APPLICATION INSTRUCTIONS

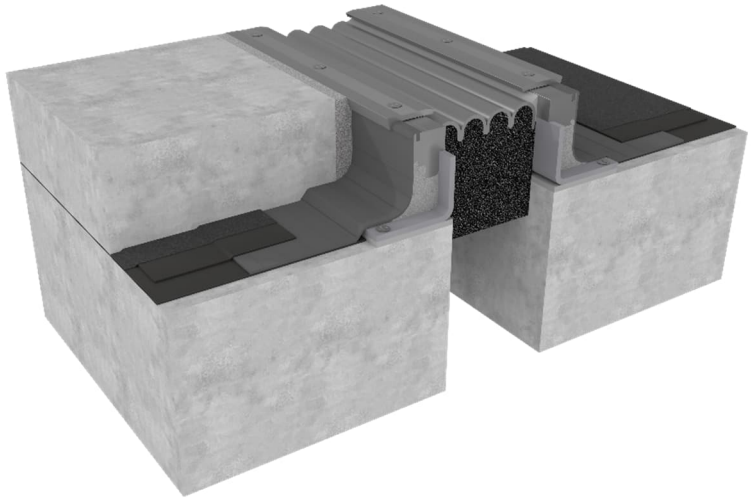
WILLSEAL® MSS

Mechanical Split Slab with Foam Expansion Joint for Split Slab Construction

1. PURPOSE

1.1 The purpose of this document is to establish typical guidelines for the installation of Willseal MSS. The techniques involved may require modifications to adjust to job site conditions. Consult your local Tremco Sales Representative or Tremco Technical Services for specific design requirements.

1.2 Willseal MSS is used as a waterproof, traffic-bearing expansion joint specifically for split-slab applications, including slab-to-slab and slab-to-wall conditions and columns. It can be successfully utilized in both restoration and new construction scenarios. This product is recommended for use in parking garages or areas with low-speed vehicular traffic, plaza decks, podium decks, pedestrian bridges, concourses, sidewalk areas, airport service roads, and other similar applications.



2. SCOPE

2.1 This document will provide typical instructions for installation of Willseal MSS to qualify for a manufacturer's warranty.

3. RECOMMENDED TOOLS & ACCESSORIES

APPLICATION	RECOMMENDED TOOL / ACCESSORY	COMMENTS
Rubber Welding	Hot Air Welder	• Contact Tremco Technical Services for additional information
Concrete, Metal, & Foam Cutting	4" Grinder	• Concrete diamond cup blade for concrete cutting • Metal cutoff wheel for small metal cuts
	Reciprocating Saw	• Metal cutting blades for small metal cuts • Wood blades for use with foams
	Bandsaw	• Metal cutting capabilities • 12" to 14" cutting capacity

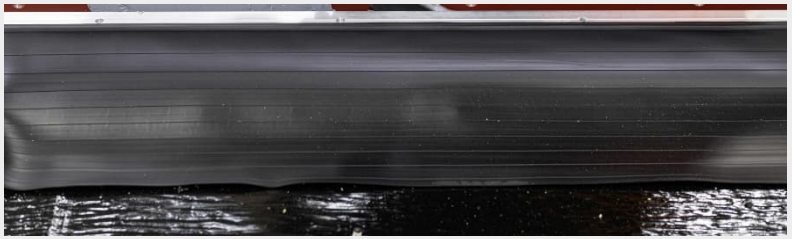
	Handheld, Fine-Tooth Mill File	• For removing burs after cutting
	1/4" Scratch Awl	• For marking of metal
	Utility Knives with Razor Refills	• Have ample supply on hand
	Long Bladed, Serrated Chef's Knife or Bread Knife	
	Hack Saw	
	Miter Box or Cutting Block	
	Smooth-Blade Insulation Knife	
Drilling	SDS-Hammer Drill	• Minimum 2 per installation
	3/8" Diameter Masonry Bit	• 3 to 4 bits per installation
	Variable Torque, Commercial-Duty Cordless Drill or Impact Wrench	• Minimum 2 per installation • Must have a variable clutch setting • Maximum drill or impact wrench torque rating of 450 ft-lbs (610 Nm)
	Twist-Drill Bit Set	• With sizes ranging from 1/32" to 1/2" minimum for metal drilling
	High-Speed Drill Bits	• 13/64” (5 mm) and 5/16” (8 mm) size bits needed • For new holes and caps
	High-Speed 3/4" Metal Countersink Bit	
Fastening	T-50 Torx Driver Bits with 3/8" Drive	• Minimum 6 per installation
	#4 Philips Drive Bits	• Minimum 6 per installation
	Long Handed 3/8” Drive Torque Wrench	• Beam or clicker style with adaptor to accept #4 Philips bit for installation of capping strip screws • Must accurately read between 60 in-lbs (5.2 ft-lbs; 7 Nm) and 240 in-lbs (20 ft-lbs; 27 Nm)
Mixing & Spreading	Heavy Duty, Plug In, Low or Variable Speed, High-Torque Mixing Drill	• For mixing setting compound
	1-1/2" Diameter Jiffy Mixer or Egg Beater	• For pre-mixing • Minimum 2 per installation
	3" Diameter Paddle Mixer	• Minimum 2 per installation
	5-Gallon Pails	• 1 to 2 per installation for mixing and cleaning
	2" Wide Margin Trowels	• Minimum 6 per installation
	3" Wide Margin Trowels	• Minimum 6 per installation
Gunning & Tooling	10-oz Cartridge Gun	• For installing splice sealant • Minimum 2 per installation
	20-oz Sausage Gun	• For detail and face joinery beads • Minimum 2 per installation • Compatible sausage gun nozzles
	1/4" Caulking Spatulas	• For tooling detail beads • Minimum 3 per installation

	3/4" Caulking Spatulas	• For tooling splice adhesive • Minimum 3 per installation
Miscellaneous Tools & Materials	Plastic Spray Bottles	• Minimum 2 per installation • 1 for clean water, 1 for solvent
	Duct Tape	• Minimum 3 rolls per installation
	2-ft Level	
	4-ft Level	
	Torpedo Level	
	Combination Square	
	Chalk Line with Chalk Refill	
	Flat Bar and Small Pry Bar	
	Rubber Mallet	
	Box of Clean, Dry, Lint-Free Rags	
	Shop Vacuum with HEPA Dust Containment Filter	
	Heavy-Duty Extension Cords	
	Markers	• For marking Willseal materials
	3/8” Nap Roller	• 3” width size
Cleaning Solvents	PUMA Cleaner	• For cleaning PUMA material
	Acetone	
	Isopropyl Alcohol (IPA)	

4. AVAILABILITY

4.1 Willseal MSS is available as part of a system, which includes a Willseal foam expansion joint with varying degrees of movement, from your authorized Tremco or Willseal Sales Representative, Tremco or Willseal Distributor or Warehouse.

4.2 Willseal MSS will be supplied as part of a complete kit for installation, components detailed in table below.

TREMCO SUPPLIED KIT COMPONENTS	COMMENTS
Willseal MSS Bracket + Spreader Bar + Top Cap and Screws  	• Including any factory-made transitions • If supplied with button head screws affixing spreader bar, discard them during installation and replace with supplied flat head screws
Willseal SS-WJS Gland/Wing 	• Including any factory-made transitions

Willseal 250 Foam Expansion Joint  	• Including any factory-made transitions
Willseal Gel Loc 1:1 Epoxy	
PUMA Setting Bed	
Spectrem® 800	• For Foam connection points
Dymonic® 100	• For Wing/Gland connection points
TREMPRO™ Chem-X Pro®	
Hilti Bolts + Epoxy 	• Hilti KH-EZ C 3/8" ⌀ Epoxy Set Anchors w/Hilti Kiwk-X epoxy capsules & compatible bit
Clever Cutter	• For opening Willseal foam

4.3 For questions about joint behavior or the proper expansion joint material to use, please contact Willseal Technical Service.

5. SUBSTRATE PREPARATION

5.1 Verify that the joint is clean, sound, and will provide an appropriate surface for installation of the Willseal MSS and any foam expansion joint being installed.

5.2 Verify that the deck surface, to which the Willseal MSS will be anchored, is flat and free from elevated or concave areas. For areas with deviations greater than 1/4", ensure correct substrate repairs are conducted using appropriate materials and methods first. These may include, but are not limited to, appropriate patching and/or repair products. Please consult Tremco Technical Services for questions about proper substrate repair.

5.3 Verify that the joint sidewalls are uniform and repair any defects or spalls prior to installation.

5.4 Check the material for appropriate length and width to confirm proper size for installation.
5.5 If installing a foam expansion joint below, in addition to the Willseal MSS, the following steps must be accomplished in addition to the steps above:
   a. Use compressed air or a vacuum to clean any loose debris from the joint.
   b. Apply water or alcohol to a clean cloth and wipe the joint walls to a depth of the foam material, plus 1".
   c. Confirm that the joint has sufficient recess to accommodate the Willseal MSS system. Material may require additional recess to accommodate the Willseal MSS system. Tremco Technical Services for questions about proper joint sizing.
   d. Open cell materials should be pre-compressed to a size smaller than the intended joint opening. Ensure correctly sized material is on hand for installation.

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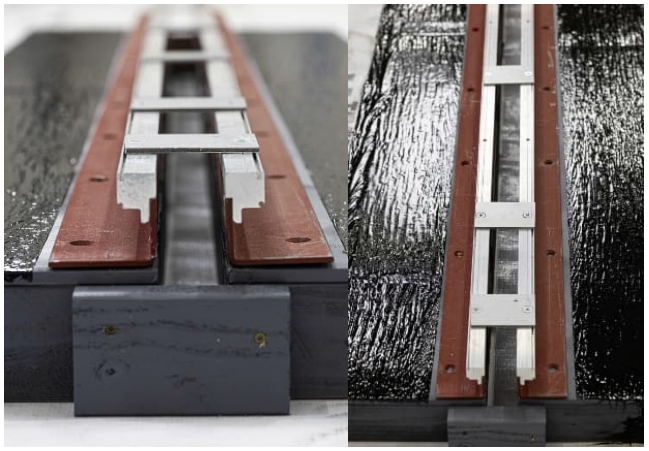
6. APPLICATION PROCEDURE

6.1 Begin by confirming receipt of all necessary Willseal MSS system components, tools, and materials. Contact Tremco with any questions regarding the materials or if any items appear to be missing.

6.2 **DRY-FIT METAL COMPONENTS**

   a. Unpack the Willseal MSS brackets and place them over the joint throat opening in order to familiarize the installer with the product and installation conditions. The MSS brackets should be able to straddle the joint opening with the spreader bars attached. Set Top Cap Strips aside until needed in 6.15b. See Ref 1.
      - The Willseal MSS brackets will arrive at the jobsite pre-aligned with temporary metal spreader bars. These spreader bars ensure that the MSS brackets are correctly spaced apart under average seasonal temperatures; installation during temperature extremes may require adjustment to these spreader bars. If adjustment to spreader bars is necessary, contact Tremco before proceeding. See Ref 1.
   b. If the project calls for any prefabricated Willseal MSS transitions (like changes in vertical plane, right-angle changes in direction, intersections, or tees), these need to be installed before the rest of the MSS straight runs. Consult Tremco if your project requires factory-fabricated transitions.



Ref 1. MSS bracket straddling joint opening with Top Cap Strips set aside. Temporary metal spreader bars are visible on top of the brackets, spanning across the joint.

6.3 **CLEAN THE METAL BRACKETS**

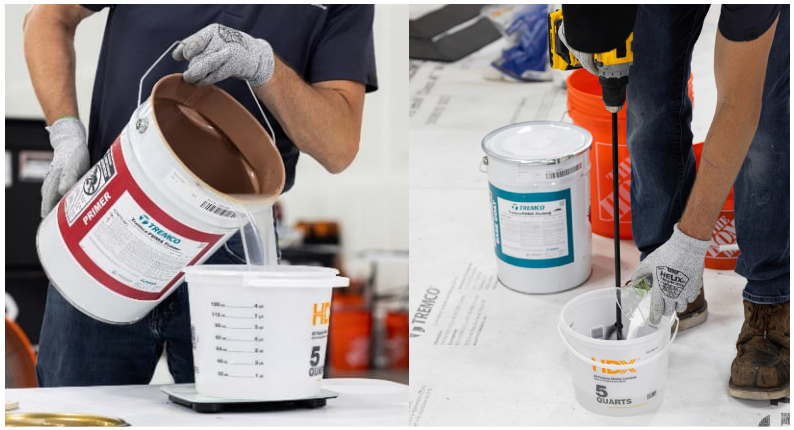
   a. Clean the bottom of the metal brackets, where they will contact the setting bed, using the 2-cloth cleaning method. See Ref 2.
      - First, the metal brackets should be wiped clean with a clean, lint-free cloth using solvent. Then immediately following the solvent wipe, a second clean, lint-free cloth should be used to wipe the metal brackets to ensure any remaining solvent and debris are removed.
   b. Place the cleaned metal brackets aside until required, taking care to ensure the brackets remain clean and uncontaminated.

Ref 2. Clean bottom of metal brackets with 2-cloth cleaning method.

6.4 **PRIME SUBSTRATE BEFORE LAYING SETTING BED**

a. The substrate must be primed with Tremco PUMA Primer before applying PUMA Setting Bed.
b. Begin by pre-mixing Tremco PUMA Primer for 1 to 2 min before adding Tremco PUMA Initiator+.
c. After pre-mixing, add the appropriate amount of Tremco PUMA Initiator+ in accordance with PUMA Initiator+ Temperature Use Chart. See Ref 3.

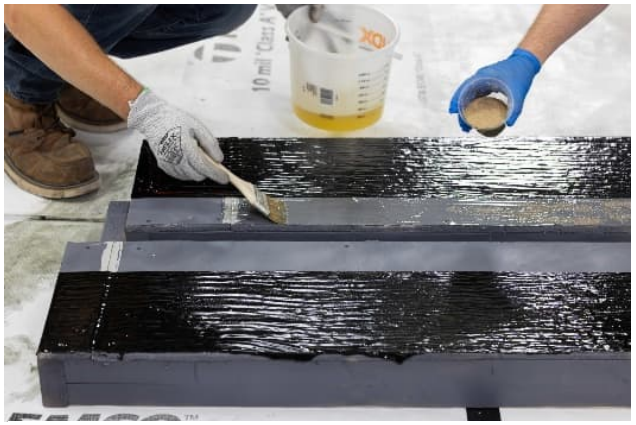
PUMA INITIATOR+ TEMPERATURE USE CHART	
68 to 95 °F (20 to 35 °C)	50 g (1.76 oz) Initiator+ / gal Resin
50 to 68 °F (10 to 20 °C)	75 g (2.65 oz) Initiator+ / gal Resin
32 to 50 °F (0 to 10 °C)	150 g (5.3 oz) Initiator+ / gal Resin
14 to 32 °F (-10 to 0 °C)	225 g (7.94 oz) Initiator+ / gal Resin



Ref 3. Pre-mix Tremco PUMA Primer for 1 to 2 minutes before adding Tremco PUMA Initiator+.

d. Mix Tremco PUMA Primer thoroughly together with Tremco PUMA Initiator+ for 2 to 3 min. See Ref 4.
e. Apply Tremco PUMA Primer at a minimum of 17 wet mils to the entire area to be coated with a 3/8" nap roller. For small areas or touchups, a brush may be used to apply Tremco PUMA Primer.
    - Application below 17 wet mils will result in the primer not curing.
f. Once primer is rolled out evenly, lightly broadcast 0.3 to 0.6 mm (30 to 50 mesh) silica sand into the primer. See Ref 5.
g. Allow Tremco PUMA Primer a minimum of 30 min to fully cure. While Tremco PUMA Primer is curing, begin prepping PUMA Setting Bed.

Ref 4. Mix Tremco PUMA Primer and Tremco PUMA Initiator+ together for 2 to 3 minutes.


Ref 5. Apply Tremco PUMA Primer and lightly broadcast silica sand into the primer.

6.5 **MIX THE SETTING BED**

a. Pre-measure all components for PUMA Setting Bed and pre-mix Tremco PUMA Flashing for 1 minute before adding aggregate. See Ref 6.
   - 1 gallon of Tremco PUMA Flashing
   - 1.5 gallons of Aggregate (16 to 18 mesh, clean, dry, silica sand)
   - 600 mL of Tremco PUMA Polyethylene Fibers
   - Appropriate amount of Tremco PUMA Initiator+ determined from PUMA Initiator+ Temperature Use Chart (above). The Tremco PUMA Initiator+ to Resin Ratio is a minimum of 50 g per gal of resin to a maximum of 225 g per gal of resin and is based on the temperature during application.

PUMA INITIATOR+ TEMPERATURE USE CHART	
68 to 95 °F (20 to 35 °C)	50 g (1.76 oz) Initiator+ / gal Resin
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b. Mix together 1 gallon of pre-mixed Tremco PUMA Flashing and 1.5 gallons of Aggregate using an egg-beater style paddle. Mix for 1 to 2 minutes. See Ref 7.
   - Cold weather will increase mixing time, warm weather will minimize mixing times.

c. After mixing the flashing and aggregate together, add a minimum of 600 mL of Tremco PUMA Polyethylene Fibers to the flashing-aggregate mixture while the mixer is running. The applicator will need to temper the consistency to their liking. See Ref 8.
   - A minimum of 600 mL up to a maximum of 2400 mL of Tremco PUMA Polyethylene Fibers should be added per gallon of resin.

d. Continue mixing resin for 1 to 2 minutes after fiber addition.

e. Split dose addition of Initiator+ in half and mix one half at a time until full dose is added. Add the 1st dose of Initiator+ to the resin, while mixing, and mix for 30 to 45 seconds. Then immediately add the 2nd dose, while mixing, and mix for an additional 30 to 45 seconds. See Ref 9.
   - Initiator+ must be added while mixing.
   - Initiator+ should be mixed for 1 to 1.5 minutes total.

Ref 6. Pre-measure all PUMA Setting Bed components and pre-mix Tremco PUMA Flashing before adding aggregate.

Ref 7. Add Aggregate to pre-mixed Tremco PUMA Flashing and mix for 1 to 2 minutes with egg-beater style paddle.

Ref 8. Add Tremco PUMA Polyethylene Fiber to flashing-aggregate mixture while the mixer is running.

Ref 9. Split dose of Initiator+ in half and mix one half at a time into mixture until full dose is added.

6.6 LAY THE SETTING BED

a. Use a mortar or mason's trowel to apply the setting bed to the bare, properly prepared and primed concrete. **Concrete in this area should be completely free of any contaminants, including waterproofing products.** The setting bed should be applied at a minimum thickness of 3/8" (9 mm) and a width 1/2" greater than the metal brackets. See Ref 10.
   - Acetone can be used as "trowel grease" to aid in installation, strictly for trowel use only, to prevent material from sticking to the trowel.
   - Setting bed thickness can be increased to accommodate variations in the concrete profile.
   - Ensure that the finish of the setting bed is uniform, allowing the metal brackets to sit fully on the setting bed. See Ref 11.
   - Voids or cavities below the metal brackets can compromise the integrity of the Willseal MSS system and waterproofing capabilities, and must be corrected prior to installation of setting bed.

b. Intermittent cleaning of excess setting bed is recommended during application.
   - Overflow and spills on adjacent areas should be cleaned immediately with Tremco PUMA Cleaner before material cures.
   - Tools and equipment should be cleaned after using with Tremco PUMA Cleaner to remove curing material.
   - If required, clean PUMA components off skin by soaking in hot, soapy water then brush with a stiff bristle brush.

c. The setting bed will fully cure in 1 to 2 hours. After 45 minutes, leveling of the metal brackets may become more challenging. It is recommended to mix and apply only the amount of setting bed material that can accommodate 45 minutes worth of bracket installation.

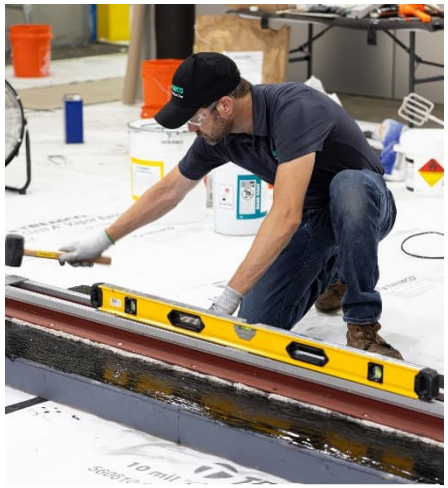
Ref 10. Use a mortar or mason's trowel to apply the setting bed to the bare, properly prepared and primed concrete.

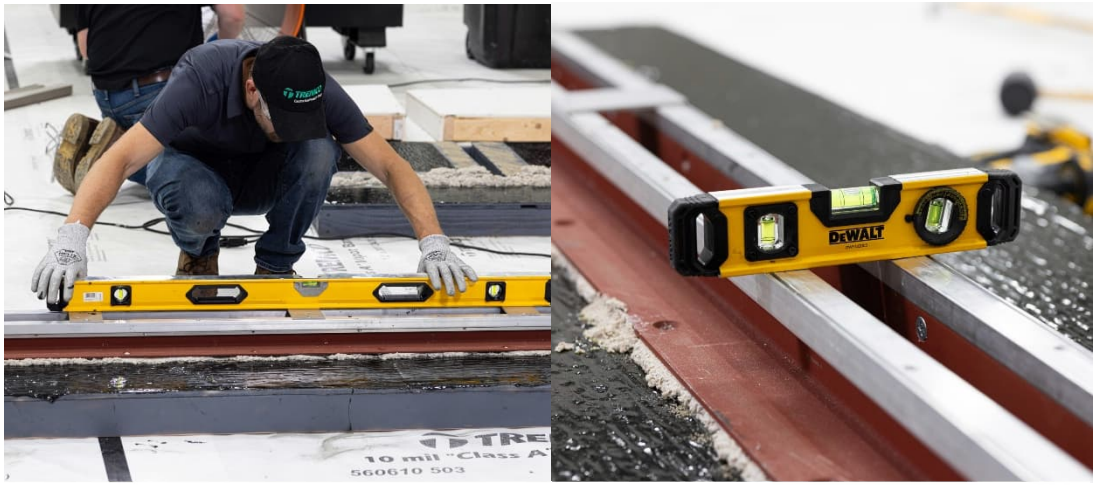
Ref 11. Ensure that the finish of the setting bed is uniform.

6.7 **LOWER BRACKETS INTO WET SETTING BED & LEVEL BEFORE SETTING BED CURES**

a. Locate the first length of the metal brackets to be installed and set them in the wet setting bed material. See Ref 12.
b. Using a rubber mallet, tap the rails into the setting bed until the desired height – from the concrete surface to the top of the bracket – has been achieved. Ensure that the metal brackets are fully set into the setting bed and no voids or cavities have formed beneath the brackets. See Ref 13.
c. Using the 4 ft, 2 ft, and torpedo levels, confirm that the brackets are level across the width of the joint, from bracket to bracket, and through the length of the joint along each bracket. See Ref 14.
d. If a slope is being used on the deck for drainage, the brackets may be adjusted in the setting bed before it cures to match the drainage slope. In these cases, the brackets may not read level in one or both directions.

Ref 12. Place the first length of metal brackets into the wet setting bed material.

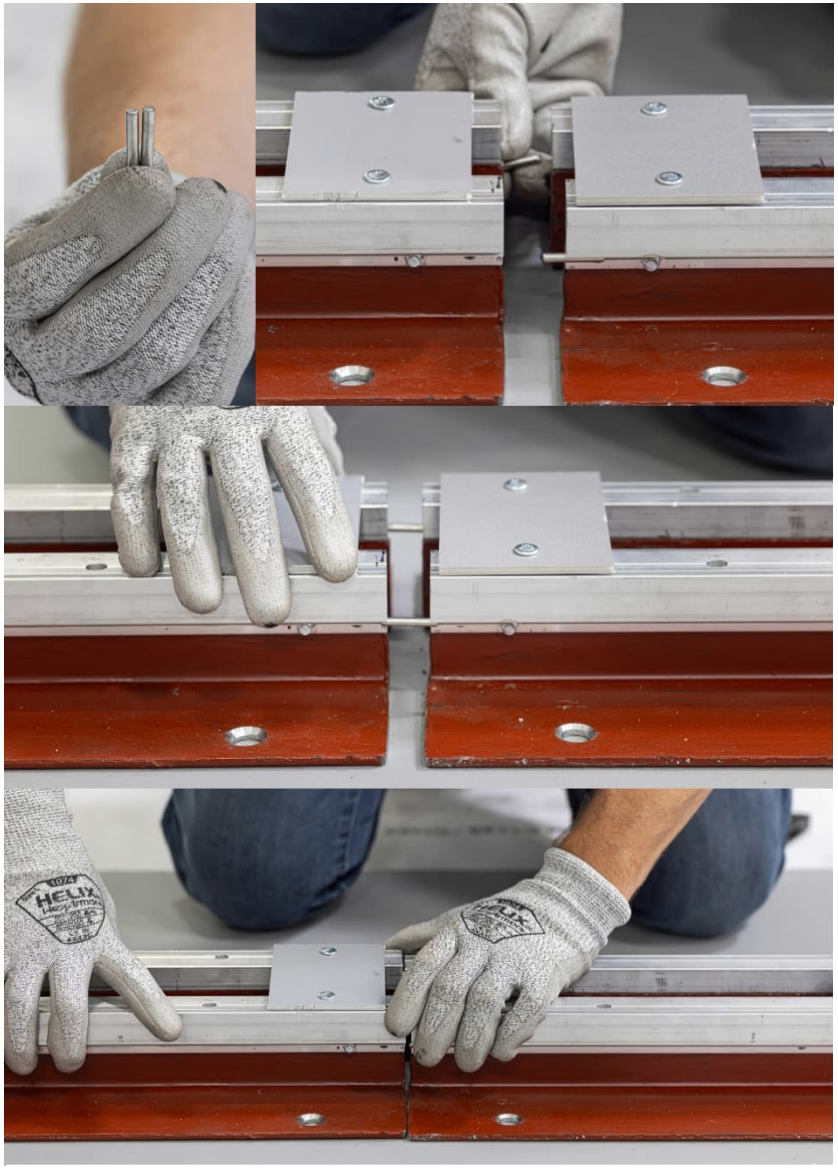

Ref 13. Using a rubber mallet, tap the rails into the setting bed until the desired height has been achieved.



Ref 14. Using 4ft, 2ft, and torpedo levels, confirm that the brackets are level across the width of the joint, from bracket to bracket, and through the length of the joint along each bracket.

6.8 **INSTALL NEXT BRACKET LENGTH**

a. Install metal alignment dowels (1 pin per bracket) into the section of Willseal MSS that was just installed (taking care not to disturb the brackets that were just placed/leveled in the curing setting bed). The metal alignment dowels should only be inserted halfway into the appropriate round channel in the brackets. Locate the next section of metal bracket and install against the previous section, ensuring the vertical and horizontal legs of the brackets are aligned. Bracket sections should be tightly butted, with no gaps between the metal sections. **Setting bed material may need to be removed from locations between brackets to ensure proper alignment.** See Ref 15.
b. Using a rubber mallet, tap the sections in place to ensure proper alignment and desired height, from concrete deck to top of bracket.
c. Using the 4 ft, 2 ft, and torpedo levels, confirm that the adjoining brackets are level across the width and through the length of the joint, or match the drainage slope.
d. Repeat this process until all bracket sections have been installed. It is recommended to periodically check previously installed brackets for level or drainage slope to ensure the brackets have not shifted during the installation of later brackets.



Ref 15. Install metal alignment dowels into each section of Willseal MSS being installed and ensure bracket sections tightly butt against each other.

6.9 CLEAN AND TOOL EXCESS SETTING BED MATERIAL BEFORE FULL CURE

a. During setting of the brackets, the setting bed material may migrate beyond the areas it's needed for bracket support—this material needs to be removed and/or cleaned up before it cures. Use a metal trowel or tooling spatula to scrape and remove the excess bed material that may have squeezed out between the metal brackets and the substrate, ensuring none is left in the throat opening of the joint beneath. See Ref 16.
    - Excess bed material may be used to fill or address any pockets or voids that might exist between the bottom of the bracket and the substrate; this can be accomplished by using a metal trowel to collect, place, and tool the excess bed material into these areas as needed.

b. Use acetone to clean excess bed material off any areas of the joint or Willseal MSS system where it does not belong.

c. Setting bed material can be cleaned from tools using the supplied PUMA Cleaner. Do **not** use PUMA Cleaner to clean substrate while the PUMA bed material is still curing.

d. Ensure that any setting bed material, that has been squeezed out from beneath the brackets and onto the deck where the extruded rubber wing will rest, is carefully tooled/feathered into a smooth transition to the top of the substrate. The goal is to create a gradual transition to the deck free of any abrupt or sharp edges that might damage the extruded rubber wing once the wear slab is placed over top of the system. See Ref 17.

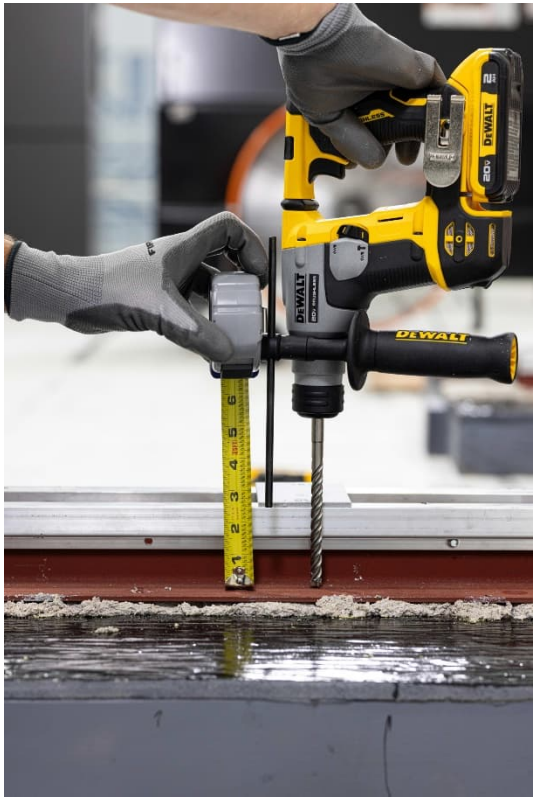
e. Allow the material to fully cure before proceeding. The setting bed will fully cure in 1 to 2 hours. After 45 minutes, tooling of the setting bed compound may become challenging. It is recommended to mix and apply only the amount of setting bed material that can accommodate 45 minutes worth of bracket installation. Use this curing period to clean and reset all tools, taking care to remove setting bed compound before it's cured into a hardened state.

Ref 16. Remove excess setting bed material that has migrated out from under the areas required for bracket support before it cures.

Ref 17. Tool/feather any setting bed material that has squeezed out from beneath the brackets onto the deck where the extruded rubber wing will rest into a smooth transition to the top of the substrate.

6.10 **DRILL BRACKET ANCHOR HOLES**

a. Confirm that there are no buried utilities or other obstacles within 3” of the top of the substrate before proceeding.
b. Before drilling, be sure to mark SDS masonry bit with tape placed 3-1/4” from bit tip to ensure pilot holes are of sufficient depth to accept epoxy capsule and anchor bolt. A depth setter can be used instead of tape if one is available. See Ref 18 (shows depth setter).
c. After the setting bed has fully cured, carefully use the SDS Hammer Drill with 3/8” masonry bit to drill holes at least 3” deep. Optionally, a 1/8” twist drill bit may be used to create a shallow pilot hole first to guide the larger masonry bit.
d. Use Shop Vacuum (equipped with HEPA dust containment filter) to remove dust from inside and around the anchor holes. Installer may need to carefully use air blasts from a blower to dislodge debris from anchor holes, taking care to capture dust with HEPA shop vacuum. See Ref 19.



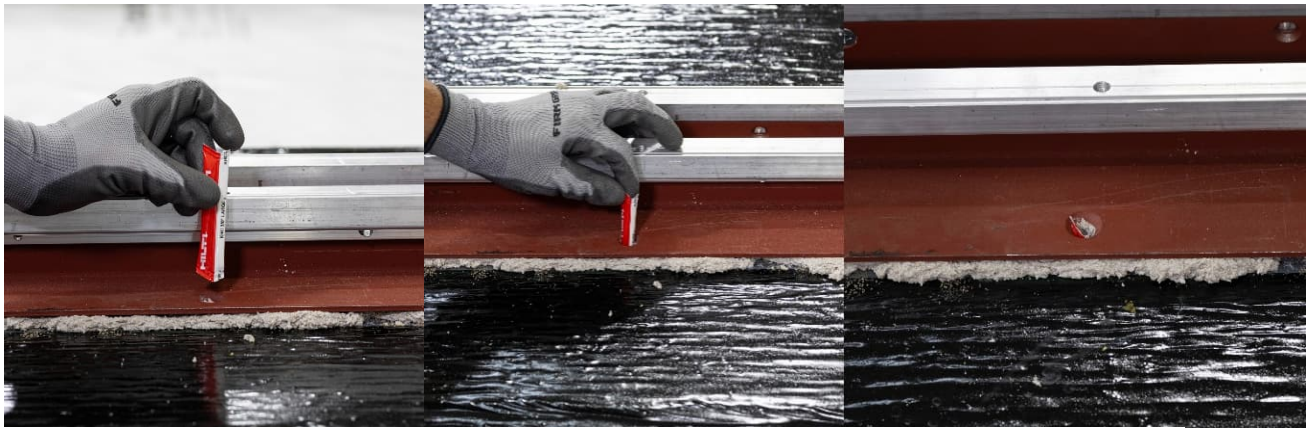
Ref 18. Set depth setter to 3-1/4” before drilling anchor holes.

Ref 19. Use Shop Vacuum to remove dust from inside and around anchor holes when drilling.

6.11 **INSTALL BRACKET ANCHORS**

a. Locate and confirm adequate number of bracket anchors and accompanying epoxy capsules (Hilti KH-EZ C 3/8" ⌀ Epoxy Set Anchors w/Hilti Kiwk-X epoxy capsules) are available. Proper installation requires one epoxy capsule per anchor.
b. Verify that all anchor holes allow sufficent depth for epoxy capsules to be fully inserted, making sure the top of the epoxy capsule is flush with the top of the hole. ***CONFIRM ENTIRE PLACEMENT IS ACCURATE DRY-FIT BEFORE PROCEEDING. ANCHORS ARE PERMANENT ONCE INSTALLED!***
c. Insert and fully seat included epoxy capsule into each anchor bolt hole (one capsule per bolt hole). See Ref 20.
d. Install the anchor bolts into each bolt hole with epoxy capsule. See Ref 21.
e. Torque anchor bolts to 40 ft-lbs (54 Nm) when fastening into concrete. For other substrates like masonry, consult Tremco Technical Services.
f. Wipe away any excess epoxy that might exude from the torqued anchor bolts to ensure clean bolt head and surrounding surfaces.

Ref 21. Install anchor bolt into each bolt hole with epoxy capsule inserted.

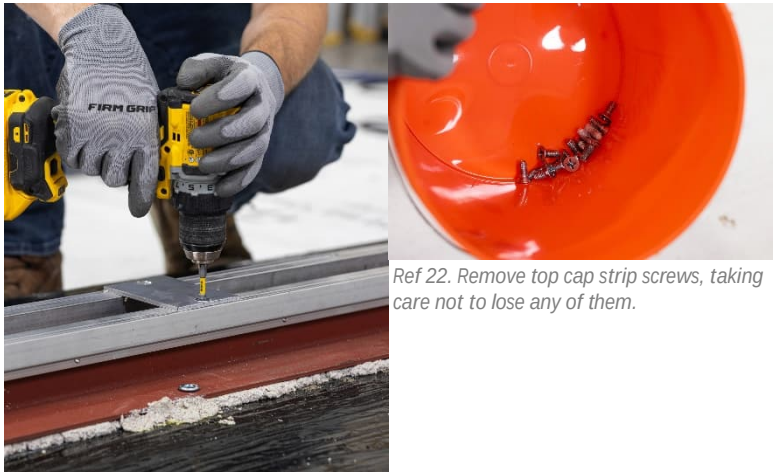


Ref 20. Insert and fully seat epoxy capsule into each anchor bolt hole. The top of the epoxy capsule should be flush with the top of the hole.

6.12 REMOVAL OF TEMPORARY SPREADER BARS & TOP CAP SCREWS

a. ***REMOVE TEMPORARY SPREADER BARS IMMEDIATELY AFTER BRACKETS ARE ANCHORED TO ENSURE NO DAMAGE TO SYSTEM IF JOINT CYCLES BEFORE INSTALLATION IS COMPLETE.***

b. Carefully remove top cap strip screws wherever used to secure a temporary spreader bar and all remaining top cap strip screws. **Do not lose these screws, they will need to be reused to complete installation.** Remove and discard or recycle temporary spreader bars. See Ref 22.
   - If button screws were used to affix spreader bars, these can be discarded. Only the supplied flat-head screws will be used to affix top cap strip in a later step (6.15b).



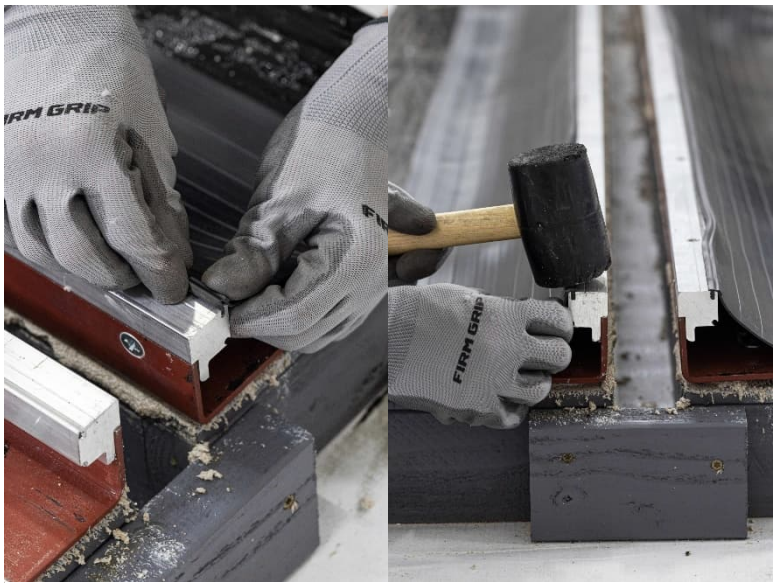
Ref 22. Remove top cap strip screws, taking care not to lose any of them.

6.13 INSTALLATION OF RUBBER WATERPROOFING TIE-IN WINGS

a. Clean receiver channel for tie-in wing dart of any and all debris that may have collected during setting bed and anchor installation.

b. Unroll tie-in wings along the length of the joint. Working along the length of the bracket, carefully and fully insert the tie-in wing dart into the receiver channel, taking care that the wing is not being stretched while doing so. A rubber mallet can be used to assist with installation. See Ref 23.

c. If two adjoining runs of tie-in wing must be joined together, the rubber wing sections can be spliced together using heat welding or a sealant splice. In both methods, the connecting ends of the extruded rubber wing must be cut square and trimmed to a straight edge.
   - Heat welding can be used for butt joint connections or overlap connections. In butt joint applications, a soldering iron capable of reaching a minimum of 500 °F may be the more suitable welding tool. In overlap connections, a hot air welder capable of reaching a minimum of 500 °F may be the more suitable welding tool.
   - When heat welding **butt joint connections**, ensure the connecting ends of the rubber wing are cut square with straight edges. It is recommended to dry fit the sections to ensure that the darts align and that there are no gaps between the rubber. Press the sections of rubber wing together, taking care not to bunch the joining sections, and run the soldering iron along the seam, up to the dart, making contact with both sections of wing. Take care not to melt through the rubber. To aid in securing the sections, the wings can be tacked at either end prior to finish weld. Once the seam has been welded, flip the rubber wing and repeat the process on the other side.
   - When heat welding using an **overlap connection**, trim 1" of dart off of one connecting end and ensure the butt ends are cut square. Align sections of the gland so that the rubber darts are even and there is 1" of overlap between the sections. The lines extruded into the rubber wing can be used to aid in alignment. Carefully place the welding hatchet between the connecting ends of the rubber wings until the wing begins to melt. Take care not to melt completely through the rubber wing.



Ref 23. Insert the tie-in wing dart of the WJS gland into the receiver channel, taking care not to stretch the material while doing so. A rubber mallet can be used to assist with getting the gland fully inserted into the channel.

Immediately remove the welding hatchet and press the melted ends together. Repeat this process until the entirety of the seam has been welded. Once the seam has been welded, flip the rubber wings and repeat the welding process on the other side, if necessary.

- Ends and edges of rubber wing can be smoothed and finished with a soldering iron or heat knife.
- If two adjoining runs of tie-in wing must be sealant spliced, an overlap connection using Dymonic 100 polyurethane sealant is recommended. In these applications, a minimum of 2" of overlap is recommended.
    - Trim 2" of dart off of one connecting end and ensure the butt ends are cut square. See Ref 24.
    - Align sections of the gland so that the rubber darts are even and there is 2" of overlap between sections. The lines extruded into the rubber wing can be used to aid in alignment. See Ref 25.
    - Apply and tool a 1/16" thick bedding of Dymonic 100 the full 2" width of the overlap. Firmly press the overlapped sections of wing together and ensure proper alignment and overlap. Tool any excess Dymonic 100 back over the seam and allow to fully cure. See Ref 26.
- Transitions in and out of plane are not recommended for field splicing. Prefabricated transitions in and out of plane can be ordered through your local Tremco Sales Representative or Tremco Distributor.
- Contact Tremco Technical Services with any questions on splicing or prefabricated transitions.

d. Confirm the free end of the tie-in wing makes contact with the waterproofing layer that will tie into the Willseal MSS.

Ref 24. Trim 2" of dart off one connecting end of the Willseal WJS gland, ensuring the butt ends

Ref 25. Align and install the sections of Willseal WJS gland that will overlap, making sure the rubber darts are even and there is 2" of overlap between the sections.

Ref 26. Apply and tool a 1/16" thick bedding of Dymonic 100 over the full 2" width of the Willseal WJS gland overlap. Firmly press the overlapped sections of wing together and ensure proper alignment and overlap. Tool any excess Dymonic 100 back over the seam and allow to fully cure.

6.14 INSTALLATION OF WILLSEAL FOAM EXPANSION JOINT

a. Verify that the brackets have not been recontaminated and are an appropriate surface for installation of joint sealant. Use a vacuum to clean any loose debris from the joint. Apply alcohol to a clean cloth and wipe the joint walls to the depth of the sealant material plus 1". See Ref 27.

b. Check the material for appropriate length, width, and depth. Supplied material should be pre-compressed to a size smaller than the intended joint opening. Joint depth must allow for the installed material to be recessed 1/4" from the top surface of the brackets.

c. The supplied 1:1 epoxy must be used for the foam joint sidewalls. Mix the epoxy at a 1:1 mixture of part A to part B in a bucket or on a clean disposable surface. See Ref 28.
   - Epoxy can be mixed by hand, using margin trowels, or using a high-speed mixer.
   - The **working time for the epoxy is about 20 to 30 minutes**. It is recommended to only mix the amount necessary for foam installation within that timeframe.

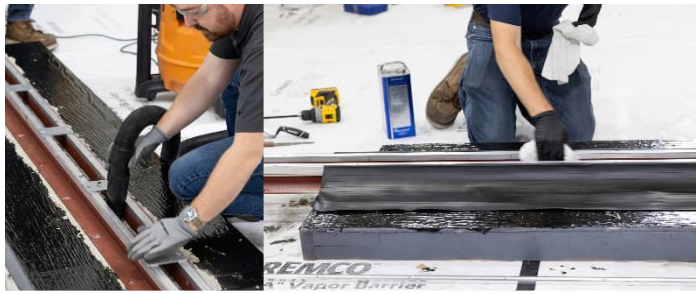
d. Apply fully mixed epoxy to both bracket sidewalls at a 1/16" to 1/8" thickness for the full depth of the foam plus 1/2". See Ref 29.
   - Epoxy must be **wet** at the time of foam installation.

e. When fully prepared to install foam, carefully cut/slit the shrink packaging along the edge of the masonite strapping with a clever cutter. Be sure you do not cut or puncture the sealant facer on the foam while cutting the shrink packaging. See Ref 30.
   - Be prepared to install material immediately once the packaging is removed to prevent the material from expanding past the joint width. Depending on the rate of expansion, it is recommended to open no more than 2 sticks at a time.
   - Material will expand faster when hot and slower when cold. In hot temperatures, store the material out of direct sunlight and not in an enclosed storage container where temperatures may exceed 100 °F (38 °C). In cold temperatures, store the material in a heated area 24 hours prior to installation. Additionally, in colder temperatures, it may be recommended to allow extra time for the foam to expand the full width of the installed joint. This will aid in the installation as the material will be in compression during the install.
   - Verify that the material is cut square at both ends for proper seams; all pieces must be square to the termination point.

f. Remove the release liners from the stick. Identify the terminating end and seal the end of the foam by buttering with the supplied foam detail sealant. See Ref 31.

Ref 30. Carefully cut/slit the shrink packaging along the edge of the masonite strapping.

Ref 31. Remove the release liners from the stick of foam.



Ref 27. Confirm that the brackets are clean and a suitable surface for the installation of joint sealant. Use a vacuum to clean any loose debris from the joint. Apply alcohol to a clean cloth and wipe the joint walls to the depth of the sealant material plus 1".

Ref 28. Mix the supplied epoxy at a 1:1 mixture of part A and part B. The epoxy can be mixed by hand or using a high-speed mixer. Mix both parts together until the mixture is a uniform gray color.

Ref 29. Apply fully mixed epoxy to both bracket sidewalls at a 1/16" to 1/8" thickness for the full depth of the foam plus 1/2".

g. Using the epoxy sidewall adhesive as an initial lubricant, install the material in the joint, ensuring compression against the terminating end. Facer of expansion joint should be flush with the top of the brackets (with the top cap strip removed). See Ref 32.
h. Each subsequent stick of foam should be installed in compression against the stick previously installed.
    - This can be accomplished by leaving the final 1” to 2” section of the installed stick hunched out of the joint and installing the next stick with an additional overlap. The following stick can be laid out with a 1/2" to 1” overlap against the previous stick. The subsequent stick should be installed from the opposite end and working towards the previous stick. See Ref 33.
    - Both ends of the connecting sticks should be buttered with the supplied foam splice adhesive and pressed into the joint together. See Ref 34.
i. “T” shaped intersections and crusifix intersections should be made in compression against the adjoining stick. This can be accomplished by installing with a minimum 1/2" to 1” overlap of the installed stick. Any connecting ends of foam should be buttered with the supplied foam splice adhesive.
    - To create a T-intersection, cut a notch out of the side of the straight run of foam. Cut the adjoining stick into a point, matching the angle to the notch in the other piece of foam. Butter both cuts on each piece of foam with silicone splice sealant and press the pieces of foam together while maintaining compression along the joint. Crusifix intersections should be created in the same way. Contact Tremco Technical Services for additional information. See Ref 35.

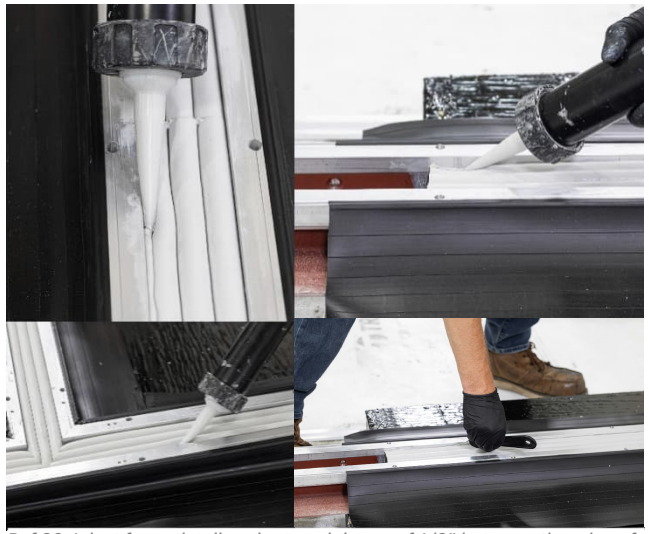
Ref 32. Install the foam material into the joint, using the epoxy sidewall adhesive as a lubricant.

Ref 33. Install each subsequent stick of foam in compression against the stick previously installed, by installing the two sticks with an overlap in the material.

Ref 34. Apply the supplied foam splice adhesive to both ends of the connecting sticks, tool ensuring both ends are fully buttered. Then press the two ends into the joint together.

Ref 35. Create a T-intersection by cutting a notch out of the straight run of foam and cutting the adjoining stick into a point, matching the angle to the notch. Apply the supplied foam splice adhesive to both sides, tool ensuring both the notch and point are fully buttered. Then press the pieces of foam together while maintaining compression along the joint.

j. Prior to applying the detail or face joinery sealant, the factory applied sealant face can be cleaned with a solvent wipe using IPA. This will remove any epoxy material that may migrate to the face as well as any cornstarch used to prevent autobonding of the face in compression.
k. Inject foam detail sealant a minimum of 1/2" between the edge of the foam and the bracket. Foam detail sealant can then be tooled with a spatula. See Ref 36.
l. Foam detail sealant should be applied to the edge of the factory applied sealant face at a 3/16" to 1/4" thickness and tooled to join the sealant face to the top of the bracket assembly. Apply foam detail sealant to join sections of the factory applied sealant face. Tool the foam detail sealant to match the valleys and ribs of the factory applied sealant face. See Ref 37.
    - Take care not to fill the valleys of the factory applied sealant face with foam detail sealant as this can impact movement potential. See Ref 38.
m. Clean off any foam detail sealant that may have migrated onto the brackets. See Ref 39.
n. Repeat procedure above for all subsequent lengths of foam.
o. Allow 72 hours for full expansion and material equalization. Expansion and equalization rates are affected by temperature. Material will expand faster when hot and slower when cold.



Ref 36. Inject foam detail sealant a minimum of 1/2" between the edge of the foam and the bracket. Then tool the sealant with a spatula.

Ref 37. Apply foam detail sealant to join sections of the factory applied sealant face and tool to match the valleys and ribs of the factory applied sealant face.

Ref 38. Take care not to fill the valleys of the factory applied sealant face with foam detail sealant.

Ref 39. Clean off any foam detail sealant that may have migrated onto the brackets.

6.15 **FINAL INSTALLATION OF TOP CAP STRIPS**

a. Perform a final inspection of rubber tie-in wing to confirm that its dart is fully engaged into the bracket's receiving channel along the full length of the run. Address any unseated or damaged areas before proceeding to final installation of top cap strips.
b. Retrieve top cap strips and screws that were removed and retained in previous steps (6.2a and 6.12b). Place top cap strip along top side of bracket, taking care to align holes in both components.
c. Reinstall the flat-head top cap strip screws with a Phillips head bit, taking care not to strip, cross-thread, or overtighten. Screws should be torqued to 60 in-lbs (5.2 ft-lbs; 7 Nm). See Ref 40.
    - Should a screw become cross-threaded or stripped, contact Tremco Technical Service for guidance.

Ref 40. Reinstall the flat-head top cap strip screws with a Phillips head bit and torque to 60 in-lbs (5.2 ft-lbs; 7 Nm).

6.16 **COMPLETING CONNECTION BETWEEN WILLSEAL MSS RUBBER WATERPROOFING TIE-IN WINGS AND THE ADJACENT WATERPROOFING SYSTEM**

a. The Willseal MSS tie-in wings will need to be encapsulated in the structural waterproofing product that is being used on the project. Proper tie-in procedure and materials should be evaluated and confirmed for successful adhesion and compatibility prior to performing this step. For questions about making this connection with Tremco Below Grade Waterproofing products and/or systems, please contact your local Tremco Representative.
b. Pull rubber tie-in wings up and off of the bracket, setting bed, and tie-in areas. These should be temporarily secured out of the way to facilitate installation of tie-in details. They should be protected and kept clean and free of any accidental contamination from waterproofing or other substances to maintain proper adhesion and compatibility with waterproofing system. See Ref 41.
c. Clean all exposed surfaces of the Willseal MSS setting bed with PUMA Cleaner. Allow to completely flash off. See Ref 42.
d. Gun a liberal amount of TREMPRO Chem-X Pro into the void at the bracket upturn (beneath aluminum bracket, at the horizontal to vertical upturn of the steel L-angle). This material is required to support the rubber tie-in wings, as well as offering an additional layer of waterproofing to the metal components of the Willseal MSS system. See Ref 43.

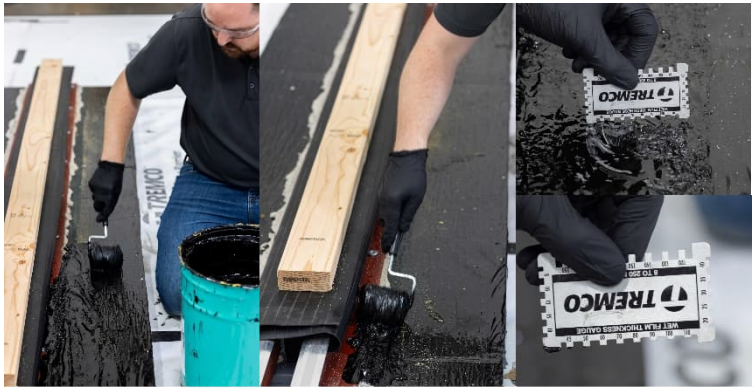
Ref 41. Secure rubber wings up and off the bracket, setting bed, and tie-in areas when applying waterproofing.

Ref 42. Clean all exposed surfaces of Willseal MSS setting bed with PUMA Cleaner.

Ref 43. Gun a liberal amount of TREMPRO Chem-X Pro into the void at the bracket upturn.

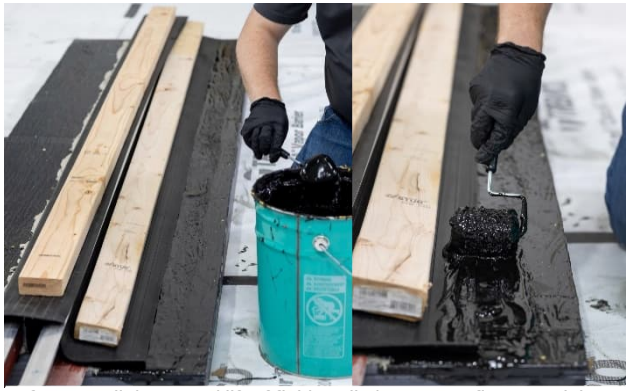
e. Apply a 16 to 20 mil coat of TREMprime VB+ epoxy primer to the tie-in area beneath the rubber wing, and extending 1/4” to 1/2” beyond the rubber wing footprint (to ensure complete encapsulation). Lightly broadcast with 30 to 50 mesh industrial grade silica sand. See Ref 44.
f. Allow TREMprime VB+ to fully cure before proceeding any further. Consult TREMprime VB+ literature for typical full-cure rates. Then blow off any excess silica sand prior to moving to next step.
g. Install initial lift of fluid-applied waterproofing to primed areas at thickness of 45 wet mils. See Ref 45.
h. Carefully place rubber tie-in wings into the wet (uncured) initial lift of fluid-applied waterproofing. Be certain to carefully place wing so that vertical to horizontal bend is fully supported by the TREMPRO Chem-X Pro filling the bracket transition void outlined in step 6.16d. See Ref 46.
i. Ensure intimate contact between the rubber wings and the wet (uncured) initial lift of fluid-applied waterproofing. Take care not to over-compress the wings (to avoid accidentally squeezing/forcing wet waterproofing out from beneath the wing) while the initial lift is still wet (uncured). Be sure to eliminate any wrinkles, air pockets, fishmouths, and other irregularities that could compromise the bond between the wing and the waterproofing beneath.
j. Immediately following the prior step, install the second lift of fluid applied waterproofing material at thickness of 45 wet mils. Ensure coverage extending out to make contact with 1/4” to 1/2” margin of material beneath to provide complete encapsulation of the rubber tie-in wing between the two layers of waterproofing. If required, install any protection courses before second lift cures. See Ref 47.

Ref 44. Apply a coating of TREMprime VB+ epoxy primer to the tie-in area beneath the rubber wing and lightly broadcast with industrial grade silica sand.



Ref 45. Install initial lift of fluid-applied waterproofing to primed areas at a thickness of 45 wet mils.

Ref 46. Carefully place rubber tie-in wings into the wet (uncured) initial lift of fluid-applied waterproofing.



Ref 47. Install the second lift of fluid applied waterproofing material at thickness of 45 wet mils. Ensuring coverage extends out 1/4" to 1/2" margin to completely encapsulate the rubber tie-in wing between the two layers of waterproofing.

6.17 PLACEMENT OF TOPPING COURSE (CONCRETE SLAB, PAVER SYSTEM, ROOFING SYSTEM, ETC.)

a. Confirm that any required protection and/or drainage courses have been installed in compliance with manufacturer's written instructions. Allow any quality inspections to take place relative to these products/systems before installation of any topping course, so that any required corrections can be made (if needed).

b. Be certain to allow for the inclusion of a control joint to be placed in between the outward edge of the top cap strips and the topping course (if required, topping course-dependent). Contact party responsible for topping course to determine whether a control joint will be required.
   - This step is to ensure that the topping course has sufficient space to thermally cycle without crashing into or damaging the Willseal MSS system. See party responsible for placement of topping course for proper control joint specifications (dimensions, control joint sealant, etc.) and installation guidance.
   - Where a control joint is required, ensure that it is properly sealed with an appropriate elastomeric sealant to ensure that the installation is completely wateproof in these areas.