Hide Technical Department

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- C. Mule-Hide is under no obligation to issue warranties on projects completed prior to submittal to the Mule-Hide Technical Department of a properly completed Warranty Application.
- E. Metal flashing products supplied by Mule-Hide (Mule-Hide Metal Accessories) and installed by a Mule-Hide Warranty Eligible Applicator will be covered under a Standard or Premium System warranty. The finish on the Mule-Hide labeled metal components are covered for a maximum warranty period for up to 25 years independent of the terms of the issued warranty (see the Mule-Hide 25 years Limited Metal Warranty for specific warranty coverage).
- F. Standard and Premium System warranties are not available for residential projects.
- G. PVC tie-ins are not covered by Mule-Hide warranties.
- H. Contact Mule-Hide Technical Department for other extended warranties that may be available.
- I. 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 Fleece Back or PVC KEE HP Fleece Back Membrane Roof System are to be products manufactured or supplied by Mule-Hide Products Co., Inc.
- B. Components other than those supplied or manufactured by Mule-Hide may be submitted for review and acceptance by Mule-Hide's Technical Department. Mule-Hide's acceptance of any other product is based on chemical compatibility and published performance data provided by the component manufacturer. Other components may be considered on a job-by-job basis and must be approved in writing by Mule-Hide's Technical Department. Mule-Hide offers no warranty or guarantee for the performance or suitability of any component not supplied or manufactured by Mule-Hide.

2.02 Roofing Membrane

The Mule-Hide Reinforced PVC Fleece Back Membrane is available in 115 mils and 135 mils total thickness. Mule-Hide PVC Fleece Back Membranes are manufactured using a state-of-the-art extrusion process that ensures complete scrim encapsulation. The PVC membrane is reinforced with a high-strength fiberglass scrim and is enhanced with a fleece backing, resulting in a very tough, durable and versatile sheet. The fiberglass reinforcement provides additional dimensional stability for the sheet, while the fleece backing enhances the sheets puncture resistance and acts as a built-in separation layer for rough or asphaltic surfaces. Meets or exceeds all requirements of ASTM D4434, Type III. Refer to the Product Data Sheets for physical properties and additional information.

The Mule-Hide Reinforced PVC KEE HP Fleece Back Membrane is available in 105 mils (FB-50), 115 mils (FB-60), and 135 mils (FB-80) total thickness. Mule-Hide PVC KEE HP Fleece Back Membrane is used in fully adhered roofing systems in new construction, reroofing and recover (retrofit) applications. The polyester fleece backing enhances the puncture resistance of the membrane, and can also serve as a built-in separation layer for rough surfaces or existing asphalt-based roofing systems. The system must be installed over acceptable roof insulation or other suitable substrate. Refer to the Product Data Sheets for physical properties and additional information.

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.

The Mule-Hide Reinforced PVC KEE HP Membrane is available 50 mils (.050-inch) thick, 60 mils (.060-inch) thick or 80 mils (.080-inch) thick. Mule-Hide PVC KEE HP (High Performance) Membrane is manufactured using DuPont® Elvaloy® resin modifier and provides outstanding thermal stability and flexibility, extended upper and lower temperature performance limits and enhanced chemical resistance. The physical properties of the membrane are enhanced by a tenacious, weft-inserted polyester fabric. Meets or exceeds all requirements of ASTM 4434, Type III and/or Type IV.

2.03 Accessory Materials

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

- A. Helix® Max Low-Rise Adhesive, Helix® Max Low-Rise Adhesive 5-Gallon Jug, Helix® Max Low-Rise Adhesive Dual Tank, and Helix® Max Low-Rise Adhesive Dual Cartridge (Helix Max Low-Rise Adhesive) are a two-component, low-rise, construction grade, polyurethane foam adhesive designed to adhere approved roof insulations, thermal barriers, cover boards and fleece backed single-ply membranes to acceptable substrates. This VOC, CFC, HCFC and solvent free adhesive is quickly and easily applied.
 - 1. Depending on the packaging and delivery option selected, these products can be installed in continuous beads, full spray, or splatter applications. Not all products have the same options so review of the product data sheets is required to ensure proper use.
- B. Helix® Low-Rise Adhesive is a two-component, low-rise, construction grade, polyurethane foam adhesive designed to adhere approved roof insulations, thermal barriers, or cover boards to acceptable substrates, and is available in multiple packaging options; 15 and 50 gallon drums, Dual Tanks, and Dual Cartridges.
- C. HydroBond™ Water-Based PVC Bonding Adhesive (HydroBond) Designed to bond PVC membranes to a clean, dry horizontal surface as a wet lay-in adhesive with slopes up to 2:12. HydroBond can be used with standard PVC, PVC Fleece Back and PVC KEE HP Fleece Back membranes. It cannot be used with standard PVC KEE HP membrane. This product can also be used as a contact adhesive for vertical applications, such as flashings. This water-based adhesive is specially formulated to be in compliance with the state of California Clean Air Act of 1988 (updated in 1997) and as further regulated by California's Air Quality Control Districts listing VOC limitations. This product also meets the requirements of the OTC Model Rule for Single Ply Roofing Adhesive.
- D. Low VOC PVC Bonding Adhesive – A high strength solvent-based contact adhesive that allows bonding of PVC membranes to various porous and non-porous substrates. It is specially formulated using a blend of VOC-exempt and non-exempt solvents to be in compliance with the state of California Clean Air Act of 1988 (updated in 1997) and as further regulated by California's Air Quality Control Districts listing VOC limitations. This product also meets the 50 gpl VOC content requirements of the OTC Model Rule for Single Ply Roofing Adhesive. This adhesive is to be used for flashings only and not to adhere the Fleece Back or PVC KEE HP Fleece Back membrane.
- E. AeroWeb Low-VOC Aerosol Contact Adhesive/Primer – A low VOC contact adhesive used to prime surfaces prior to the application of F5 Air & Vapor Retarder. It features a quick dry time and ease of application from the self-contained pressurized cylinder.
- F. Mule-Hide PVC Flashing - A non-reinforced, .080-inch thick material primarily used to seal details where field fabrication is necessary, such as drain details, pipe flashings, pitch pocket flashings, seaming joints of the Mule-Hide PVC Coated Metal, and any place where reinforced membrane is not practical.
- G. Mule-Hide PVC Universal Corners - .060-inch thick pre-molded, non-reinforced PVC material. They are uniform in shape and size and provide water tightness at corners formed by PVC Coated Metal and flashing membrane. They provide a neat, finished look to building corners, curbs and parapet flashings with no cutting or stretching required. Universal Corners are available in white only.

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- H. Mule-Hide PVC Outside Corners – Are pre-molded and are used for flashing outside corners on a variety of details. Installation is fast and easy with no cutting or stretching required. PVC Outside Corners are available in white, gray, and tan.
- I. Mule-Hide PVC Inside Corners – Are pre-molded and are used for flashing inside corners on a variety of details. Installation is fast and easy with no cutting or stretching required. PVC Inside Corners are available in white, gray, and tan.
- J. Mule-Hide PVC Membrane Cleaner – Used to clean aged PVC and PVC KEE HP membrane prior to the welding process. This cleaner helps to loosen and remove dirt and other contaminants from the surface of the PVC membranes and leaves a suitable surface for welding.
- K. Mule-Hide PVC Pipe Seal – An injection molded, pre-formed flashing for pipes made of Mule-Hide non-reinforced PVC material. They are designed to add ease to the installation process while offering increased watertight security and improved aesthetics. PVC Pipe Seals are designed as an economical flashing for single pipe penetrations on Mule-Hide PVC Membrane roof systems.
- L. PVC Split Pipe Seals – Are fabricated flashings made of 60-mil reinforced PVC membrane for pipes 1-inch to 6-inches in diameter. They are designed to add ease to the installation process while offering increased watertight security and improved aesthetics. The PVC Split Pipe Seals contains a split (cut) and overlap tab that allows the pipe-boot to be opened and wrapped around a round pipe with an obstruction. Such obstructions prevent the use of a standard pre-molded pipe boot.
- M. PVC Square Tubing Wraps – Are fabricated square penetration flashings made of white, gray or tan 60 mil reinforced PVC membrane. Overall height of the flashings is 11 inches. A split (cut) and overlap tab are incorporated into these parts to allow the flashings to be opened and wrapped around a square penetration with an obstruction.
- N. Mule-Hide PVC T-Joint Cover – 60-mil non-reinforced flashing cut into a 4.5" diameter circle used to seal step-offs at splice intersections. Installation is mandatory on all 60-mil and 80-mil PVC systems and on all jobs warranted longer than 15 years.
- O. Mule-Hide PVC Coated Metal – 24-gauge, galvanized steel laminated PVC 35 mils (.035" thick) of Mule-Hide non-reinforced PVC Membrane used for flashing and edge metal.
- P. Mule-Hide All-Purpose Bar ("A-P Bar") – An extruded aluminum bar, 50 mils (.050") thick, used to terminate adhered, reinforced membrane vertical flashings in certain constructions. Mule-Hide A-P Bar may also be used to anchor the field sheet at the base of vertical angle changes.
- Q. Membrane Fasteners and Plates – Mule-Hide offers a variety of membrane fasteners and plates to meet specific job conditions and substrates.
- R. Mule-Hide Thermoplastic One-Part Pourable Sealer – A one-component thermoplastic sealant for use in pitch pockets.
- S. Mule-Hide PVC Cut Edge Sealant – A solvent-based, liquid sealant used to seal the cut edge of the Mule-Hide PVC Membrane.
- T. Mule-Hide PVC Walkway Rolls – an 80 mil non-slip, diamond plate tread pattern of polyester reinforced PVC material that offers excellent tear and puncture resistance. Available in rolls (36" x 60'). Walkway Rolls are welded directly to the PVC roofing membrane. Walkway Rolls are available in gray. Mule-Hide specifications require the use of such a product in walkway concentration points (i.e., roof hatches, access doors, rooftop ladders, etc.) regardless of traffic frequency. Walkways must also be installed if regular maintenance (once a month or more) is necessary to service rooftop equipment.
- U. Mule-Hide Insulation - Mule-Hide Poly ISO polyisocyanurate insulation (flat or tapered) is a closed-cell polyisocyanurate foam core laminated to heavy, black (non-asphaltic) glass fiber reinforced felt facers.

- V. Mule-Hide HP Protective Mat – A nominal 6.0-ounce per square yard (140 grams per square meter) UV resistant polypropylene needle punched fabric. It can be used above the membrane as a slipsheet for protection from damage by materials placed on top of the membrane.
- W. F5 Air & Vapor Retarder – A 40-mil thick composite consisting of 35-mil self-adhering rubberized asphalt membrane laminated to a 5-mil UV resistant poly film with an anti-skid surface which is fully compatible with Helix Max Adhesive. A white poly film is available for summer time exposure and a black poly film is available for winter time exposure. F5 Air & Vapor Retarder can also function as a temporary roof for up to 120 days. Available in rolls 39" wide by 75' long (244 square feet).

2.04 Related Materials By Others

A. Wood Nailers

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

B. Insulation

- 1. Insulation shall be installed as a protection layer over the existing substrate or to obtain a desired thermal value.
- 2. Insulation shall be compatible with the Mule-Hide PVC Fleece Back or PVC KEE HP Fleece Back Membranes, Mule-Hide adhesives, Mule-Hide PVC flashings and other Mule-Hide accessories.
- 3. The following insulation boards are acceptable for use with a fully adhered roofing system when a standard warranty is requested:
 - a. Polyisocyanurate insulations having non-asphaltic facers (foil facers are not acceptable) 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 by insulation manufacturer to span steel deck flutes.
 - b. Poly ISO 1-HD is 1/2" thick, 100 psi high density polyisocyanurate insulation board that was specifically designed for use as a cover board. This product consists of a closed-cell polyisocyanurate foam core laminated to premium performance coated glass fiber felt facers.
 - c. High Density Wood Fiberboard – May be used as an overlay over other insulations. 1/2" thick is the minimum requirement when used as an overlay. Mule-Hide requires a minimum 1-inch thick board when installing directly over steel decks. Wood and concrete decks require a minimum 1/2" thick board. Minimum thicknesses and attachment rates will vary with wind requirements and deck types.
 - d. Expanded Polystyrene (EPS). Density of boards must be 1.0 PCF certified minimum and meeting ASTM C578, Type II physical properties. Minimum thickness shall be 1.0 inch. When installing directly over a steel deck the minimum thickness shall be as required by insulation manufacturer to span flutes. An overlay of a minimum 1/2" thick High Density Wood Fiberboard, minimum 1" polyisocyanurate insulation, minimum 1/4" DensDeck, or minimum 1/4" Securock is required. Check local building codes as a layer of gypsum board may be required under the EPS insulation (on steel decks).

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- e. Extruded polystyrene meeting ASTM C578, Types IV, VI or VII physical properties. Minimum thickness shall be 1.0 inch. When installing directly over a steel deck the minimum thickness shall be as required by insulation manufacturer to span flutes. An overlay of a minimum 1/2" thick HD Wood Fiberboard, minimum 1" polyisocyanurate insulation, minimum 1/4" DensDeck, or minimum 1/4" Securock is required. Check local building codes as a layer of gypsum board may be required under the extruded insulation (on steel decks).
 - f. Perlite Insulation – Perlite is not an acceptable insulation. Perlite may only be used as a fill insulation under an approved insulation. The PVC Fleece Back or PVC KEE HP Fleece Back membrane cannot be adhered directly to perlite insulation.
 - g. DensDeck Prime or Securock - A minimum 1/4" thick layer of DensDeck Prime or Securock may be used as an overlay over an approved insulation or as a thermal barrier over a combustible deck.
 - h. State and local building codes should be reviewed regarding the installation of expanded or extruded polystyrene insulation directly over a steel deck.
4. Insulation manufacturer shall provide its recommendations for use and attachment to the owner with a copy sent to Mule-Hide's Warranty Department. In addition, the insulation manufacturer shall provide a copy of their specific warranty conditions.
 5. Mule-Hide Premium Warranties require the use of the Mule-Hide labeled insulation or insulation by an approved Mule-Hide manufacturer. Use of other insulations may disqualify the project for consideration of the issuance of a Premium Warranty. Contact the Mule-Hide Technical Department for specific requirements.

C. UL and FM Approved Assemblies

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

D. Sheet Metal

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

2.05 Precautions

- A. Consult Safety Data Sheets and container labels for specific safety instructions prior to use.
- B. Avoid breathing vapors of solvents, cleaners, primers, sealants and adhesives. Use with adequate ventilation. Avoid prolonged contact of solvents, sealants, cleaners, primers and adhesives with skin. Solvent resistant rubber gloves should always be worn during use.
- C. Do not use Mule-Hide PVC roofing products near fire or flame. Do not use open flames for drying of surfaces, sealants or adhesives. **Do not smoke near flammable products.**

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- D. Do not use oil-based paint on Mule-Hide PVC Coated Metal or membrane. Contact Mule-Hide's Technical Department for recommendations.
- E. Do not allow muriatic acid (masonry cleaner) to come in direct contact with the Mule-Hide PVC Membrane or accessory products.
- F. Do not allow Mule-Hide PVC membranes or accessories to come into direct contact with steam or vents that produce temperatures in excess of 160°F.
- G. The Mule-Hide PVC Fleece Back or PVC KEE HP Fleece Back Roof System must be installed in temperatures 40°F and rising for 72 consecutive hours when using HydroBond Water-Based PVC Bonding Adhesive to prevent it from freezing before fully curing.
- H. Sprayed polyurethane foam application shall not proceed during periods of inclement weather. Follow Mule-Hide requirements for application temperatures and humidity levels.
- I. Wind barriers shall be used if conditions could affect the quality of the sprayed polyurethane adhesive and to prevent possible over spray.
- J. Do not apply Helix Max Adhesive when surface and/or ambient temperatures are below 25°F.
- K. In colder temperatures when the ambient temperature is near the dew point, condensation may form on the adhesive as the solvents flash off. If condensation occurs, discontinue the application and allow the surface to dry. **Do not attempt to dry the surface with heat guns or torches.** When weather permits apply a new coat of product.

PART 3 - EXECUTION

3.01 General

- A. When installing a Fully Adhered Mule-Hide PVC Fleece Back or PVC KEE HP Fleece Back Membrane Roofing System in cooler weather, it is recommended that liquids such as adhesives, solvents, sealants, etc. be stored at warmer temperatures (60°F or more but not exceeding 80°F) until just prior to use in order to facilitate the installation.
- B. When using HydroBond Water-Based PVC Bonding Adhesive, the PVC Fleece Back membrane must be installed in temperatures of 40 degrees (F) and rising for 72 consecutive hours to prevent the HydroBond from freezing until fully cured.
- B. Application of the Helix Max Low-Rise Adhesive shall not proceed during periods of inclement weather. Follow Mule-Hide requirements for application temperatures and humidity levels.
- C. Do not apply Helix Max Adhesive when surface and/or ambient temperatures are below 25°F.

3.02 Substrate Conditions

The following general conditions apply to the substrate that will receive a Fully Adhered Mule-Hide PVC Fleece Back or PVC KEE HP Fleece Back Membrane Roofing System for both new construction and reroof applications:

- A. The roof deck must be structurally sound to provide proper securement for mechanical fasteners. Areas showing a loss of integrity due to corrosion, rotting, warping, concrete spalling, etc., must be repaired or replaced prior to installing the roofing system.
- B. It is the responsibility of the roofing contractor to perform test cuts at each roof area prior to reroofing. The condition of the substrate must be suitable to receive a Fully Adhered Mule-Hide PVC Fleece Back or PVC KEE HP Fleece Back Roofing System. Wet insulation must be removed and replaced. See Single Ply Roofing Institute's guidelines for determining wet insulation.

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- C. Contact the material manufacturer when the substrate is exposed to excessively high humidity and/or a corrosive environment. Special fasteners (e.g. stainless steel) or details may be required.
- D. A determination must be made regarding the presence or absence of coal tar pitch within the existing roof assembly when considering a recover of the old roof system. The presence of coal tar pitch requires the use of a suitable slipsheet under the insulation unless the coal tar pitch is 10 years or older and is separated from the PVC membrane by a layer of insulation a minimum of 1-1/2 inches thick having a minimum "R" value of 5.0. All joints must be butted tightly together or have the joints completely taped to prevent volatiles from damaging the roof membrane.
- E. It is acceptable to install a Fully Adhered Mule-Hide PVC Fleece Back or PVC KEE HP Fleece Back Membrane Roofing System over the following deck substrates in new construction, provided that an acceptable insulation is installed over the substrate as needed:
 - 1. Structural Metal Deck (22-gauge minimum) shall conform to recommendations outlined in Factory Mutual's Loss Prevention Data Sheet 1-28 (requires insulation). Contact Mule-Hide's Technical Department for attachment requirements for decks less than 22-gauge in thickness. All FM testing is based on attachment to a 22-gauge steel deck.
 - 2. Structural concrete and pre-cast, pre-stressed concrete (2,500 psi minimum) shall be cured and dry to industry standards and surface shall be smooth and free of moisture or frost. All sharp ridges or other projections above the surface shall be removed before roofing. An approved insulation board is recommended. Minimum deck thickness shall be 2 inches with 3 inches preferred due to possible spalling damage that may occur to the underside of the deck when using fasteners for insulation and membrane attachment. Insulation may be attached with Type III or IV hot asphalt, approved adhesive or approved fasteners. The PVC Fleece Back or PVC KEE HP Fleece Back 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 Fully Adhered Mule-Hide PVC Fleece Back or PVC KEE HP Fleece Back Membrane Roofing System after pullout tests have been completed and appropriate fasteners have been selected. Attachment must be through the insulating concrete into the steel or concrete deck. Insulation board is required. Vapor barriers may be required when installing insulation over new decks.
 - 4. Wood Plank (1" minimum) shall conform to Factory Mutual's requirements for Class 1 impregnated decks (insulation is required). FM approved wood decks are a minimum, nominal 2-inch thick, tongue and groove planks.
 - 5. Plywood (15/32" minimum) shall be exterior grade (minimum CDX grade). A layer of an approved insulation is required for reroof applications. On new construction, while insulation board is recommended, adhering directly to the plywood or Oriented Strand Board ("OSB") deck is acceptable if the decking is secured with screws or back-out resistant fasteners. Decks attached with common or cement coated nails or staples shall be covered with an approved insulation. Check with local building code requirements as adhering a PVC membrane direct to a wood deck may not meet local fire codes.
 - 6. Cementitious Wood Fiber Decks - Certain cementitious wood fiber decks may be acceptable to receive a Fully Adhered Mule-Hide PVC Fleece Back or PVC KEE HP Fleece Back 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 decks may be

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acceptable to receive a Fully Adhered Mule-Hide PVC Fleece Back or PVC KEE HP Fleece Back Membrane Roofing System after pullout tests have been completed and appropriate fasteners have been selected. This deck type requires an acceptable insulation.

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.

Substrate Compatibility					
Insulation/Underlayments		Roof Decks		Existing Roofing Materials	
Poly ISO 1 & 2	Yes	Concrete	Yes	Smooth BUR	Yes ⁵
StructoDek [®] High Density	Yes	Cellular Lt.Wt. Concrete	Yes ¹¹	Gravel BUR	Yes ⁶
Expanded Polystyrene (EPS)	Yes ¹	NVS Lt.Wt. Concrete	Yes ¹¹	Mineral Cap Sheet	Yes
Extruded Polystyrene (XPS)	Yes ²	Gypsum	Yes	Granular Modified-Bitumen	Yes
New Sprayed Foam	No ⁹	Cementitious Wood Fiber	Yes	Smooth Modified-Bitumen	Yes
Scarified SPF	No ⁹	Plywood/OSB	Yes	Coal Tar Pitch	Yes ⁷
DensDeck [®]	Yes	Painted Steel	Yes	Aluminum-Coated BUR	No ⁸
Securock [®]	Yes	Galvanized Steel	Yes ³	Acrylic-Coated SPF	No ⁹
Oriented Strand Board	Yes	Acoustical Steel	Yes ⁴	Silicone-Coated SPF	No ⁹
Poly ISO 1HD	Yes	Wood Plank	Yes		
				Unexposed (Shiny) Asphalt	Yes ¹⁰

- Fleece Back membrane maybe installed directly over minimum 1.5-lb.-density EPS; however, to obtain UL & FM codes, an overlayment of StructoDek[®] High Density, DensDeck, Securock or Poly ISO insulation is required.
- For insulation attachment only.
- For new galvanized steel decks, power-washing is necessary to remove finishing oil residue if present.
- For acoustical steel decks, fill the flutes with fiberglass or other suitable fill insulation and tack in place with strips of duct tape 3' OC, or other adhesive, prior to spraying the deck with Helix Max Adhesive.
- Existing Smooth BUR must be Type III or IV asphalt if the Fleece Back membrane is to be installed directly without insulation.
- A minimum of an approved cover board or insulation is required over properly prepared gravel BUR. **Fleece Back membrane cannot be installed directly over a gravel/slag surface.**
- An insulation providing the necessary R-value must be specified to prevent the coal tar pitch from softening. **Fleece Back membrane cannot be installed directly to coal tar pitch.**
- Aluminum coatings must be removed by power-washing or by physical abrasion prior to the application of Helix Max Adhesive. Adhesion tests are required to confirm sufficient preparation of the substrate.
- SPF roofing assemblies may be considered on a job by job basis. Contact Mule Hide Technical Department prior to bidding.
- Requires AeroWeb as primer for all applications.
- Cellular or air-entrained lightweight substrates are acceptable. Lightweight concrete containing expanded aggregate such as perlite or vermiculite is not acceptable. New lightweight concrete must be confirmed by the contractor to be thoroughly dry. Existing substrates will require adhesion tests.

F. For reroofing projects having plywood decks, a minimum of one layer of an approved insulation is required after the tear-off has been completed.

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

3.03 Preparation of Existing Substrate

A. General

- To prevent delays or interruptions, coordinate work with other trades or suppliers to ensure that components to be incorporated into the Fully Adhered Mule-Hide PVC Fleece Back or PVC KEE HP Fleece Back 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 Fleece Back or PVC KEE HP Fleece Back Membrane Roofing System application.

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2. Do not permit voids greater than 1/4" wide in the substrate. Concrete substrates shall be cured and free of laitance and curing compounds. Substrates for roofing materials shall be dry and free of oil, dirt, grease, sharp edges and debris. Inspect substrates and correct defects before application of roofing membrane.
3. Specifier or roofing contractor shall determine the condition of the existing roof deck and roofing system. Areas with deteriorated decking or wet insulation or other failed materials shall have those affected materials removed and replaced. Make sure all decking is securely fastened. The roofing contractor has the final responsibility to ensure an acceptable deck is provided to receive the new roof system.
4. Large blisters shall be cut and patched to provide a reasonably level substrate surface.
5. On recover projects, tear off all existing base flashings, cant strips and projection flashings down to the substrate. The flashing substrate shall be dry and free of oil, dirt, grease, sharp edges and debris.
6. Gravel over existing nailers must be totally removed prior to installing new nailers and flashings. Verify that the existing nailers are in good condition and securely anchored to the roof decks.
7. When an additional thickness of insulation is being added, new nailers must be added to match the height of the new insulation. Nailers must be securely anchored to the roof deck per Section 3.05 of this specification.
8. All roof surfaces shall be free of ponded water, ice, or snow. Significant ponding that remains after a period of 48 hours should be eliminated by either installing tapered insulation to create positive drainage of the roof surface or by installing new drains in the low areas where the ponding remains. Positive drainage shall also eliminate the possibility of excessive live loads caused by ponding water that could cause structural damage or failure.
9. When removing an existing roof during reroofing, remove only that amount of roofing and flashing that can be made watertight with new Mule-Hide PVC materials in a one-day period or prior to the onset of inclement weather.
10. Gravel surfaced BUR systems require the installation of an acceptable insulation. Loose gravel must be removed prior to mechanically attaching a new layer of insulation. All lead pipe and drain flashings shall be removed.
11. Smooth surfaced BUR and smooth modified bitumen roofing systems shall require the installation of an acceptable insulation. All lead pipe and drain flashings shall be removed. Single-ply membranes such as EPDM, Hypalon, PVC or CPA must have all existing flashings removed, the field sheet must be cut up into sections no larger than 10' by 10' and an acceptable layer of insulation shall be mechanically attached over the existing field membrane.
12. Polyurethane Foam roofing systems ("PUF") are not acceptable for recover applications. The PUF system must be completely removed and new insulation installed prior to the installation of the new PVC Roofing System.
13. If a Mule-Hide Premium System Warranty is requested, the existing roof system **must be removed to the deck** prior to the installation of the new roofing system or a moisture survey by an independent third party must be taken, all wet areas removed and a copy of the survey submitted to Mule-Hide with the warranty application. In no event shall the Mule-Hide Premium System warranty cover the existing roof system or problems created by the existing roof system.

3.04 Vapor Retarder Installation (where specified)

- A. Specific climatic and job conditions may require the use of a vapor retarder. It is the sole responsibility of the design professional to determine the need for a vapor retarder (which may be required by local

building or energy codes and its type and location in the roofing system. A vapor retarder may often act as an "air barrier" which may have a positive effect in reducing internal air pressure. Vapor retarders should be strongly considered for buildings subject to high internal air pressures such as airplane hangars and buildings with many loading bays such as warehouse facilities.

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

3.05 Wood Nailers

- A. Wood nailers are required at all roof perimeter edges where metal edging and gutter systems are specified or where indicated in Mule-Hide's published standard PVC 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.

3.06 Insulation Installation

- A. General
 - 1. Mule-Hide accepted roof insulations shall be installed in accordance with Mule-Hide specifications.
 - 2. Mule-Hide accepted roof insulations shall be secured to the roof deck in accordance with Mule-Hide's requirements.
 - 3. All roof insulation shall be neatly cut to fit around all penetrations and projections with a maximum allowable gap of 1/4-inch.
 - 4. Open joints shall be repaired with like insulation material.
 - 5. Insulation shall be feathered or tapered to provide a minimum sump area of 36" x 36" where possible at all drains. Crickets and saddles may be installed beneath the specified insulation where possible. Crickets and saddles made from non-compatible insulations materials must be overlaid with an acceptable insulation or underlayment.

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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 traffic.
8. When installing insulation, the end joints of each row of insulation shall be offset against the previous row. When more than one layer of insulation is to be used, succeeding layers are to be laid staggered in relation to the previous layer of insulation and all joints shall be offset.
9. When a Mule-Hide Premium System Warranty is requested, only Mule-Hide labeled insulation may be used unless written approval is obtained, prior to job bid, for an alternative insulation.
10. Insulation other than Mule-Hide labeled insulation must be an FM approved insulation and acceptable to Mule-Hide for use under the Mule-Hide Fully Adhered PVC Fleece Back or PVC KEE HP Fleece Back Roofing System. Refer to the insulation manufacturers guidelines for the appropriate type, size and thickness of the insulation needed for use over the respective substrate and under the Mule-Hide PVC Fleece Back or PVC KEE HP Fleece Back Roofing System. Contact Mule-Hide Technical Department prior to bidding the project to determine approved insulation and assemblies.

B. Mechanical Attachment

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

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

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

4. Perimeter Enhancements:

To meet increased uplift requirements in the perimeters and corners of each roof area, additional insulation attachment provisions must be installed as follows:

- a. The minimum width of the perimeter and corner areas shall not be less than eight (8) feet.

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- b. See Details MHT-UN-108A and MHT-UN-108B.
- c. **Perimeters** – insulation attachment to be increased 50% over the field attachment requirements with a maximum of one (1) fastener every one (1) square feet.
- d. **Corners** – insulation attachment to be increased 100% over the field attachment requirements with a maximum of one (1) fastener every one (1) square feet.
- e. For Factory Mutual projects, the width of the roof perimeter and corner areas is defined as the smaller of 0.1 times the building lesser plan dimension or 0.4 times the eave height (mean roof height for slopes greater than 2"/12" slope), except for heights greater than 60 feet. The minimum width of the perimeter and corner areas shall not be less than three (3) feet. Contact Mule-Hide Technical Department for Factory Mutual projects exceeding 60 foot heights.

C. Adhesive Attachment

Adhesive attachment substrate preparation

1. The surface to which adhesive is to be applied shall be dry, clean and free of fins, protrusions, sharp edges, loose and foreign materials, oil and grease. Depressions greater than 1/4" shall be filled with Helix Max Adhesive or other approved patching material. All sharp projections shall be removed. Previously unoxidized (shiny) asphalt must be primed with AeroWeb.
2. Seal gaps between the wall/penetration and concrete deck with Mule-Hide F5 Air & Vapor Barrier, FROTH-PAK, or other suitable material, to avoid condensation issues and positive pressure from air infiltration.
3. Apply Helix® Max Adhesive when the substrate and ambient temperatures are 25°F or above when spraying or extruding with heated or non-heated equipment. Dispense the adhesive between 300-800 psi depending on the equipment used. Consult Mule-Hide Technical Department for more details.

Adhesive installation

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

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

Spacing parameters are for 5, 10, or 15-year 55-mph warranties: (Contact the Mule-Hide Technical Department for bead spacing on higher mph warranties or 20 and 30-year warranty projects).

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

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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 board size is 4' x 4'. Cover boards such as 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 areas 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.

3.07 Membrane Installation

General - Unroll the Mule-Hide PVC Membrane and position without stretching. 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.

- A. Membrane should run perpendicular to the direction of steel deck flutes and orientation of wood decks where possible.
- B. All membrane overlaps shall be installed to facilitate the flow of water. Seams shall be shingled or run parallel to the flow of water. Backwater seams are not permitted.
- C. Mule-Hide PVC Fleece Back and PVC KEE HP Fleece Back membranes have a 3" fleece-free selvage edge along one edge of the membrane. Lap sheets a minimum of 3 inches of fleece-free seam to provide space for a continuous, minimum 1-1/2" weld. Membrane overlaps shall be shingled with the flow of water or parallel to the flow of water. All welded field seams shall be a minimum of 2 inches wide. End laps shall be butted and stripped in with standard PVC reinforced membrane, see Detail MHP-FA-104E.
- D. The roofing contractor shall check all welded seams for continuity and integrity using a cotter pin puller or other suitable blunt object. The contractor shall make sample test seams each day 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, is operating properly and proper settings have been determined. This should be done each time the equipment is turned on after a cool down period.
- E. Perimeter - When installing the Mule-Hide Fully Adhered PVC Fleece Back or PVC KEE HP Fleece Back Roofing membrane system, it is not necessary to install Half Sheets parallel with the perimeter. Full size sheets should be used everywhere practical to minimize the number of field seams. In place of Half Sheets, additional fasteners or more ribbons of adhesive are installed in the insulation in the perimeter areas as defined in 3.06.B Perimeter Enhancements. Weld all laps (seams and end laps) continuously with a minimum weld width of 2 inches. All field welds shall be completed with an automatic welder. Perimeter areas shall be determined by one of the following methods:
 1. Mule-Hide defines the minimum perimeter area as 8' in from the roof edge along all exterior roof edges.
 2. For Factory Mutual insured buildings, follow guidelines in FM's Loss Prevention Data Sheet 1-29. Contact Mule-Hide Warranty Department for fastener spacing for compliance with FM 1-60 and 1-90 requirements.

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3.08 Field Sheet Attachment

A. General

1. Position membrane over substrate with 3" selvage edge overlap at lap seams, and positioned so that laps will shed water. Allow the membrane to relax at least 15 minutes prior to fastening when temperatures are 60°F and above or 30 minutes when temperatures are below 60°F. After membrane has relaxed, fold membrane in half lengthwise exposing the underside of the sheet. Pails of adhesive are often used to weight the back edge of the membrane to hold it in position.
CAUTION: Keep the protective packaging of the Mule-Hide Heat-Weld Membrane intact until ready to use.
2. Any seams running through drains shall be cut out and target patches (36" x 36") shall be installed

B. Adhesive Options for Fleece Back Adhered Systems

Adhesive*	Single Sided (Wet Lay)	Double Sided (Contact)
Low VOC PVC Bonding Adhesive	No	No
HydroBond	Yes	No
AeroWeb Low-VOC Aerosol Contact Adhesive	No	No
Helix Max Low-Rise Adhesive**	Yes	No

*Refer to Product Data Sheets for specific installation instructions related to each adhesive option.
**Installation options for Helix® Max Adhesive are packaging specific. Product Data Sheets should be thoroughly reviewed for installation options.

C. Mule-Hide HydroBond Water-Based PVC Bonding Adhesive (not for PVC KEE HP membrane)

1. Once several sheets are rolled out, carefully position each sheet with a 3" side lap and with the end laps butt jointed, and allow the membrane to relax.
2. After the sheets have relaxed, take the end of the first sheet and pull back to expose the underside of the sheet. Pull the sheet back one half of its length onto itself.
3. Mix adhesive scraping the sides and bottom of the can (minimum of 5 minutes is required) until adhesive is uniform in color. Consult Product Data Sheet for adhesive instructions.
4. Apply a smooth even coating of Mule-Hide HydroBond water based bonding adhesive to the substrate only and immediately roll the fleece back membrane into the **wet** adhesive.
5. Apply the Mule-Hide HydroBond adhesive to the substrate in a uniform manner at the rate of 100 to 120 square feet per gallon. Avoid globs, puddles and un-coated areas. Additional adhesive may be required on porous substrates.
6. Once the membrane has been mated to the insulation, broom the membrane with a stiff bristled push broom to ensure proper contact and 100% adhesion.
7. The Mule-Hide HydroBond adhesive can be applied with a 1/4" or 3/8" nap roller. Note: Adhesive must be wet at time of membrane placement.
8. Repeat this procedure for the second half of the sheet and each successive sheet of membrane on the roof, remembering to shingle all laps. Do not run any seams through field drains or sumps. Any seams running through drains or sumps shall be cut out and target patches (36" x 36") shall be installed.
9. Do not apply adhesive in seam lap areas that are to be heat welded.

D. Membrane Attachment using Helix® Max Low-Rise Adhesive

Slide-in Method:

1. Unroll Fleece Back sheet and position. Fold the sheet back in half lengthwise (end-to-end).
2. Spray apply, splatter apply, or bead apply Helix® Max Adhesive to the substrate.
 - a. For fully adhered application, spray adhesive to obtain full coverage (approx. 1/8" to 1/4" thick after foaming). Ensure end laps are protected from adhesive.
 - b. For bead applications, apply at 4", 6", or 12" on center with a **min. 1/2" wide wet bead**. Ensure end laps are protected from adhesive.
3. Once "string time" occurs, gradually roll Fleece Back membrane into Helix® Max Adhesive, checking for "string/body" every few feet. If membrane reaches adhesive that has NOT developed "string/body" stop rolling Fleece Back membrane into adhesive until string develops. As sheet is being installed, immediately start rolling the membrane width-wise with a 150-lb. segmented weighted roller. Repeat process until Fleece Back sheet is fully installed.

Roll-in (Mod Bit) Method:

1. Unroll the Fleece Back sheet and position in place. Starting at one end of the membrane, using the roll core, carefully roll the membrane back up half way making sure you do not reposition the membrane. Leaving half the membrane laid out will help prevent this.
2. Spray apply, splatter apply, or bead apply Helix® Max Adhesive to the substrate.
 - a. For fully adhered application, spray adhesive to obtain full coverage (approx. 1/8" to 1/4" thick after foaming). Ensure end laps are protected from adhesive.
 - b. For bead applications, apply at 4", 6", or 12" on center with a **min. 1/2" wide wet bead**. Ensure end laps are protected from adhesive.
3. Once "string time" occurs, gradually roll Fleece Back membrane into Helix® Max Adhesive, checking for "string/body" every few feet. If membrane reaches adhesive that has NOT developed "string/body" stop rolling Fleece Back membrane into adhesive until string develops. As sheet is being installed, immediately start rolling the membrane width-wise with a 150-lb. segmented weighted roller. Repeat process until Fleece Back sheet is fully installed.

3.09 Welding of Lap Areas

A. General

1. The Mule-Hide PVC Roofing membrane is to be hot air welded only. Seaming "membrane to membrane" and "flashing/detail membrane to membrane" shall only be done by hot air welding.
2. All surfaces to be welded shall be clean and dry.
3. Side laps have a selvage edge that allows them to be heat welded together. End laps must be butted together and covered with a minimum 6" wide strip of reinforced membrane that is heat welded along all edges, refer to Mule-Hide Detail # MHP-UN-104E. Apply cut edge sealant to all cut edges of reinforced membrane.

B. Hot Air Welding

1. Machines for hot air welding are available from several different sources. Each 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. **Mule-Hide requires the use of automatic welding machines for all field sheet seaming. Hand welding is only acceptable for flashings and those seams where the automatic welder cannot be used.**
2. Hand-held welding equipment is also available to weld membrane. After the preheated nozzle tip is applied in the overlap area and the material starts to soften, immediately follow with a silicone hand

roller to press the heated membrane surfaces together with slow, even movements. Keep the roller within 1 inch of the nozzle tip. Angle the hot air tool so that the flowing air faces the roller. Seam strength may be tested when cool. For best results, testing seams 8 hours after hot air welding is recommended.

C. "T" Joint Covers

1. **For 50-mil membrane and maximum warranty length of 15-years.** Pay special attention to the "T" lap seams formed where three layers of membrane overlap at a seam. To ensure proper seaming of the "T" joints, the top layer of the Heat-Weld Membrane is creased a minimum of one inch into the lower layer of membrane by using a heat gun with a narrow or pencil tip nozzle and a rubber hand roller. By inserting a heat gun nozzle between the layers of the membrane, the membrane will soften and begin to flow allowing it to crease and seal completely after applying pressure with a hand roller to ensure adequate bonding of the softened material. After heat-sealing the "T" joint, Edge Sealant must be applied on all cut edges of reinforced membrane. See detail MHP-UN-105A.
2. **For membrane thickness greater than 50-mil or warranty length greater than 15-years.** Separate "T" joint patches are required over all "T" joints. See detail MHP-UN-105B

D. Seam Patches at Roof/Wall Transitions

1. Mule-Hide requires the installation of Non-Reinforced PVC Flashing Membrane patches over any seam that transitions from the horizontal to the vertical. These patches are to be constructed with Non-Reinforced PVC Flashing Membrane only and hot air welded. Refer to Mule-Hide Detail MHP-UN-105C

E. Daily Welding Equipment Setup

1. The roofing contractor shall make sample test seams each day prior to welding field seams. The contractor shall, using scrap material, run at least two test seams, each a minimum of 2 feet long. Each test seam shall be used to determine adequate seam strength and to ensure the equipment has warmed up, is operating properly and proper settings have been determined. This should be done each time the equipment is turned on after a cool down period.

F. Quality Control of Seams

1. After seaming, the seams are checked for integrity with a 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.

3.10 Additional Membrane Securement (Base Attachment)

- A. Additional securement of the PVC membrane by mechanical attachment must be provided at the perimeter of each roof level, base of walls, curbs, skylights, expansion joints, tie-ins, interior walls, bottom of valleys and any angle changes that exceed inclines of 2:12 (2" rise in 12") and various penetrations as shown in the Mule-Hide Standard Details. All securement must be either horizontally to the roof deck or vertically to the base of the various penetrations as shown in the Mule-Hide Standard Details.
- B. The mechanical attachment of the membrane may be achieved by the following methods:
 1. 2.4" Seam Plate and appropriate fasteners
 - a. The 2.4" Seam Plate and appropriate fasteners are placed with the edge of the Seam Plate approximately 1/2" away from the angle change. Seam Plates may

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be placed either horizontally or vertically depending on the conditions encountered. Refer to the Mule-Hide PVC standard details for proper placement.

2. Mule-Hide All Purpose Bar
 - a. The Mule-Hide All Purpose Bar is a specially extruded aluminum bar that has pre-punched holes 6 inches on center. Bar may be placed either horizontally or vertically depending on the detail followed. Refer to the Mule-Hide PVC Standard Details for the proper placement. Refer to Mule-Hide Detail # MHP-UN-124 appropriate placement of the All Purpose Bar.
 - b. The maximum spacing of the fasteners shall not exceed 12 inches on center. Adjoining bars should be spaced approximately 1/2 inch to 1 inch apart. All bars must be attached at the ends a maximum of 1 inch from the end of each bar. This may require pre-drilling additional holes. All cut bars shall be deburred.
 - c. PVC .050 Reinforced 9" X 100' product may be used to strip-in the All Purpose Bar with a continuous, minimum of 1-1/2" (40 mm) wide weld.
 - d. The All Purpose Bar must be installed a minimum of 3 inches to a maximum of 6 inches from inside and outside corners.
3. PVC Coated Drip Apron and Gravel Stop
 - a. For drip aprons and gravel stops, the metal flange shall extend a minimum of 3 inches onto the wood nailer. The wood nailer must be wider than the metal flange. Approved screw fasteners shall be installed a maximum of 6 inches on center and 1/2" to 3/4" from the inside edge of the metal flange. Ring shank nails spaced a maximum of 4" on center may also be used.

3.11 Flashing Installation

A. PVC Membrane Flashings

1. **All vertical flashings in a Fully Adhered PVC Fleece Back or PVC KEE HP Fleece Back Membrane Roofing System must be standard PVC or PVC KEE HP membrane.** The flashing membrane thickness must match the thickness of the PVC membrane thickness of the Fleece Back membrane.
2. 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.
3. On recover projects, tear off all existing base flashings, cant strips and projection flashings down to the substrate. If deteriorated areas of substrate are uncovered, repairs must be made to provide a suitable substrate for the new PVC flashings.

B. Adhesive Options for wall flashings (Standard (non-fleece) PVC or PVC KEE)

Adhesive*	Single Sided (Wet Lay)	Double Sided (Contact)
Low VOC PVC Bonding Adhesive	No	Yes
HydroBond™ (PVC only, not for PVC KEE)	No	No
AeroWeb Low-VOC Aerosol Contact Adhesive	No	No
Helix® Max Low-Rise Adhesive**	No	No

*Refer to Product Data Sheets for specific installation instructions related to each adhesive option.
 **Installation options for Helix® Max Adhesive are packaging specific. Product Data Sheets should be thoroughly reviewed for installation options.

C. PVC Low-VOC Bonding Adhesive

1. Mix adhesive scraping the sides and bottom of the can (minimum 5 minutes is required) until adhesive is uniform in color. Consult product data sheet for adhesive instructions.
 - a. PVC Low-VOC Bonding Adhesive require mechanical stirring (electric drill), initially.
 - b. Porous surfaces and substrates may require the application of a prime coat and second coat of PVC Low-VOC Bonding Adhesive to accomplish proper adhesion.
2. Using a plastic core, medium nap roller, apply a smooth even coat of PVC Low-VOC Bonding Adhesive to back side of membrane and substrate (no globs or puddles). A nine inch roller will easily fit into a 5-gallon adhesive container. **Do not apply adhesive in area of seam laps.**
3. Coverage rate to be approximately:

120 square feet per gallon for one surface (membrane or substrate only) or
60 square feet per gallon per finished surface (membrane and substrate)
4. Allow adhesive to dry to a 'tacky' state. Test adhesive by placing a knuckle into it and turning your wrist a one-quarter turn. Adhesive is ready to mate when it is tacky but does not string when knuckle is lifted.
5. Care must be taken to ensure proper drying. Avoid thin layers of adhesive which can result in over drying and improper adhesion.
6. Roll coated membrane onto substrate being careful to not wrinkle the sheet or trap air bubbles. Once membrane is mated to the substrate, carefully roll the membrane with a 2-inch wide rubber hand roller to promote maximum positive contact between the membrane and the substrate.
7. PVC Membrane Flashings shall extend a minimum of 6 inches onto the field sheet and be adhered securely. There shall be a minimum of 2 inches between the front of the fastener plates and the edge of the sheet to allow for heat welding. All side laps are to overlap a minimum of 2 inches.
8. **Areas of the flashings and membrane to be welded are not to have PVC Bonding Adhesive applied to them.**
9. Extended drying times can be expected during cool, overcast, humid, shaded, or late day applications. The adhesive must be dry (but still tacky) before mating surfaces to avoid permanent blisters due to trapped solvents.
10. All flashings shall be extended a minimum of 8 inches above roof membrane level and be terminated unless previously accepted by the owner or his representative and the Mule-Hide Technical Department. All flashings shall be hot air welded at their connections with the roofing membrane. Apply Cut Edge Sealant at all welded edges of cut membrane flashings. Refer to Mule-Hide PVC Standard Details for more information.

NOTE: After flashing is adhered in place, promote full contact adhesion by going back over entire area with a 2-inch rubber hand roller.

C. HydroBond Water-Based PVC Bonding Adhesive (Not for Use with Standard PVC KEE HP Membranes)

1. The surface, on or against which adhesive is to be applied, shall be clean, smooth, dry, free of fins, sharp edges, loose and foreign materials, oil and grease. Depressions greater than 1/4" (6 mm) should be feathered; using epoxy, mortar or other approved patching material. All sharp projections shall be removed by sweeping, blowing or vacuum cleaning.

2. Apply a medium to heavy coat of adhesive to wall, and then apply a standard coat to the membrane flashing. ALLOW ADHESIVE TO DRY THOROUGHLY. Lack of thorough drying will result in poor adhesive strength and/or blistering over time.
3. **Areas of the flashings and membrane to be welded are not to have HydroBond Water-Based PVC Bonding Adhesive applied to them.**
4. Coverage rate to be approximately:

120 square feet per gallon for one surface (membrane or substrate only) or
60 square feet per gallon per finished surface (membrane and substrate)
6. Avoiding wrinkles, mate flashing membrane to adhesive coated wall. Immediately broom bonded flashing with a stiff bristle push broom, start at the angle change and roll the membrane flashing up the wall. Using a 3" wide 'J' roller (preferred) roll membrane flashing into place to assure maximum contact. Work up evenly from the base and in small sections, thus ensuring full attachment at the lower sections before moving to the top of the membrane. Temporarily tape or pin the top edge of flashing to the wall to prevent membrane curl-back until the termination detail can be completed.
7. Extended drying times can be expected during cool, overcast, humid, shaded, or late day applications. The adhesive must be dry (but still tacky) before mating surfaces to avoid permanent blisters due to trapped moisture.
8. Overlap all adjacent flashing sheets a minimum of 2 inches. PVC Membrane Flashings shall extend a minimum of 6 inches onto the field sheet and be adhered securely. There shall be a minimum of 2 inches between the front of the fastener plates and the edge of the sheet to allow for heat welding. All side laps are to overlap a minimum of 2 inches.
9. All flashings shall be extended a minimum of 8 inches above roof membrane level unless previously accepted by the owner or his representative and the Mule-Hide Technical Department. All flashings shall be hot air welded at their connections with the roofing membrane. All welds must be a minimum of 2" wide. Apply Cut Edge Sealant at all welded edges of cut membrane flashings. Refer to Mule-Hide PVC Standard Details for more information.

NOTE: After flashing is adhered in place, promote full contact adhesion by going back over entire area with a 2-inch rubber hand roller.
10. All flashings shall be hot air welded at their connections with the roofing membrane. All hand welds shall be a minimum of 1-1/2" wide.
11. All flashings shall be properly terminated according to Mule-Hide's published Standard Details.

3.12 Drains, Expansion Joints, Pitch Pans

A. Roof Drains

1. All existing roofing materials and metal flashings shall be removed.
2. Do not run field seams through drains or sumps. If sheet layout causes a seam to fall in line with a drain, a target patch (minimum 36" x 36") shall be required.
3. Prepare the surface around each drain to prevent any distortion, tenting, or bridging of the membrane. A smooth transition shall be provided from the roof surface to the surface of the drain bowl/clamping ring.
4. Mule-Hide recommends the installation of a target patch of standard PVC or PVC KEE HP membrane at the drain.

5. If PVC Fleece Back or PVC KEE HP Fleece Back membrane is extended into roof drain, fleece backing must be removed from portion of membrane that extends into the roof drain. See approved detail drawings.
6. Mule-Hide requires the application of one full tube of Water Cut-Off Mastic per drain applied to the drain bowl, under the membrane, where the clamping ring will be seated. This will provide a continuous seal between the membrane and the drain bowl. The membrane terminating into the drain must have the fleece backing removed where contact is made with the Water Cut-Off mastic. This is accomplished by heating the fleece and scraping it off the back of the membrane. Removal of the fleece allows the Water Cut-Off to bond directly to the membrane creating a complete seal.

B. Expansion Joints

1. Refer to Mule-Hide's published standard PVC details for application methods for flashing expansion joints.

C. Pitch Pans

1. Install and flash pitch pans as indicated in Mule-Hide's published standard PVC details. All pitch pans shall be filled with Thermoplastic One-Part Pourable Sealer.

3.13 Walkway Installation

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

A. PVC Walkway Roll Installation

1. Install PVC Walkway Rolls over clean, dry surfaces.
2. Layout areas where PVC Walkway Rolls are to be installed with most of the material being oriented so that it is placed between field seams with each adjacent and abutting section gapped a minimum of 6". Do not install walkway pads over seams or flashings.
3. Heat weld the perimeter of the properly positioned PVC Walkway Roll. Check seams for any voids or inconsistencies that might prevent watertightness.

B. Precast Pavers

1. Install precast paver systems acceptable to Mule-Hide over one layer of 6 oz. HP Protection Mat or other acceptable slip sheet material. Contact Mule-Hide for other acceptable slipsheets.
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.

3.14 Temporary Tie-ins

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

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

END OF SECTION

This specification represents the applicable information available at the time of its publication. Mule-Hide reserves the right to change this information at any time. Contact Mule-Hide or check the Mule-Hide website (www.mulehide.com) for the latest updates regarding changes or modifications to this specification.