

System Specifications

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MECHANICALLY ATTACHED TPO SYSTEM INDUCTION WELDING ATTACHMENT METHOD 07 54 00/MUL

Revision Date: May 2020

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MECHANICALLY ATTACHED SYSTEM SPECIFICATION INDUCTION WELDING ATTACHMENT METHOD

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This is an alternate method for securing Mule-Hide's TPO-c or PVC membranes and is intended to be used in conjunction with the Mule-Hide's Mechanically Attached TPO or PVC Roofing System Specification.

1.01 Description

The Mule-Hide Induction Welding attachment method incorporates 3" diameter corrosion-resistant plates with either a hot melt TPO coating or a hot melt PVC coating. The Mule-Hide Induction Welding Plates (Induction Welding Plates) are installed with Mule-Hide EHD Fasteners to secure an acceptable insulation to minimum 22 gauge steel deck or minimum 15/32" thick plywood. Note that only TPO Induction Welding Plates may be used with TPO membrane, and that only PVC and PVC-KEE membranes may be used with the PVC Induction Welding Plate. This attachment method is not for use with fleece back or self-adhered membranes.

Mule-Hide's TPO-c or PVC (Heat-Weld) Reinforced membrane is positioned over the secured Induction Welding Plates and welded to the top surface of the plate with the Induction Welding Tool.

Projects utilizing the Induction Welding Plate Attachment Method will qualify for system warranties up to a maximum 20 year warranty. Contact the Mule-Hide Technical Department for warranty enhancement requirements.

1.02 Products/Heat Welding Equipment

Products listed in "Part II of the Mule-Hide Mechanically Attached TPO or PVC System Specifications can be used as part of this alternate securement method in conjunction with the Induction Welding Plates.

- A. **Induction Welding Plate:** A 3" diameter, 0.028" thick, corrosion-resistant steel plate with hot melt coating of either TPO or PVC on the top surface. The plate is used in conjunction with Mule-Hide EHD fasteners to attach the roofing assembly and is activated using the Induction Welding Tool.
- B. **Induction Welding Tool:** An induction heating tool is used to emit the magnetic field that activates the hot melt coating on the top

surface of the Induction Welding plate to fuse with the Heat-Weld roofing membrane. Refer to Induction Welding Tool Owner's Manual for additional information.

- C. **Cooling Clamp Device:** A stand-up device that allows the weld to cool as it clamps the membrane to the heated plate. Refer to Induction Welding Tool Owner's Manual for additional information.
- D. **Heavy Duty Plunger:** Used for testing bond of Induction Welding Plate to matching Mule-Hide roofing membrane.

1.03 Induction Welding Tool Calibration

- A. Prior to attaching the roofing membrane to the Induction Welding Plates, the Induction Welding Tool must be calibrated with samples of the project insulation thickness and type and project specified membrane thickness. Refer to Induction Welding Tool Owner's Manual for additional information.
 - 1. Loose lay five Induction Welding Plates in a row about 12-24 inches apart on the specified membrane substrate.
 - 2. Place Heat-Weld membrane over the Induction Welding Plates.
 - 3. Center the Induction Welding Tool over the Induction Welding Plates under the membrane and use the device's default setting. Weld the membrane to the first plate, and when ready, completely remove Welding Tool. Immediately place the Cooling Clamp on the membrane over the plate and leave in place for 60 seconds. Mark the Welding Tool energy setting used for that particular plate on the membrane near the fastener.
 - 4. Place Induction Welding Tool on the next plate as previously done and increasing induction energy one level by depressing the  (UP) button once. After welding, immediately place the Cooling Clamp over the plate. Mark the Induction Welding Tool energy setting used for that particular plate on the membrane near the fastener.
 - 5. Repeat above procedure for the remainder of the plates, increasing induction energy one level for each plate.
 - 6. After allowing the membrane and plates to cool to ambient temperature, remove Cooling Clamps. Turn the membrane

over and use a pair of pliers to peel the Induction Welding Plates from underside of membrane to determine bonding strength. Examine the top of the plates for weld quality. A 100% bond to the top of the plate is required.

7. Repeat trial process, if needed, adjusting energy level up or down until desired results are achieved.
8. Set the Induction Welding Tool to the setting the produces a 100% bond. Several settings may yield a 100% bond. If this happens, select the energy level setting in the middle. See below for descriptions of acceptable and unacceptable bonds.
 - a. **100% Bond (required)** – Total, even, consistent adhesion of membrane. Plate makes a visible impression on the top of the membrane.
 - b. **Partial Bond (unacceptable)** – Uneven/incomplete adhesion of membrane. Energy setting may be too low, heat source may be off center, or plate may be overdriven.
 - c. **Excessive Heat (unacceptable)** – Membrane may turn yellow, melt or become dimpled.

B. Calibration Tips:

1. Recalibrating the induction tool settings is necessary when ambient temperature changes more than +/- 15°F or power to device has been interrupted. This may be necessary several times a day. Do not assume that the same setting will work throughout the day.
2. If a Low Voltage message appears in the display or if you do not get a 100% weld during calibration, check power at the end of the cord and determine what else is running on the same circuit. Power may be diminished if:
 - a. The cord is too long or
 - b. The power source is overloaded.

1.04 Installation

- A. After placement of insulation on substrate, secure the insulation at a rate of six (6) Mule-Hide EHD Fasteners and Induction Welding

Plates per 4' x 8' board in the field. Note: Avoid fastener overdrive to prevent plate from deforming.

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:

Perimeters – insulation attachment to be increased 50% over the field attachment requirements to nine (9) fasteners per 4' x 8' board or 1 fastener every 3.55 square feet.

Corners – insulation attachment to be increased 100% over the field attachment requirements to twelve (12) fasteners per 4' x 8' board or 1 fastener every 2.66 square feet.

- a. For Factory Mutual projects, the width of the roof perimeter and corner areas is defined as the smaller of 0.1 times the building lesser plan dimension or 0.4 times the eave height (mean roof height for slopes greater than 2"/12" slope), except for heights greater than 60 ft. The minimum width of the perimeter and corner areas shall not be less than three (3) feet. Contact Mule-Hide Technical Department for Factory Mutual projects exceeding 60 ft. heights.
 - b. For non Factory Mutual projects, the minimum width of the perimeter and corner areas shall not be less than eight (8) feet.
- B. Place the Heat-Weld membrane over the appropriate Induction Welding Plates and allow membrane to relax.
 - C. Place Induction Welding Tool centered over the Induction Welding Plates (+/- 1") under the roofing membrane.
 - D. Elevate the temperature of plate from ambient to 400-500°F using induction tool.
 - E. Immediately place Cooling Clamp on the membrane over the plate and leave in place for at least 60 seconds.
 - F. Resume process ensuring membrane is attached to all plates.

1.05 Induction Welding Plate Test Procedure

Test all Induction Welding Plates during construction. To determine if a weld has been made, place a heavy duty plunger next to a welded plate and create enough suction to lift the membrane. An acceptable weld will crease the membrane around the edge of the plate. If the assembly is not welded, the membrane will lift up off of the plate. Mark any plates that are not welded and return to complete the weld as required. Unwelded plates are not permitted anywhere in the system.

1.06 Membrane Hot Air Welding Procedures & Additional Securement

- A. Join membrane sheets by overlapping and heat welding the seam following standard welding requirements as outlined in 3.09 Welding of Lap Areas of the Mule-Hide Mechanically Attached TPO Roofing System Specification.
- B. Base Attachment at any area where the change of plane is equal to or exceeds 2" per foot (2:12) is required as outlined in Section 3.10 Additional Membrane Securement (Base Attachment) in Mule-Hide's Mechanically Attached TPO or PVC Roofing System Specification and must be done using one of the following methods:
 - 1. Utilize Induction Welding Plates and EHD fasteners placed 3-½" to 4" away from angle change as shown in Details MHT-RB1 and MHT-RB2.
 - 2. Using 2.4" Seam Plates and EHD Fasteners placed either horizontally into the deck or vertically into the wall as depicted in Detail MHT-UN-305A.

Note: 6" or 10" RUSS or RMS products are not approved for use in Induction Welding attached systems.

1.07 Associated Installation Details

- A. Induction Welding Plate Attachment Requirements..... MHT-IW1
- B. Base Attachment with Induction Welding Plates.....MHT-IW2

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.

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