

System Specifications

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FULLY ADHERED EPDM SYSTEM SPECIFICATION for MODULAR CONSTRUCTION

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System Specifications

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Modular Fully Adhered EPDM Specification

PART 1 GENERAL

1.01 DESCRIPTION

- A. The Mule-Hide Fully Adhered EPDM Roofing System incorporates the Mule-Hide Black or White-on-Black, .045" or .060" thick EPDM membrane. The EPDM membrane is fully adhered to a wood deck (plywood or Oriented Strand Board) or an acceptable insulation board that has been mechanically attached to the roof deck. The Mule-Hide EPDM membrane is fully adhered using the Mule-Hide Acrylic Water Base Bonding Adhesive. This system is intended for application on individual modular units that have been constructed in a manufacturing facility and transported to the project site. The modular units may be individual or multiple units that are joined together at the project site to form larger structures.

- B. Related Work

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

- a. Roof decking
- b. Vapor retarder, air barrier or slip sheet (where specified)
- c. Wood blocking (nailers)
- d. Insulation
- e. Fasteners
- f. Roof membrane, flashings and other accessories
- g. Mate-Line completion
- h. Metal flashings
- i. Walkways (where specified)

- C. EPDM sheet of sufficient size necessary to eliminate field seams on each individual modular unit shall be provided.

1.02 QUALITY ASSURANCE

- A. All components that comprise the Mule-Hide Fully Adhered EPDM Roofing System (membrane and all necessary accessories) shall be those supplied by Mule-Hide.
- B. This roofing system must be installed in compliance with the published Mule-Hide Specification and details. There shall be no deviations to this specification without the written approval of Mule-Hide's Technical Department. All deviations must be approved prior to the installation of the roofing system.
- C. For specific system (component assemblies) approvals (UL, FM or ICBO) contact Mule-Hide's Technical Department prior to bidding the project. It is the modular manufacturer's responsibility to confirm this specification is in compliance with local building codes. Mule-Hide is not responsible to determine local code compliance. Mule-Hide will provide to the modular manufacturer copies of its UL and FM listings and ICBO reports for submittal to local code officials upon request.
- D. All projects wherein a system warranty is required shall have a warranty application submitted to Mule-Hide's warranty department for review and approval prior to the start of the installation. Only those manufacturers that have obtained training and Warranty Eligibility status shall be able to apply for system warranties when required by the building owner/lessee.

- E. All projects submitted for system warranties shall be inspected by an authorized representative of Mule-Hide at the completion of the project to verify that all installation and material requirements are met. All punch list items shall be completed and appropriate warranty fees paid prior to the issuance of the warranty. **Note: *Mule-Hide does not provide inspections for projects that only require a membrane material warranty or do not require a warranty.***
- F. Mule-Hide reserves the right to reject any roof system for warranty that does not comply with Mule-Hide's written specifications, details and current policies.
- G. The modular manufacturer/dealer shall certify that it's set-up crews have received training and are capable of completing basic details such as Mate-Lines, pipe boot installations and curb flashings. Should the modular manufacturer/dealer engage the services of a roofing contractor to complete on-site work necessary to complete the roofing system in compliance with Mule-Hide's written specification and details, the roofing contractor shall submit to the manufacturer/dealer a copy of its Mule-Hide Warranty Eligibility Certificate. Manufacturers/dealers not completing the training and paperwork process necessary to become a Warranty Eligible Applicator will not be able to request system warranties.
- H. When UL or FM rated assemblies are required, all products used in the roofing assembly shall bear the UL and FM labels.

1.03 SUBMITTALS

Prior to starting a project that will require the issuance of a system warranty and before the bidding process, the modular manufacturer shall submit to Mule-Hide's Technical Department the following:

- A. A copy of the project specifications and proposed details and deviations to the Mule-Hide standard specification.
- B. A fully completed Mule-Hide Standard System Warranty Application
- C. Dimensioned shop drawings to include an outline of the roof and appropriate details for flashings and terminations.
- D. All project specifications and details where deviations to the Mule-Hide standard specification are requested.
- E. All information necessary to determine compliance with specified UL or FM requirements.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. All products delivered to the modular manufacturer, to the factory or project site, shall be in their original unopened containers or wrappings and clearly labeled with the manufacturer's name, product identification and date of manufacture. Products placed in the units for use at the project shall be stored in a manner to prevent damage from shipping.
- B. 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.
- C. Store all materials in a dry, clean area protected from the elements. All adhesives and caulks 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 room temperature prior to use.

1.05 JOB CONDITIONS

- A. The modular manufacturer/dealer shall be responsible for providing adequate surfaces to receive the Mule-Hide Fully Adhered EPDM Roofing System, insulation (as needed), accessories, and related products necessary for the successful completion of the roofing system.
- B. In-plant temperatures shall be within reasonable working conditions. Temperatures below 55 degrees will retard the drying time of the Acrylic Water Base Adhesive. Temperatures above 90 degrees may cause the Acrylic Water Base Adhesive to dry too quickly. High moisture content in the air will also impede adhesive drying times. The Acrylic Water Base Bonding Adhesive (WBA) must be protected from freezing prior to use. The WBA should not be exposed to freezing temperatures for 24 hours after application.
- C. The modular manufacturer/dealer must make sure that all decking is properly secured prior to installation of any insulation, barrier board or the application of the EPDM membrane when adhering directly to a plywood deck.
- D. Material Safety Data Sheets should be on location at all times during construction in the plant, during transportation and at the project site.
- E. Drainage must be determined by the modular manufacturer/dealer in compliance with all applicable building codes. Mule-Hide shall require a minimum of a 1/8-inch per foot slope when a system warranty is requested.
- F. Do not install the Mule-Hide EPDM roofing membrane in direct contact with any product containing coal tar pitch, creosote or penta-based materials. Contact Mule-Hide's Technical Department for special installation requirements.

1.06 DECKING REQUIREMENTS

- A. Acceptable decks:
 - 1. Nominal 1/2 (15/32) inch thick APA Grade CDX Plywood. Note: Projects to be located in high wind zone locations may require a minimum 3/4-inch thick (Tongue & Groove), fire-treated plywood.
 - 2. Minimum 7/16-inch thick non-veneer APA rated Oriented Strand Board (OSB). Note: Projects to be located in high wind zone locations may require a minimum 3/4-inch thick (Tongue & Groove), fire-treated plywood.
 - 3. Minimum 24 gauge steel decking overlaid with acceptable insulation. Note: Certain insulations may require the use of a thermal or moisture barrier installed directly on top of the deck prior to the placement of the insulation. Note: Roof systems to be installed on projects located in high wind zone areas may require a minimum 22-gauge deck.
- B. When projects require a Mule-Hide system warranty, the plywood deck must be attached with screws or back-out resistant nails.
- C. OSB and plywood decks shall be installed in compliance with APA guidelines and ICC code requirements.

1.07 PRECAUTIONS

- A. Consult the Material Safety Data Sheets and container labels for specific safety information.
- B. Avoid breathing vapors of solvents, cleaners, primers, sealants and adhesives. Use solvent-based products with adequate ventilation. Avoid prolonged contact with solvent-based products with skin. Solvent resistant gloves should always be worn during use.

- C. Do not use Mule-Hide EPDM roofing products near fire or flame. Do not use open flames for drying of surfaces or any products such as adhesives, cleaners, primers or sealants.
- D. **Do not smoke near flammable products.**
- E. Do not allow muriatic acid (masonry cleaner) to come in direct contact with the EPDM membranes or accessories.
- F. Do not allow EPDM membranes or accessories to come in direct contact with steam or vent pipes that produce temperatures in excess of 160°F.
- G. All accessory products such as Cured Cover Tapes, Mate-Line Bridging Tapes, Flashing Tapes and In-Seam Tapes may lose tack when exposed to temperatures below 50°F. These products should be maintained at room temperature (65° - 75°F) until just prior to use. Products left in cold temperatures shall be brought up to room temperatures prior to use.
- H. In cold temperatures, only enough materials should be exposed to the cold as can be used within one hour of exposure.
- I. In cold temperatures, when ambient temperatures are near the dew point, condensation may form on the surfaces where a solvent-based product is used. 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 and resume application procedure.

1.08 WARRANTIES

- A. Mule-Hide Limited Membrane Material Warranty
 - 1. Upon completion of the roof system and submittal of a warranty application, a material warranty for a 10-year period may be obtained.
 - 2. This warranty covers only the EPDM membrane. Accessories and workmanship are not covered. Refer to the actual warranty for specific coverage, terms and conditions.
- B. Mule-Hide Standard System Warranty
 - 1. Mule-Hide Standard System Warranties are available to those manufacturers and Dealers that become Warranty Eligible. These warranties may also be obtained from Mule-Hide Warranty Eligible Contractors.
 - 2. The Standard System Warranty is available for a 10-year period. The warranty covers both labor and Mule-Hide labeled materials. Refer to the actual warranty for specific coverage, terms and conditions.
 - 3. All projects requesting Standard System Warranties shall require an inspection by a representative of Mule-Hide. Refer to the Modular Warranty Application for appropriate fees.

PART 2 PRODUCTS

2.01 GENERAL

The components of the Mule-Hide Fully Adhered EPDM Roofing System are to be products manufactured or supplied by Mule-Hide Products Co., Inc. Mule-Hide's EPDM membranes are available in black and White-on-Black. The membranes are available non-reinforced, .045 and .060 inches thick. The Mule-Hide EPDM membranes are manufactured to meet the ASTM D 4637 and ANSI/RMA IPR-1. Refer to the Product Data Sheets for typical physical properties.

2.02 ACCESSORIES

The following accessories are furnished by Mule-Hide and must be used to complete the installation of a Mule-Hide EPDM roofing system. Mule-Hide will not warrant any system where a Mule-Hide product has been substituted with another manufacturer's product. Approval of the use of a product not available from Mule-Hide must be obtained in writing prior to the installation of the roof system.

- A. **Mule-Hide Splice Adhesive** - a black or white adhesive (solvent-based) used for splicing EPDM membranes and uncured EPDM flashings (rubber to rubber only).
- B. **Mule-Hide Seam Cleaner** - a black or clear solvent-based cleaner used to clean and prep EPDM membranes prior to the application of Mule-Hide Splice Adhesive. **Do not use with Tape products.**
- C. **Mule-Hide Acrylic Water Base Bonding Adhesive** - a non-flammable and non-toxic acrylic latex adhesive designed to bond EPDM membrane to various approved insulations and substrates. For horizontal surfaces only, not to be used on slopes greater than 2" per foot.. This is a one-side, wet lay-in product.
- D. **Mule-Hide Bonding Adhesive** - a solvent based (amber colored) contact adhesive used to bond EPDM membrane and flashings to acceptable vertical surfaces. May also be used to bond EPDM membranes to certain acceptable horizontal surfaces. Porous surfaces such as concrete, block and brick may require two coats of adhesive.
- E. **Mule-Hide Tape Primer** - a primer specifically designed for use with Mule-Hide's In-Seam Tapes, Cured Cover Tapes, Mate-Line Tapes and Uncured Flashing Tapes and Cured and Uncured Laminated Tapes. May also be used as a substitute for Seam Cleaner.
- F. **Mule-Hide In-Seam Tape**- a cured butyl rubber, pressure sensitive tape designed to seam EPDM sheets. Mule-Hide Tape Primer must be used when installing the In-Seam Tape.
- G. **Mule-Hide Uncured Flashing Tapes** - An uncured EPDM material laminated to cured butyl, pressure sensitive tape, to be used to flash pipes, inside and outside corners, "T-joints" and various other roof penetrations that require a moldable product. Tape Primer must be used with this product. Not to be used for stripping seams, gravel stop or drip apron.
- H. **Mule-Hide Uncured Flashing** - an uncured EPDM material to be used to field flash pipes, corners, "T-joints" and various other penetrations that require a moldable product. When adhering to EPDM (cured or uncured), Splice Adhesive and Seam Cleaner must be used. This product is not to be used to strip gravel stop or drip apron.
- I. **Mule-Hide Self Bridging Mate-Line Tape™** - a reinforced Cover Tape used to seal the mate-line between two modular units. this product eliminates the use of wood or metal stripping over the mate-line joint. Large/uneven joints may require the installation of a backer-rod prior to installation of the Self-Bridging Mate-Line Tape™. Tape Primer must be used with this product.

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- J. **Mule-Hide Cured Cover Tapes** - a cured EPDM material laminated to a cured butyl, pressure sensitive tape used to strip gravel stops, drip aprons and other metal surfaces. See published details for specific uses. Tape Primer must be used with this product.
- K. **Mule-Hide Mate-Line Tape** - a cured EPDM material laminated to a cured butyl, pressure sensitive tape used to seal the mate-lines of multi-unit modular projects. Tape Primer must be used with this product.
- L. **Mule-Hide Pre-Cut Corners** - a 7" wide by 9" long uncured flashing tape used to flash corners and "t-joints". Tape Primer must be used with this product.
- M. **Mule-Hide Premolded EPDM Pipe Boots w/Tape** - an economical pre-molded EPDM flashing used for flashing single pipe penetrations. Also available without tapes.
- N. **Mule-Hide 6" RMS Strip w/Tape** - a 6-inch wide, cured, reinforced EPDM strip with a 3-inch wide pressure sensitive tape laminated to one side. This product is used as a base attachment around curbs and walls to mechanically attach the EPDM field sheet. 2-inch wide Barbed Seam Plates are required to install the RMS w/Tape. Tape Primer must be used with this product. The RMS strip is also available without the tape. Splice Adhesive and Seam Cleaner are required to install the RMS strip without the tape.
- O. **Mule-Hide Lap Sealant** - a one-part, black, elastomeric caulk design for sealing the exposed edge of field seams when Splice Adhesive is used. Also required to seal all edges of flashings, "T-joints", pipe boots and along gravel stop and drip apron. To be used with black membrane and accessories.
- P. **Mule-Hide All Purpose Sealant** - A white elastomeric caulk designed to be used as a lap sealant with white EPDM membranes and accessories. May also be used as a termination caulk to seal along termination bar.
- Q. **Mule-Hide Water Cut-Off Mastic** - a butyl based, one component mastic used for sealing EPDM membranes and accessories to wood, metal, concrete plastic and other substrates. See published details for specific use. This product cannot be exposed to sunlight.
- R. **Mule-Hide Pourable Sealer** - a two-component, 100% solids, liquid polyurethane elastomer used to fill pitch pockets.
- S. **Mule-Hide Pourable Sealer Pockets** - prefabricated pockets consisting of a 2 inch wide plastic support strip with pre-applied, pressure sensitive Uncured Flashing. Ideal for irregular penetrations that cannot be flashed with uncured flashing. Multiple pockets may be joined to form larger pockets. Pourable Sealer is used to fill pockets.
- T. **Mule-Hide All-Purpose Bar (A-P Bar)** - a specially extruded aluminum bar, .050" thick x 1" wide x 10 foot long with predrilled holes 6" on center. Used as a termination bar and as an anchor bar.
- U. **Mule-Hide Fasteners** - Factory Mutual Approved #14 Heavy Duty and #12 drill and thread point fasteners used to attach insulation (#12 fasteners with 3" Stress Plates) and to attach the 2" barbed Seam Plates and A-P Bar (#14 fasteners).
- V. **Mule-Hide 3" Metal Stress Plates** - Factory Mutual Approved plates used with Mule-Hide #12 fasteners to attach various insulations to acceptable wood and steel decks.
- W. **Mule-Hide 2" Barbed Seam Plates** - Factory Mutual Approved metal plates used to anchor the RMS strips and for use in field seam attachment when using reinforced EPDM membrane.
- X. **Mule-Hide Poly ISO 2 Insulation** - a closed cell polyisocyanurate insulation laminated to heavy, black, non-asphaltic glass fiber reinforced facers. Available as flat stock or tapered.

- Y. **Mule-Hide Modular Butyl Seal Tape** - a cured butyl rubber tape (1" wide) used to seal EPDM membrane at certain details. May be used as a substitute for water Cut-Off Mastic in certain details as noted in the published Mule-Hide details.
- Z. **Mule-Hide Walk Way Pads** - a black, rubber walkway pad available in 30" wide by 30" long pads, approximately 5/16-inch thick. Mule-Hide strongly recommends the pads are adhered to the roof membrane on fully adhered systems.

2.03 INSULATION

A. Approved Insulations

1. **High Density Wood Fiberboard** - shall be a minimum of 1/2 inch thick. When installing over a steel deck, a minimum thickness of 1 inch is required. If using 1/2-inch thick board over a steel deck a minimum 1/2 inch thick barrier board must be installed prior to the High Density Wood Fiberboard. Standard attachment to the deck is 1 fastener/plate per 2 square feet.
2. **Expanded Polystyrene (EPS)** - a minimum of 1 lb. density is required. EPS must be overlaid with a minimum 1/2-inch thick High Density Wood Fiberboard. When installing EPS over a steel deck a thermal barrier may be required. Check local code requirements. Standard attachment of the insulation to the deck is 1 fastener/plate per 2 square feet.
3. **Extruded Polystyrene (EPS)** - Extruded polystyrene insulation must be overlaid with a minimum 1/2-inch thick High Density Wood Fiberboard. When installing EPS over a steel deck a thermal barrier may be required. Check local code requirements. Standard attachment of the insulation to the deck is 1 fastener/plate per 2 square feet.
4. **Polyisocyanurate Insulation** - a polyisocyanurate insulation with a non-asphaltic facer must be a minimum of 1-inch thick. The EPDM membrane may be fully adhered to the polyisocyanurate insulation with the use of the Mule-Hide Bonding Adhesive (solvent based). When using the Acrylic Water Base Adhesive a minimum 1/2-inch thick High Density Wood Fiberboard must overlay the polyisocyanurate insulation. Attachment of the insulation to the deck is 1 fastener/plate per 2 square feet.
5. **Perlite** - This insulation is not an approved insulation and cannot be used as the top layer in a fully adhered system. Mule-Hide does not accept adhering the EPDM membrane to perlite.

B. Barrier Board

Georgia-Pacific's Dens-Deck is a gypsum product that has been rated as a non-combustible barrier board and may be used to obtain fire resistant classifications when installing roofing assemblies over a wood deck. It is also an acceptable product to be installed as a thermal barrier when installing EPS over a steel deck. Product is available 1/4-inch and 1/2-inch thick. Dens-Deck Prime is the same product but has one side coated with an acrylic coating to enhance adhesive coverage rates for fully adhered single-ply systems.

- C. Application rates of the Bonding Adhesive and the Acrylic Water Base Bonding Adhesive may vary with the porosity of the surface of the different insulations to which they are applied. This can also vary for the same generic product from manufacturer to manufacturer.
- D. Insulation boards shall be installed in a manner offsetting the joints in the insulation by a minimum of 6" in each direction with the joints in the wood deck. All insulation boards shall be butted tightly together.

PART 3 EXECUTION

3.01 SUBSTRATE CONDITIONS

- A. The roof deck must be structurally sound and free of defects to provide proper securement for mechanical fasteners. The modular manufacturer shall inspect the deck prior to starting the roof installation and shall be responsible for correcting any defects. Make sure all decking is securely fastened. The modular manufacturer has the final responsibility to ensure an acceptable deck is provided to receive the new roof system.
- B. The deck must be free of debris, dry, free of protrusions, sharp edges and any loose and foreign materials.
- C. The modular manufacturer shall verify that roof openings, penetrations and wood nailers (if applicable) are in place, set and braced, and that roof drains are in the correct position and properly installed. The modular manufacturer shall be responsible that proper drainage is provided and in compliance with current IPC (International Plumbing Code) requirements. Refer to the published details for specific use of wood nailers. Height of wood nailers shall be equal to the height of the insulation at the point of placement.
- D. If no additional thermal resistance is required, the EPDM membrane may be adhered directly to the plywood or Oriented Strand Board (OSB) deck.

3.02 INSTALLATION - UNDERLAYMENT/INSULATION

- A. Except on steel roof decks, the use of insulation and underlayments (fire, moisture, air barriers) is not required but may be specified for a particular project.
- B. When underlayments such as fire-retardant slip sheets or plastic sheeting is specified over a wood deck, a minimum layer of 1/2-inch thick High Density Wood Fiberboard is required as an overlay. The High Density Wood Fiberboard shall be mechanically attached to the roof deck at a minimum rate of 1 fastener/plate per every 2 square feet.
- C. When installing insulation, all boards shall be fitted tightly together with no gaps greater than 1/4 inch wide. Gaps greater than 1/4 inch wide shall be filled with same material. Insulation shall be tightly fitted around all protrusions. Crickets, saddles and other tapered areas shall be installed as needed to provide positive drainage.
- D. All insulation shall be installed with joints offset at least 6 inches from the joints in the deck. Additional layers shall have joints offset from the previous layer.
- E. If either UL or FM (or both) requirements are listed, specific insulation type (or types), thickness, barrier board/slip-sheet, approved deck type and thickness, and rate of attachment may be required. The modular manufacturer must confirm with the membrane manufacturer a listed assembly that will meet the requirements.
- F. Vapor barriers and air barriers may be specified for a specific project. Contact Mule-Hide for appropriate products.
- G. Insulations such as polyisocyanurate, expanded polystyrene and extruded polystyrene shall have a layer of High Density Wood Fiberboard or Dens-Deck installed over the insulation when using the Mule-Hide Acrylic Water Base Bonding Adhesive. Minimum attachment of the High Density Wood Fiberboard and the Dens-Deck shall be 1 fastener/plate per every 2 square feet.
- H. Insulation installed over steel decks shall be checked so that no edges are left unsupported along the flutes of the deck. All insulations used shall be of sufficient thickness and density to prevent breakage under normal roof construction traffic.

- I. Only Mule-Hide FM Approved fasteners and 3" wide Metal Stress Plates may be used to attach the insulation to the deck.

3.03 MEMBRANE INSTALLATION

- A. Fully adhere the EPDM membrane to the substrate with the Mule-Hide Acrylic Water Base Bonding Adhesive. The Acrylic Water Base Bonding Adhesive is applied only to the substrate as a single-side, wet lay-in adhesive.
 1. Align the EPDM membrane making sure there is sufficient membrane to cover the unit in one piece with ample material hanging over all edges. **Allow the membrane to relax at least 30 minutes prior to applying adhesive.**
 2. Once relaxed, using the cardboard core (or a section of 3" – 4" diameter PVC pipe), making sure not to move the material out of alignment, re-roll the membrane back onto the core. Only re-roll the membrane to the midpoint of the roof.
 3. Always thoroughly stir the adhesive before application. Apply the adhesive starting at the roll and working toward the end of the unit. Adhesive should be applied with a minimum 1/2-inch thick, napped paint roller. The adhesive shall be applied at an approximate rate of 100 to 120 square feet per gallon. Due to the porosity of a particular board, coverage rates may vary. (Note: Application rate over Dens-Deck is about 60 square feet per gallon. If using Dens-Deck Prime, application rate is about 100 to 120 square feet per gallon.) Never exceed 120 square feet per gallon. Adjust the application rate to compensate for absorption into the surface.
 4. The adhesive is similar in consistency to a heavy latex paint and white in color. Apply a uniform coat to the substrate until it is white in color. Leave no voids when spreading the adhesive.
 5. **As you apply the adhesive, immediately roll the membrane into the wet adhesive. Continue this process to the end of the roof. Repeat this procedure with the second half of the roof. Once the sheet is down, thoroughly broom the entire surface using sufficient pressure to work out bubbles or wrinkles.**
 6. **Mule-Hide recommends periodically checking the adhesive application rate.** Immediately after brooming the membrane, gently pull the sheet back from the end of the unit 1 to 2 feet and check the surface of the membrane. A uniform coat of adhesive should have transferred onto the EPDM membrane. This would indicate a sufficient amount of adhesive was used. Failure to observe a sufficient transfer of adhesive to the membrane indicates a less than adequate amount of adhesive was applied or the EPDM membrane was not immediately rolled into the adhesive while it was wet. The adhesive will turn clear and remain tacky but will not provide sufficient strength to hold the membrane in place. The applicator shall adjust the application rate accordingly.
The membrane must be laid into the adhesive while it is wet.
- B. Membrane Installation Using Mule-Hide Bonding Adhesive (solvent based) - Optional
 1. Roll out membrane over unit making sure there is ample material to extend over all edges. Allow the membrane to relax at least 30 minutes prior to applying adhesive.
 2. Fold the EPDM membrane either in half lengthwise or front to back or vice versa. Make sure not to move the sheet out of alignment. After stirring the adhesive, use a 1/2-inch nap roller to apply a uniform coat of adhesive to both the substrate and the membrane. Leave no voids or puddles of adhesive. Approximate coverage rate is 100 to 120 square feet per gallon to each surface. This will yield a finished coverage rate of 50 - 60 square feet per gallon.

3. When both surfaces are tacky to the touch, carefully roll the membrane out over the adhesive, mating the membrane to the substrate. A 15 to 30 minute drying time is typical but will vary with temperature and humidity. Roll the material out carefully making sure not to trap air or put wrinkles into the sheet. This is a contact adhesive and once both surfaces are mated, they cannot be moved. Repeat the procedure with the remainder of the sheet. Thoroughly broom the entire surface with a push broom to ensure proper contact.
- C. If no vents, equipment or skylights are to be installed in the plant it is recommended that openings for such details not be cut out until the unit has been set on its support foundation at the project site.
- D. Perimeter termination of membrane
1. Prior to installing Mule-Hide All-Purpose Bar (termination bar), wood stripping or "J" channel, install the 1-inch wide butyl tape along the exterior side of the unit where it will just be covered by the EPDM membrane. This should be 2 to 4 inches down from the roof surface. Refer to the appropriate Mule-Hide detail. The EPDM membrane should be firmly pressed into the tape with a steel roller.
 2. The termination bar shall be installed over the EPDM membrane centering the bar over the butyl tape. This will ensure the fasteners used to attach the termination bar pass through the butyl tape. Excess EPDM membrane below the bar may be trimmed off with a utility knife. If this is a permanent detail, apply a bead of Lap Sealant along the top edge of the termination bar.
 3. The front corners of the units may be folded to the sides to prevent air getting into the unit during transportation. The rear corners should be folded to the rear of the units. It is essential that air does not get under the membrane during transportation.
 4. If the edge detail is only temporary, 1" x 2" or 1" x 4" wood stripping may be used in place of the termination bar. However, Mule-Hide strongly recommends the use of the termination bar with the Mule-Hide #12 DP or TP fasteners for the best possible method of termination. The Mule-Hide All-Purpose Bar is pre-drilled 6 inches on center to speed installation.
 5. If not installing a continuous clip, metal drip apron should not be installed until the unit has been positioned at the project site.
- E. Membrane Seaming
1. If seaming of the membrane (one sheet to another) is required either in the plant or at the project site, the preferred method is with the Mule-Hide In-Seam Tape.
 - a. Make sure the top sheet is lapped over the bottom sheet in shingle fashion so that water will flow over the seam edge and not against it.
 - b. All surfaces to be seamed shall be clean and dry. Overlay the top sheet a minimum of 3 inches and fold back the top sheet approximately 12 inches for priming with Tape Primer.
 - c. Prepare each surface of the seam by scrubbing the areas with Mule-Hide Tape Primer using clean Scotch-Brite® Pads. The pads should be replaced with new ones as they become dirty. Apply the Tape Primer in an overlapping circular motion. The primed surface should have a uniform black color when dry. There should be no streaks present. Approximate coverage is 200 to 250 square feet per gallon. The Tape Primer should be thoroughly stirred before each use.

- d. Allow the Tape Primer to dry to the touch. Lightly roll the top sheet over the bottom sheet but do not press the sheet down. Place marks (crayon or marker) along the length of the top sheet spaced about every three feet. The marks should be about 5/8" to 3/4" away from the edge of the top sheet. Do not use chalk lines as the dust will contaminate the primer. After placing the guide marks, fold back the top sheet. Align the In-Seam tape so that the edge of the release liner is touching the guide marks. Leaving the release liner in place, install the In-Seam Tape along the marks on the bottom sheet. Apply light hand pressure to the tape as it is being installed. After installed, follow up by rolling the tape with a 2-inch wide steel roller running the roller perpendicular to the seam with overlapping strokes. If more than one roll is needed to complete a seam overlap the second roll about 1-1/2 inches.
 - e. Where In-Seam Tapes intersect at the corner of a sheet, the tapes must overlap a minimum of 1 inch. Both sides of the corner (at least 6 inches in each direction) shall be caulked with Lap Sealant.
 - f. Fold the top sheet back onto the tape so that the sheet is laying flat over the release paper. Peel the release paper off the tape at a 45 degree angle and parallel with the roof surface allowing the top sheet to fall freely on to the exposed tape. Using hand pressure, wipe the seam toward the splice edge. Immediately roll the seam with a 2-inch wide steel roller, running the roller perpendicular to the length of the seam. Use overlapping strokes and roll the entire seam.
 - g. There should be approximately 1/8 inch to 3/8 inch of exposed In-Seam Tape the entire length of the seam. If more than 1 inch of tape is exposed the seam must be stripped with Cured Laminated Tape (Cured Cover Tape). If the In-Seam Tape is flush with the top sheet the seam must be caulked with Lap Sealant. If installed properly, Lap Sealant is not required except at those locations where a second piece of tape overlaps another.
2. Membrane Seaming with Splice Adhesive (Optional)
 - a. Make sure the top sheet is lapped over the bottom sheet in shingle fashion so that the water will flow over the seam edge and not against it.
 - b. Prepare each surface of the seam by scrubbing the areas with Mule-Hide Seam Cleaner using Scotch-Brite® Pads or clean lint-free rags. Additional cleaning may be needed along the factory seams to remove excess buildup of talc. The cleaned membrane should have a uniform black color when dry. There should be no streaks. Replace pads and rags as they become dirty. Note: Mule-Hide's Tape Primer may be used as a substitute for Seam Cleaner when using Splice Adhesive. Always thoroughly stir liquid products prior to use.
 - c. Once the Seam Cleaner has dried, apply the Splice Adhesive to the cleaned surface of both sheets. Mule-Hide recommends the use of a solvent resistant, 3 - 4 inch wide, short bristle paintbrush or a solvent resistant 3 - 4 inch wide, 1/2-inch, medium nap, paint roller.
 - d. Apply the adhesive in a uniformly thick, even coat. When using a paintbrush do not use circular motions. Use long, straight strokes applying sufficient adhesive that will achieve a smooth surface without leaving brush marks. When using a roller do not over roll the adhesive. This will cause an uneven application.

- e. Do not allow adhesive to puddle as these areas will not dry properly and may cause excessive swelling of the membrane that may result in fishmouths in the completed seam. The adhesive must be applied to both surfaces of the seam at the same time to allow for uniform drying of the adhesive. The adhesive must fully cover the surface of the splice area a minimum of 3 inches wide. Allow the adhesive to dry until tacky to the touch of a dry finger without stringing or moving when pushed forward or twisted. Typical coverage rate of the Splice Adhesive is approximately 150 linear feet for a 3-inch wide seam (applying a 4-inch wide coat of adhesive to each surface).
 - f. Drying time will vary from day to day depending on the ambient weather conditions. In low temperatures, condensation may form on the surface caused by the solvents flashing off as the adhesive dries. If this occurs, the application of the Splice Adhesive should be discontinued. The surface must dry naturally and a new, thin coat of adhesive shall be applied.
 - g. Once the adhesive is tacky, roll the top sheet onto the bottom sheet being careful not to stretch or wrinkle the membrane. Apply hand pressure brushing the seam toward the top splice edge removing any fishmouths and trapped air.
 - h. Immediately roll the seam with a 2 inch wide steel roller running the roller perpendicular to the length of the seam. Using overlapping strokes roll the entire length of the seam.
 - i. All "T-Joints" (where 2 seams intersect) shall be patched with a 6-inch by 6-inch piece of uncured EPDM Flashing (Uncured Flashing Tape or Pre-Cut Corners may also be used). All seams completed with Splice Adhesive shall be sealed with a bead of Lap Sealant. Allow a minimum of two hours prior to application of the Lap Sealant.
 - j. Just prior to applying the Lap Sealant, the seam edge shall be cleaned with a clean rag or cloth using the Mule-Hide Seam Cleaner to remove any dirt or talc that has accumulated along the seam edge. Apply a continuous bead being sure to cover the seam edge. It is not necessary to trowel the Lap Sealant. The Lap Sealant shall be applied at a maximum rate of 20 linear feet per tube.
3. Regardless of the method used to splice seams, all seams must be thoroughly inspected for fishmouths, bubbles, blisters and wrinkles and repaired as needed.
 4. If fishmouths or wrinkles occur in the seam, they must be cut out and patched with cured membrane (Cured Cover Tape may be used). Do not use uncured products to patch seams.
 5. Patches must be at least 3 inches larger in all directions than the area that has been cut out. Round corners of all patches. Center the patch over the area to be repaired. Follow the splicing procedures for the appropriate material used. All patches shall be caulked with Lap Sealant.

3.04 MEMBRANE SECUREMENT (MECHANICAL)

- A. Additional securement of the EPDM membrane by mechanical attachment must be provided at the perimeter of each roof level, at the base of walls, parapets, curbs, skylights, expansion joints, tie-ins (to other roofs), bottom of valleys and top of ridges of sloped roofs, angle changes that exceed inclines of 2 inches per foot or greater and various penetrations as depicted in the published details. All securement may be either horizontal or vertical to the point of angle change.

- B. Mechanical attachment may be achieved by one of the following methods:
1. Mule-Hide All-Purpose Bar (A-P Bar)
 - a. The Mule-Hide A-P Bar is an extruded aluminum bar that has pre-punched holes spaced 6 inches on center. Refer to the published details for proper placement of the bar. When using the A-P Bar, maximum attachment spacing shall not exceed 12 inches on center. Adjoining bars should be spaced 1/2 inch to 1 inch apart.
 - b. When used as a perimeter termination, the bar is to be installed continuously. If the bar is used as an anchor bar at the base of a curb, wall or other vertical surface, the bar may be installed a minimum of 3 inches to a maximum of 6 inches from the corner to ease the flashing of the corner. In no event is the bar to be covered with uncured flashing material. The bar, when required to complete a detail, may only be covered with cured EPDM material or Cured Laminated Tape (Cured Cover Tape). Refer to the published details for proper flashing materials.
 2. Mule-Hide RMS Strip
 - a. The Mule-Hide RMS strip is a 6-inch wide, reinforced strip of EPDM membrane. The RMS is also available with a 3-inch wide strip of pressure sensitive butyl tape laminated to one side (product is referred to as "RMS w/Tape"). Either product may be used, however, the RMS w/Tape simplifies the application procedure.
 - b. The RMS and the RMS w/Tape is mechanically attached either horizontally or vertically at the base of an angle change (walls, curbs, parapets, etc.) using the Mule-Hide 2-inch Barbed Seam Plates. The plates are fastened to the deck or the vertical substrate using Mule-Hide #14 HD fasteners with a maximum spacing of 12 inches on center. Standard 2-inch diameter Seam Plates (non-barbed plates) are available when anchoring the RMS to a hard surface such as concrete.
 - c. Refer to the Mule-Hide published details MHE-124 and MHE-125 for appropriate placement of the RMS strips. Detail MHE-119 shows the proper positioning of the Seam plates.
 - d. For vertical attachment, the RMS (or RMS w/Tape) strip must extend a minimum of 3 inches onto the horizontal surface and not more than 3 inches up the vertical surface. If using the RMS w/Tape, the side of the strip with the tape shall always be positioned on the horizontal surface with the tape face up. Installation of the plates may start a minimum of 6 inches to a maximum of 9 inches from both inside and outside corners with a maximum spacing of 12 inches on center.
 - e. For horizontal attachment, the RMS (or RMS w/Tape) strip must be placed not more than 1/2 inch from the base of the vertical surface (or angle change). The strip is installed prior to installing the EPDM field sheet. If using the RMS w/Tape, the side of the strip with the tape is positioned toward the interior of the roof. Do not install the 2-inch Barbed Seam Plates over the half of the strip with the tape. Refer to Mule-Hide's detail MHE- 125 for proper placement of the strip and 2 inch Barbed Seam Plates. Installation of the plates may start a minimum of 6 inches to a maximum of 9 inches from both inside and outside corners with a maximum spacing of 12 inches on center.
 - f. Using the RMS strip requires the use of Splice Adhesive and Seam Cleaner or 3-inch wide In-Seam Tape and Tape Primer. If using the RMS w/Tape, the In-seam Tape is pre-applied to the RMS and only requires Tape Primer to prime the EPDM membrane.

5. Both sides of the overlap and the end of the second piece shall be caulked with Lap Sealant. Apply a bead along each side of the overlap approximately 3 inches beyond each end of the two strips. Repeat this procedure for each mate-line. Intersecting mate-lines shall be treated as "T-joints" and shall have each intersection patched with Uncured Flashing Tape and then caulked with Lap Sealant. Lap Sealant should not be applied at a rate greater than 20 linear feet per tube.
- B. Mule-Hide does not recommend the use of cured EPDM strips installed with Splice Adhesive to seal mate-lines. If using the Mate-Line Tape, bridging material or backer rod shall be required over the joint prior to the installation of the Mate-Line Tape. If a system warranty is required for the project, Self-Bridging Mate-Line™ must be used. Refer to the published details for installation options.

3.06 FLASHING INSTALLATION

- A. All walls, parapets, curbs and other penetrations shall be flashed with cured EPDM membrane where possible. The use of Uncured EPDM Flashing or Uncured Flashing Tape shall be limited to those details such as inside and outside corners, pipes, scuppers, metal pitch pans, patches over the "T-Joints", patches at the base of all vertical field seams (at the angle change) and other shaped penetrations that require the flashing to be molded and cured product is not practical. All flashing shall be performed in accordance with Mule-Hide's published details. All vertical flashings shall require the use of Mule-Hide Bonding Adhesive (solvent base). Mule-Hide's Acrylic Water Base Bonding Adhesive is not permitted for use on vertical surfaces.
- B. Vertical wall, curb and skylight flashings.
 1. Cured EPDM membrane shall be used to flash all vertical surfaces except when flashing inside and outside corners or other details that require the flashing to be molded.
 2. There are two basic methods of flashing vertical surfaces. Each method is dependent on the type of attachment used to anchor the field membrane at the base of the vertical surface.
 - a. When using the RMS strip as the mechanical attachment, the field sheet may be continued up the vertical surface to the point of termination.
 - b. When using the All-Purpose Bar as the mechanical attachment, the field sheet is turned up the vertical only enough to accommodate the placement of the All-Purpose Bar as depicted in Mule-Hide Details MHE-120 and MHE-122. Cured EPDM membrane is used to flash over the bar and up the vertical surface to the point of termination. A minimum of a 3-inch wide seam is completed at the base of the vertical surface in front of the All Purpose Bar.
 3. The minimum height of the flashing on a vertical is 8 inches where possible.
 4. Surfaces such as corrugated siding (metal or other), stucco, EIFS and other irregular surfaces are not acceptable substrates to adhere vertical flashings.
 5. Through-wall counterflashings, weep holes and overflow scuppers must not be covered by the new EPDM membrane flashings. Termination of the membrane must be below the through-wall counterflashings.
 6. All vertical flashings must be fully adhered to the vertical surface with the Mule-Hide Bonding Adhesive (solvent base).

C. Pipe Flashings

1. Single pipe penetrations may be flashed with Mule-Hide pre-molded EPDM pipe boots. The boots are available with or without pressure sensitive tape laminated to the boot flange. Tape Primer is required to install the Pipe Boot w/Tape. Splice Adhesive and Seam Cleaner are required to install the boot without the tape. The pre-molded pipe boot is designed to slide over the pipe. It cannot be cut to wrap around a pipe. The membrane around the base of the pipe shall be primed with Tape Primer and allow to dry. The top of the boot is cut to the first ring that is smaller than the diameter of the pipe. The boot is slipped over the pipe and positioned on the membrane. The release liner is pulled out from under the flange letting the tape contact the primed EPDM surface. The flange is thoroughly rolled with a 2-inch wide steel roller. The top of the boot collar is turned down the pipe about 1 inch. A bead of Water Cut-Off Mastic is applied around the pipe at the fold in the collar. The collar is turned back up sandwiching the Water Cut-Off Mastic between the top of the collar and the pipe. A clamping ring is installed compressing the collar over the Water Cut-Off Mastic. The Water Cut-Off Mastic must not be exposed as it is not designed to be UV stable. Following the clamping ring, a bead of Lap Sealant is applied around the top of the boot sealing the EPDM boot to the pipe.
2. Pipes where a Pipe Boot cannot be used must be field flashed with Uncured Flashing Tape and Tape Primer. This will require the installation of two base pieces and one piece to wrap around the pipe. The base pieces shall be a minimum of 6 inches wider than the pipe. The two base pieces shall be installed from opposite sides and turned up the pipe a minimum of 3/4 inches and overlap each other at least 3 inches. The vertical wrap shall extend up the vertical surface at least 8 inches and out onto the horizontal surface at least 1-1/2 inches. All flashing edges shall be caulked with Lap Sealant.
3. Multiple pipes or conduit penetrations that are too small for a pipe boot or are too close together to effectively field flash must be flashed with a Pourable Sealer Pocket. the pocket is filled a minimum of 2 inches deep with Pourable Sealer.
4. Hot pipes exceeding 180°F shall require the installation of an insulated cold collar (sleeve) to which the flashings may be adhered. Cold collars require the use of rain collars (aprons or hoods) to prevent leakage between the pipe and the cold collar.

D. Drains and Scuppers

1. Field seams must not run through the drains. Target patches (minimum 4' x 4') are required when field seams intersect drains.
2. Refer to the published details for examples for flashing roof drains. One tube of Water Cut-Off is required around the drain bowl. The EPDM membrane is pressed into the bowl and is anchored to the drain with the clamping ring. The opening in the membrane over the drain shall be the same diameter or slightly larger than the actual drain opening. Do not cut a hole smaller than the drain opening.
3. Scuppers are installed after the EPDM has been adhered to the vertical surface. Scuppers must have welded, watertight corners. Cleaning the metal surface with a solvent (toluene or xylene) may be required prior to installing the flashing. The scupper acts as additional mechanical attachment of the EPDM membrane. A heavy bead of Water Cut-Off mastic is applied around the neck of the scupper tight to the scupper flange. When installed, the Water Cut-Off acts as a compression sealant between the scupper and the membrane. The flanges of the scupper are secured with screws and stripped with Uncured Flashing Tape with all edges caulked with Lap Sealant.

E. Expansion Joints and Tie-Ins

1. Tie-ins to existing roof systems are not covered by Mule-Hide warranties. Tie-ins will vary with the type of existing roof system. Mule-Hide recommends that new roof systems be isolated to the deck surface to prevent leakage through an existing roof system carrying across a deck and getting under the new system. Refer to details MHE-160, MHE- 161 and MHE-162.
2. Whenever there is an expansion joint in the roof deck or walls, an expansion joint must be installed in the roof system when installing a fully adhered system. Refer to Mule-Hide's published details for various flashing options.

F. Vent Flashings

1. When a system warranty is requested, metal vents installed to vent air space under the deck shall only be those designed for application on low-slope roofing systems. Metal vents designed specifically for steep slope application (shingle vents) are not acceptable for warranted projects. The design of the vent (one way or two way) shall provide sufficient protection from leakage due to snow loads, ice build up and hard wind driven rain. Openings should be a minimum of 6 to 8 inches above the roof surface.
2. Mule-Hide's Special Spun Aluminum (insulated) Breather Vent is available as a one-way or a two-way vent.
 - a. The Mule-Hide Breather Vent has a narrow flange at the base that allows for mechanical attachment to the deck and at the same time permits the use of a Standard Mule-Hide EPDM Pipe Boot w/Tape for flashing to the EPDM membrane. Field fabrication with Uncured Flashing is no longer necessary as with typical roof vents. The vent is positioned on the roof and fastened to the roof deck with Mule-Hide HD fasteners (4 per vent). The EPDM membrane around the vent is primed with Mule-Hide Tape Primer at least 6 inches out from the metal edge of the vent.
 - b. The collar of the Mule-Hide Pipe Boot w/Tape is cut to fit tight to the shaft of the vent. The boot is fitted down over the vent with the flange resting on the roof surface. The release liner is pulled out from the boot flange letting the tape mate with the primed EPDM membrane. The boot flange is thoroughly rolled with a 2-inch wide steel roller. A clamping ring is installed around the top of the collar. A bead of Lap Sealant is applied around the edge of the boot flange and around the top of the collar completing the detail.
3. Other metal vents must be submitted to Mule-Hide for review and determination of proper flashing methods provided such vents have a sufficient flange to flash against and the vent is determined to be of sufficient height (6 to 8 inch minimum) to prevent water infiltration. Vents designed for shingle application are not acceptable.

G. Metal Flashings

1. Metal work by others, such as copings, gravel stops, drip aprons, counterflashings and expansion joint covers must be properly fastened and sealed to prevent moisture infiltration into the roof system. Refer to Mule-Hide published details for flashing options.
2. Selection of the type of metal design, metal work and securement of the metal components is not covered by Mule-Hide warranties.
3. All metal copings, gravel stop, drip must be as recommended in Mule-Hide's published details. Designs not similar to those published by Mule-Hide must be reviewed by Mule-Hide prior to installation.

3.07 TEMPORARY NIGHT SEALS

- A. Install temporary cut-offs around incomplete edges of roofing assembly at the end of each day's work and when work must be postponed due to inclement weather.
- B. All loose membrane edges should be sealed with Mule-Hide's Water Cut-Off Mastic or Pourable Sealer to prevent water migration under the finished roof sections.
- C. For temporary tie-ins to existing BUR, metal or other single-ply roofing systems, make sure the surface of the adjoining roof is smooth clean and dry. Using either Water Cut-Off Mastic or Pourable Sealer, apply a continuous, heavy bead along the length of the tie-in. Press the membrane into the sealant making sure there is a complete and continuous seal. Apply weight over the seal to ensure wind does not pull the seal open. Effectiveness of temporary tie-ins are the responsibility of the crew completing the work at the project site and not that of Mule-Hide.

3.08 WALKWAY PADS

- A. Walkways should be provided in areas where routine roof top maintenance occurs in areas where regular rooftop traffic is expected. This should include but is not limited to all roof access points such as doors, hatches and ladders, and around roof top mechanical equipment (along the side where service panels are located).
- B. Mule-Hide recommends the use of rubber walk pads as they may easily be adhered directly to the EPDM membrane. Do not install walk pads over field seams or flashings. The Mule-Hide Walkway pads may be installed with In-Seam Tape (and Tape Primer) or may be spot or fully adhered to the EPDM membrane using Seam Cleaner and Splice Adhesive. Mule-Hide recommends Walkway pads be installed at the project site and not in the plant.
- C. Mule-Hide does not include the Walkway pads under the warranty as they are considered maintenance items and are not part of the roofing system.

***** 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