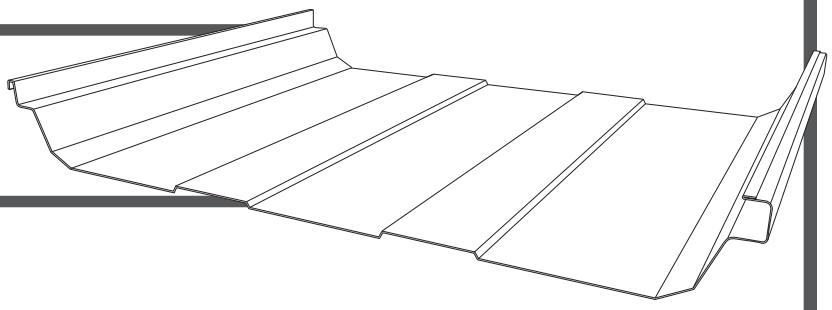
Quality Metals
ROOF AND WALL SYSTEMS

STANDING
SEAM
ROOF SYSTEMS

Installation Manual

ML-30Q
TRAPEZOIDAL PANEL



CONTINUOUS PANEL · NO OVERLAPS · Quality Metals Roof Systems

WEATHER TIGHTNESS® WARRANTY PROGRAM

TESTED AND CERTIFIED · up to 120 mph Wind Resistance

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IMPORTANT NOTICE

THIS MANUAL CONTAINS SUGGESTIONS AND GUIDELINES ON HOW TO INSTALL THE SUBJECT QUALITY METALS ML-300 PANEL AND TRIM DETAILS. THE CONTENTS OF THIS MANUAL INCLUDE THE GUIDELINES THAT WHERE IN EFFECT AT THE TIME THIS PUBLICATION WAS ORIGINALLY PRINTED. IN AN EFFORT TO KEEP PACE WITH THE EVER CHANGING CODE ENVIRONMENT, QUALITY METALS RETAINS THE RIGHT TO CHANGE SPECIFICATIONS AND/OR DESIGNS AT ANY TIME WITHOUT INCURRING ANY OBLIGATIONS. TO INSURE YOU HAVE THE LATEST INFORMATION AVAILABLE, PLEASE INQUIRE OR VISIT OUR WEBSITE. APPLICATION AND DESIGN DETAILS ARE FOR ILLUSTRATIVE PURPOSES ONLY AND MAY NOT BE APPROPRIATE FOR ALL ENVIRONMENTAL CONDITIONS AND/OR BUILDING DESIGNS. PROJECTS SHOULD BE ENGINEERED AND INSTALLED TO CONFORM TO APPLICABLE BUILDING CODES, REGULATIONS AND ACCEPTED INDUSTRY PRACTICES.

READ THIS MANUAL COMPLETELY PRIOR TO BEGINNING THE INSTALLATION OF QUALITY METALS ML-300 ROOFING SYSTEM.

ALWAYS INSPECT EACH AND EVERY PANEL AND ALL ACCESSORIES BEFORE INSTALLATION, NEVER INSTALL ANY QUALITY METALS PRODUCT IF ITS DAMAGE, NOTIFY QUALITY METALS IMMEDIATELY IF ANY PRODUCT IS NOT ACCORDING TO SPECIFICATION OR HAS BEEN DAMAGE.

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Quality Metals
ROOF AND WALL SYSTEMS

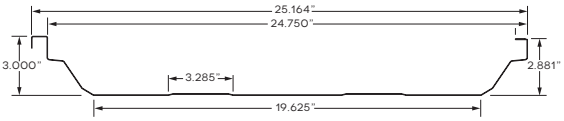
STANDING SEAM ROOF SYSTEMS

ML-300
TRAPEZOIDAL PANEL

INTRODUCTION

The **ML-300** Standing Seam System is an architectural panel designed for non-structural applications. This product incorporates a floating clip with an interlocking system, allowing panels to be installed in a single direction from a designated starting point.

The **ML-300** panel offers the leak resistance and aesthetic appeal characteristic of traditional standing seam systems. The clip system, in conjunction with screw attachments, facilitates thermal expansion and contraction, ensuring ease of panel movement with temperature fluctuations.



APPLICATIONS

Meticulously crafted for residential and commercial applications. The **ML-300** system boasts a simplified installation process, making it accessible for a range of projects.

What sets this system apart is its symmetrical visual aesthetics, presenting a non-directional appearance that enhances the overall design harmony of any structure.

SPECIFICATIONS

Gauges: 24 (standard), 22 and 26 (optional)
Coatings: Galvalume®, Storm Armor (Durapon 70®, Ceranamel®).
Substructure: Plywood or OSB to be a nominal 5/8 inch thick, open framing and metal decking.

WIDTHS

Actual Panel Coverage (Width): 24 ¾".
Minimum Slope = ¼:12

LENGTHS

The **ML-300** Panels are offered in standard lengths ranging from 4' to 40'. Extended lengths beyond 40' necessitate supplementary handling, packaging, and shipping considerations, potentially incurring an additional handling charge. Continuous roll-formed lengths obviate the necessity for panel lap joints.

DESIGN

The **ML-300** panel features a completely standing seam roofing system, ensuring a sleek and durable solution for your roofing needs.
With its low-maintenance requirements and ease of installation, the **ML-300** panel is suitable for both new construction and re-roofing projects, providing versatility and reliability for any application.

TESTING

UL-790 Fire Test of Roof Coverings, Class A,B, C.
UL-2218 For impact Resistance Class4.
UL 580 Uplift Resistance Class 90.

INSTALLATION

The **ML-300** panel features a floating clip system.
With its standing seam design, field seaming is necessary.
Weathertight Warranty is available for this product.
Underlayment is required for optimal performance.

OIL CANNING

Pencil ribs enhance structural integrity while minimizing the occurrence of oil canning.

TOOLS AND EQUIPMENT

The installer must possess previous experience and proficiency in working with metal roofing, including familiarity with the tools listed below and their respective applications.

- Caulking Gun
- Snips
- Cordless Screw Gun
- Pop Rivet Tool
- Tape Measure
- Hemming Tool
- Electrical Extension Cord
- Heavy Gloves
- Safety Glasses.
- Roof Seamer Machine

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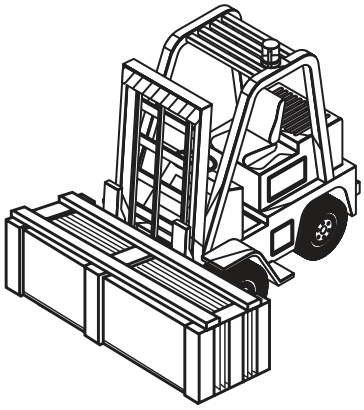
MECHANICAL HANDLING

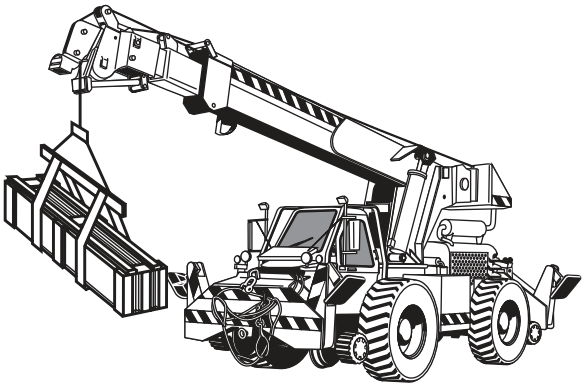
FORKLIFT

A forklift may be utilized for panels up to 20 feet in length. Ensure that the forks are fully extended to their maximum separation. Avoid transporting open crates. When moving crates over uneven terrain or for extended distances, supplementary support for the panel load is necessary.



CRANE

A crane is recommended for hoisting panels exceeding 20 feet in length. Utilize a spreader bar to ensure uniform weight distribution across the lifting points. As a general guideline, avoid leaving more than one-third of the panel length unsupported during lifting operations. Use canvas or nylon slings for panel hoisting. Avoid the use of cables or chains as they may cause damage to the panels.



CAUTION

IMPROPER LOADING AND UNLOADING OF CRATES MAY LEAD TO BODILY HARM AND/OR MATERIAL DAMAGE. QUALITY METALS BEARS NO RESPONSIBILITY FOR ANY BODILY INJURIES OR MATERIAL DAMAGES RESULTING FROM IMPROPER LOADING AND UNLOADING PRACTICES.

GENERAL HANDLING

Each crate requires careful handling to avoid damage, ensuring the prevention of panel bending or finish abrasion. Follow these guidelines for proper care during crate unloading and handling to mitigate panel damage:

1. Crates must remain intact during handling until individual panels within each bundle are ready for installation.
2. Never lift crates by the banding.
3. Lift each crate as close to its center of gravity as possible.
   When lifting crates with a crane, use a spreader bar of appropriate length and nylon band slings.
4. Avoid using wire rope slings to prevent panel damage.
5. Depending on panel length, some crates may be lifted by a forklift. Ensure the forks are spread apart to their maximum spacing, and the load is centered on the forks to prevent scratching adjacent panels.
6. Avoid lifting panels by their ends; instead, lift them along their longitudinal edge in a vertical position.
7. For panels exceeding 10 feet in length, enlist two or more individuals to lift the panel along the same edge.
8. After opening crates, handle individual panels with care to prevent buckling or coating damage. When removing a panel from a crate, avoid sliding it over another panel. Instead, "roll" the individual panels out of the crate to minimize the risk of damage.

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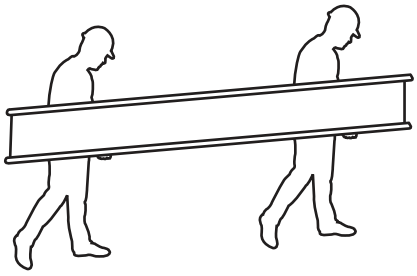
MANUAL HANDLING

It is imperative to wear soft gloves while handling panels. Panels should never be lifted by their ends. Instead, lift the panel along its longitudinal edge and carry it in a vertical position, avoiding a flat orientation.

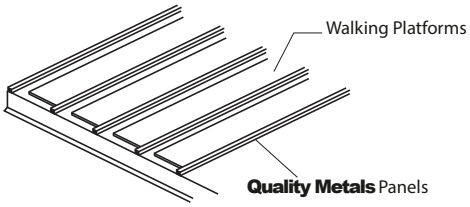


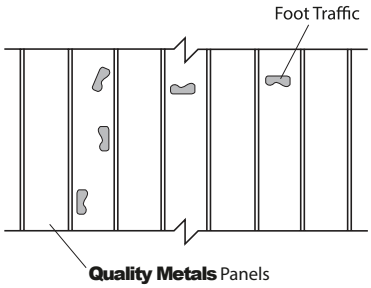
6'-8' MAX

FOOT TRAFFIC

Foot traffic poses a risk of panel distortion and finish damage. It is essential to minimize traffic over the installed system. In cases where continuous foot traffic is required for maintenance, the installation of permanent walkways is recommended.

During installation, if continuous foot traffic is unavoidable, utilize walking platforms to prevent panel damage. Avoid walking directly on the ribs, as this may cause harm to the panels.





CAUTION

ALL RELEVANT SAFETY REGULATIONS, INCLUDING THOSE OUTLINED BY OSHA, MUST BE ADHERED TO THROUGHOUT THE PANEL INSTALLATION PROCESS.

FIELD CUTTING

For field cutting **ML-300** panels, it is advisable to use snips or an electric tool of the "nibbler" type.

Utilizing a skill saw may result in the generation of metal chips, which can damage the finish and reduce the lifespan of the product.

To mitigate this issue, one approach is to flip the panels over during cutting, enabling the removal of metal chips from the back side of the panels.

CAUTION

ALL PRODUCT SURFACES MUST REMAIN CLEAR OF DEBRIS AT ALL TIMES. ONCE INSTALLED, SURFACES SHOULD BE WIPED CLEAN AT THE CONCLUSION OF EACH WORK PERIOD. AVOID CUTTING PANELS OVER METAL SURFACES, AS METAL SHAVINGS MAY ACCUMULATE AND LEAD TO SURFACE RUSTING, THEREBY VOIDING THE WARRANTY.

CAUTION

WHEN CUTTING METAL PANELS, IT IS IMPERATIVE TO WEAR GOGGLES FOR EYE PROTECTION.

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DESIGN CONSIDERATIONS AND CALCULATIONS

Proper design and installation of vapor barriers and ventilation systems are crucial to preventing condensation and the associated problems of moisture damage and reduced insulation efficiency.

Condensation occurs when air containing moisture comes into contact with a surface whose temperature is equal to or below the dew point of the air.
This phenomenon is not exclusive to metal buildings; rather, it is a common issue in various types of construction.

In addition to providing resistance to heat transfer, insulation also serves to mitigate condensation formation on cold surfaces, whether inside the building or within the wall/roof system cavity. The arrangement of the building's insulation system and vapor retarder falls under the purview of the building designer.

Here are some fundamental guidelines to help manage condensation in metal buildings:

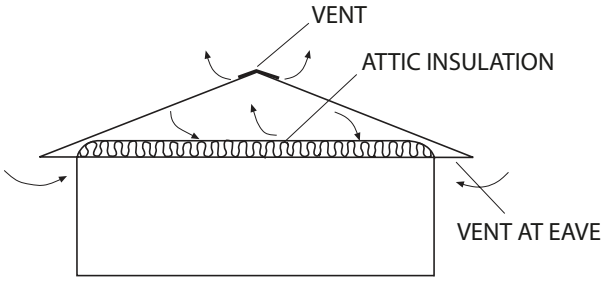
1. Insulation should feature a vapor retarder facing the "warm" side, typically towards the building's interior.

2. The insulation thickness must be carefully determined to maintain the vapor retarder's temperature above the interior dew point, even under extreme outside temperature conditions.

3. All perimeter conditions, seams, and penetrations of the vapor retarder must be effectively sealed to create a continuous membrane that resists the passage of water vapor.

4. Building ventilation, whether facilitated by gravity ridge vents, power-operated fans, or other means, plays a significant role in condensation reduction. Air movement towards the exterior of the building lowers the interior vapor pressure.

In buildings with an attic space or those retrofitted with a metal roof system, vents should be strategically placed at both ends of the eave and peak of the roof to prevent moisture buildup in the attic space.



TOUCH-UP PAINT

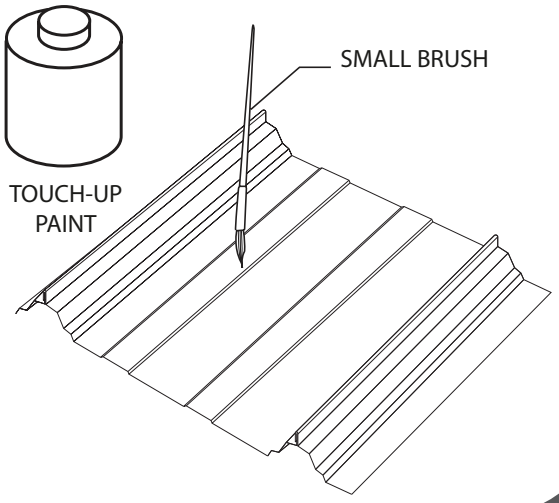
All painted panels and flashings are equipped with a factory-applied baked-on finish. However, handling and installing panels may occasionally result in minor scratches or nicks to the paint finish.

Touch-up paint is available in matching colors for such instances. It is recommended to use a small brush for precise application of touch-up paint to areas in need of repair.

It is important to note that touch-up paint does not possess the superior chalk and fade resistance characteristic of the factory-applied paint finish. As a result, it may discolor at an accelerated rate.

Periodic touch-up painting may be necessary to maintain color consistency. However, it's essential to understand that there is no warranty on touch-up paint in terms of color matching, as the paint processes may differ.

Furthermore, the use of aerosol paint is not recommended due to the potential for overspray, which may cause unintended damage.



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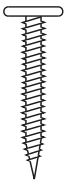
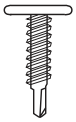
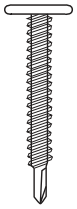
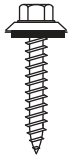
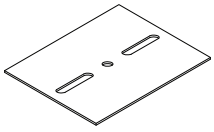
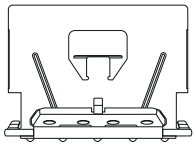
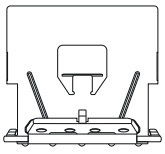
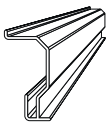
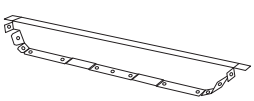
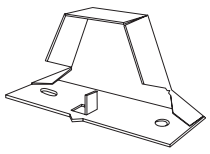
Accessories

			
¼ 14 x 7/8" Hex Head Lap Tek *Screw metal to metal*	**#10 x 1-½" Hex Head** *Woodmate Screw* *Metal to Wood*	**#10 x 1" Pancake Head** *Woodscrew*	**2" Pancake Head** *Woodscrew*
			
1" Pancake Head *Tek Screw*	**2-½" Pancake Head** *Tek Screw*	**#10 x 1" Hex Head** *Woodscrew*	**1/4 - 14 X 7/8 "Lap" Longlife** *W/washer Metal to Metal*
			
1/4 - 14 - 14 X 1 ¼" Longlife *W/washer Metal to Metal*	**¼-4 x - DP#3 Concealor** *Metal to Metal*	**Standard Bearing Plate** *5" x 4"*	**ML-300 Floating Clip**
			
ML-300 Expansion Clip	**Rake Retainer**	**Outside Metal Closure**	**Inside Metal Closure**

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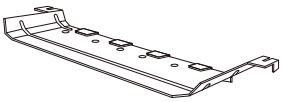
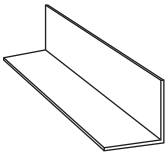
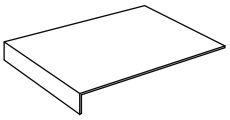
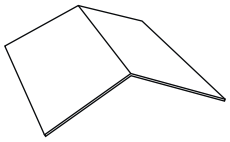
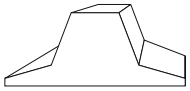
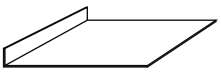
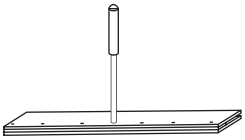
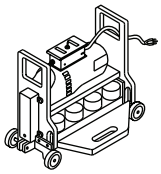
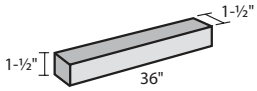
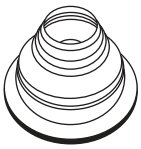
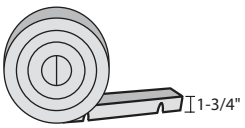
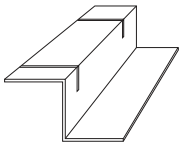
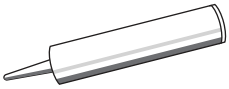
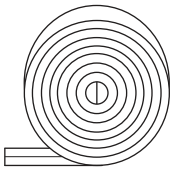
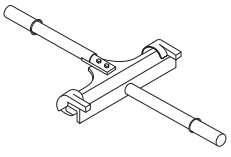
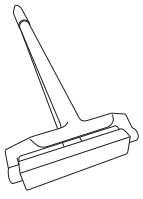
Accessories

			
Back up Plate	**Parapet Wall Support** *Galvanized*	**Eave Support** *Galvanized*	**Ridge - Valley Support** *Galvanized*
			
Inside Rubber Closure	**Rake Support** *Galvanized*	**Hemming Tool**	**Electric Seamer**
			
Neoprene Universal *Closure*	**Pipe Boot** *(Various sized, heat treated & retro fit available)*	**Vented Ridge** *Closure*	**Gutter Strap**
			
Tube Sealant	**Double Bead Butyl Tape** *(7/8" x 3/16" x 40')*	**Hand Seamer** *Stage 1*	**Hand Seamer** *Stage 2*

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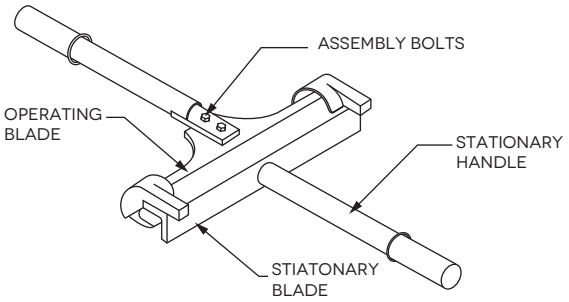
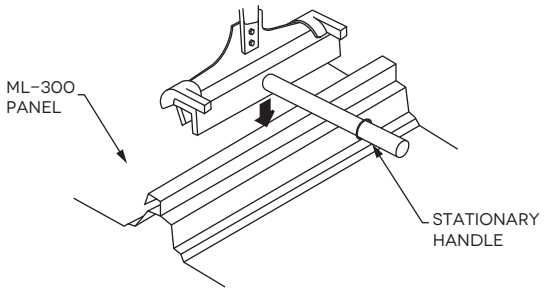
Installation

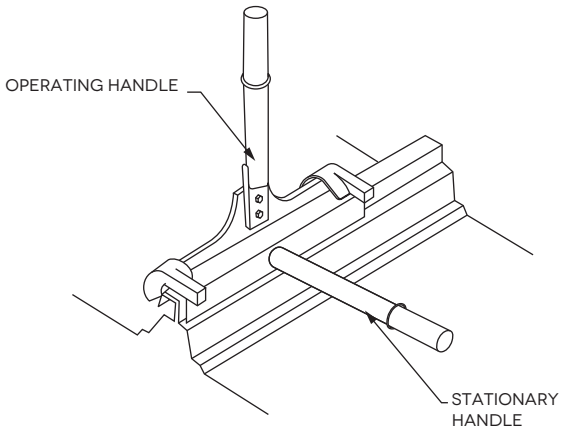
SEAMING PROCESS

HAND SEAMER STAGE 1



Ensure the hand seamer ***Stage 1*** is oriented to fit securely onto the roof panel seam, following the provided illustration. The stationary handle should be in a horizontal position, while the operating hand must be rotated upwards to the open position.

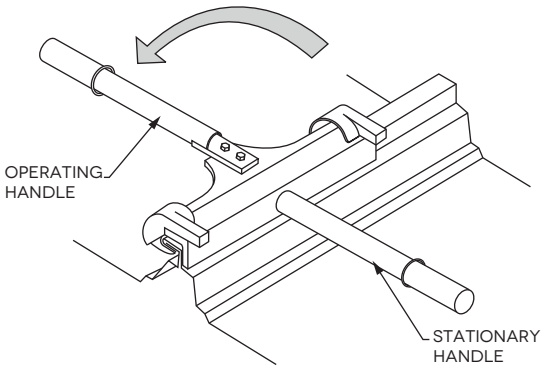


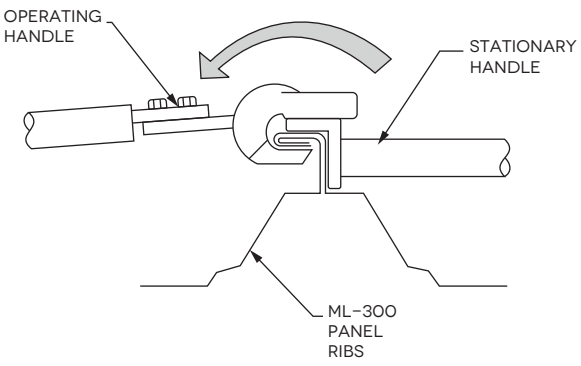


CAUTION

IT'S ESSENTIAL TO CRIMP AND FOLD THE PANEL SEAMS AS DEMONSTRATED BEFORE OPERATING THE ELECTRIC SEAMER. FAILURE TO ADHERE TO THESE GUIDELINES WILL LEAD TO DAMAGED SEAMS.

Once the tool is properly positioned on the panel, firmly push the stationary blade against the top of the seam. While keeping the stationary handle horizontal, proceed to rotate the operating handle down to the horizontal position. This action will form the seam.





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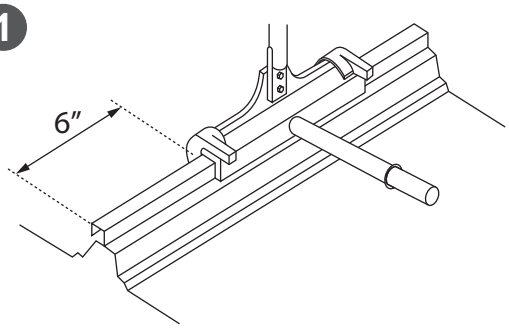
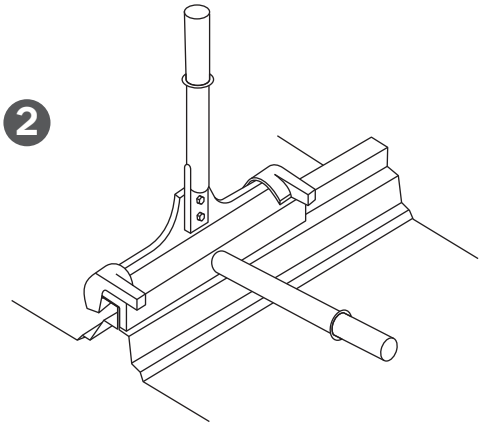
HAND SEAMER STAGE 1

1



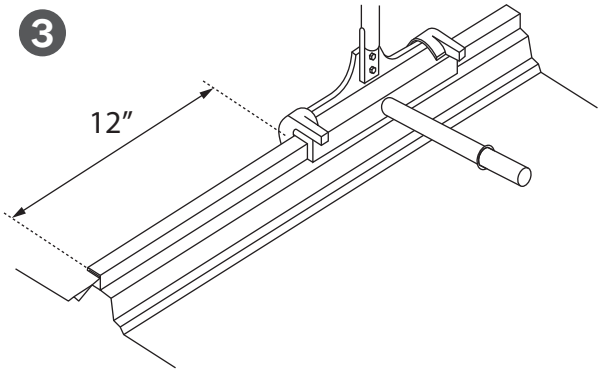
When seaming at the eave or ridge of the roof panel, the process must be completed in four steps. Begin by positioning the end of the seaming tool ***6 inches*** from the end of the roof panel and seam that area.

2



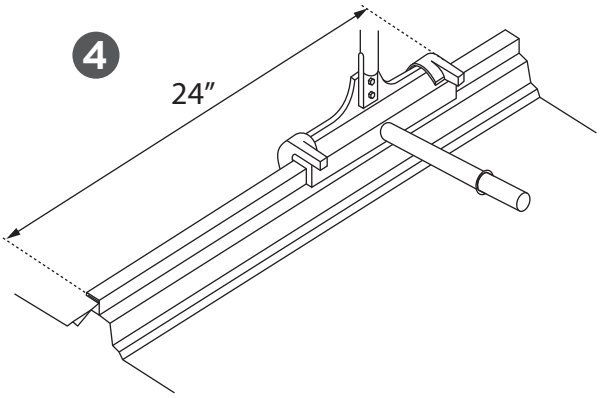
For the second step, position the end of the seaming tool flush with the end of the roof panel and seam that area.

3



For the third step, position the end of the seaming tool 12 inches from the end of the roof panel and seam that area.

4



For the fourth step, repeat the process by seaming 24 inches from the end of the roof panel.

AFTER COMPLETING STAGE 1 WITH THE SEAMING TOOL 1 INCH FROM THE END, THE ROOF IS READY FOR STAGE 2. PLEASE BE ADVISED NOT TO USE THE ELECTRIC SEAMER MACHINE DURING THIS PROCESS, AS IT MAY COMPROMISE THE INTEGRITY OF THE ROOF AND PANELS AND POTENTIALLY DAMAGE THE MACHINE.

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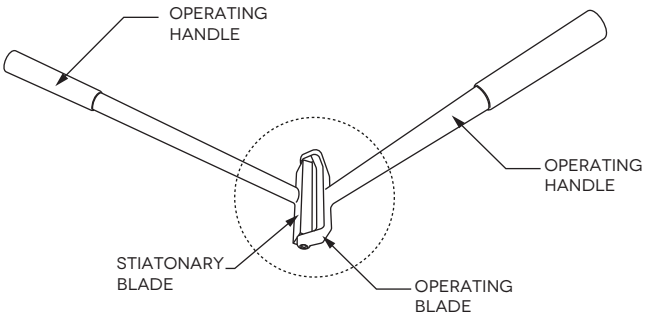
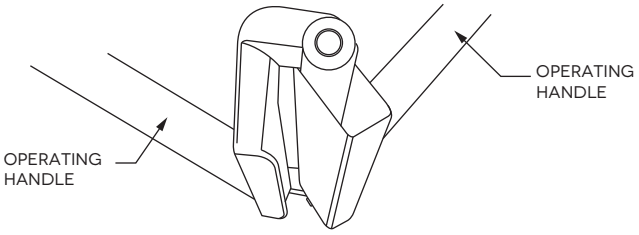
HAND SEAMER STAGE 2

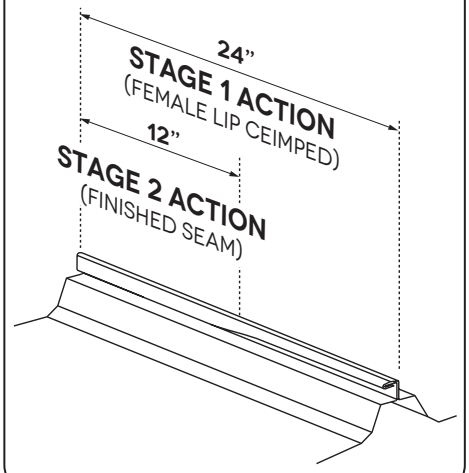
Forms the 180º bend.

Once Stage 1 seaming is complete, prepare for ***Stage 2*** by ensuring all seams are securely fastened and aligned.

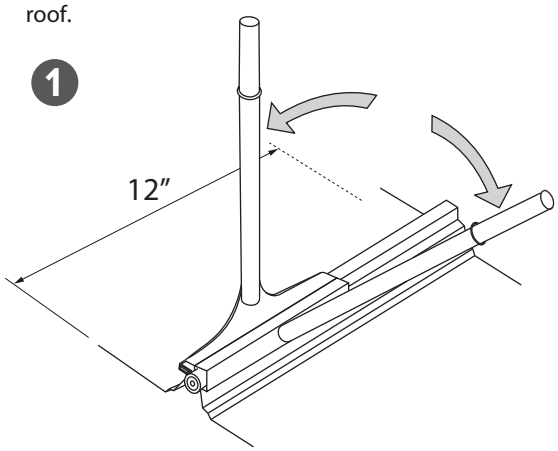


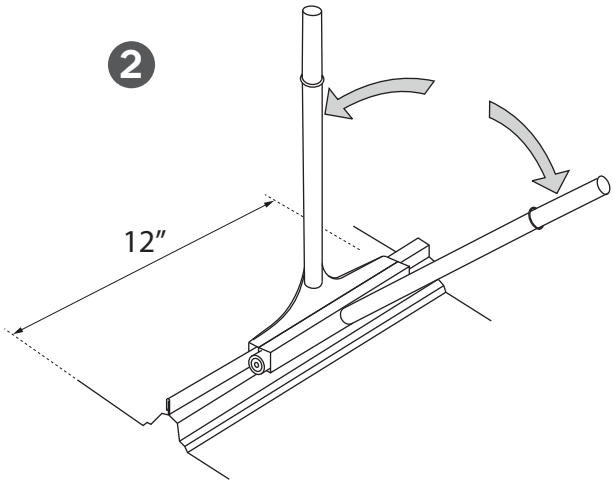


SEAM READY TO ACCEPT THE ELECTRIC SEAMER



Position the hand seamer in ***Stage 2*** over the panel rib, following the completion of ***Stage 1*** at the edge of the roof.





Pull both operating handles to bend the panel 180 degrees. Repeat this process until reaching 12 inches from the edge.

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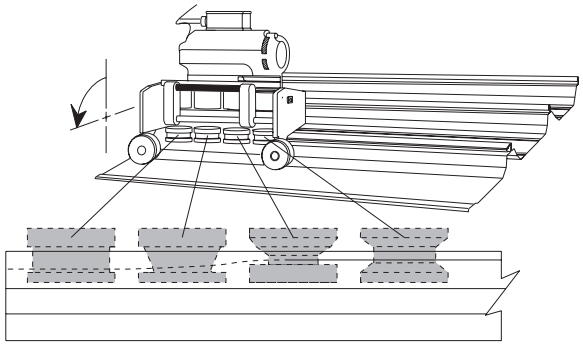
ELECTRIC SEAMER

Place the seamer on the seam with the locking arm up and facing the open side of the seam. Ensure that the rear wheels are positioned at the edge of the panel.

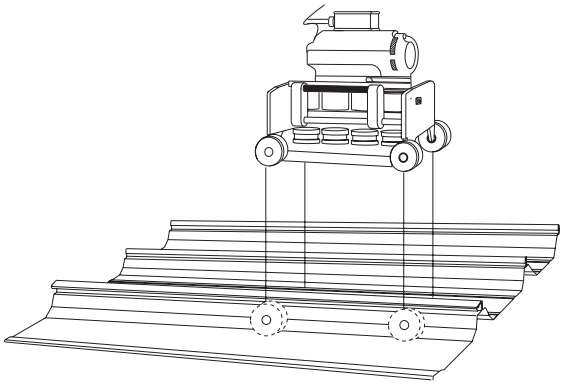
Verify that the last roll of the seamer is on the finished portion of the seam, while the other rolls are on the crimped portion of the seam.

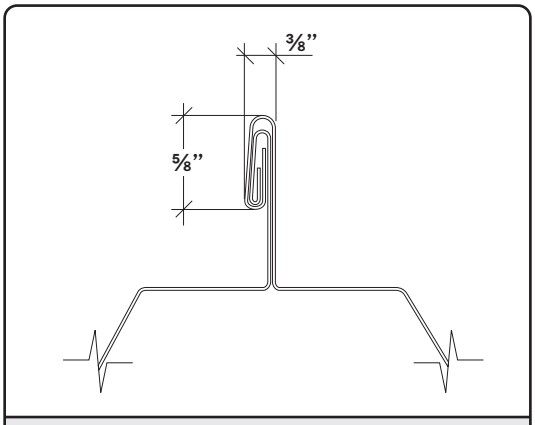
Push the locking arm down to engage the rolls, and then turn the seamer on.



Note: While seamer is running, walk in front of the seamer applying foot pressure to top of the panel seam while paying attention to end of panel.

Push the locking arm down to engage the rolls, and then turn the seamer on.

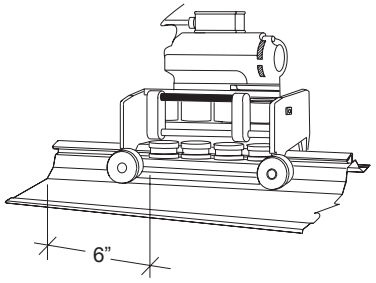




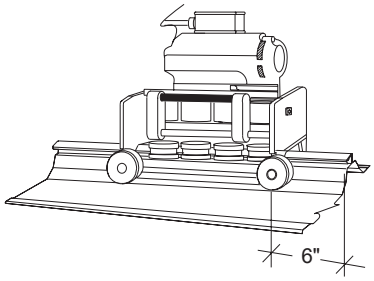
CROSS SECTION OF FINISHED SEAM

Stop the seamer approximately one foot from the ridge. Disengage the locking arms and remove the electric seamer.

Proceed to finish the seam with a hand tool by crimping the remaining portion of the female lip. Then, using the second stage hand seamer, fold and finish the seam. Repeat this procedure for all panels.



START SEAMER 6" FROM END OF PANEL.



STOP SEAMER 6" FROM END OF PANEL.

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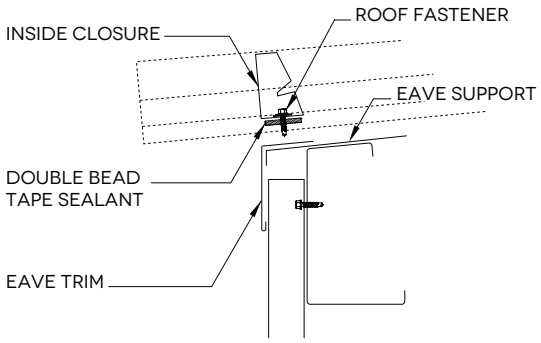
INSIDE METAL CLOSURE



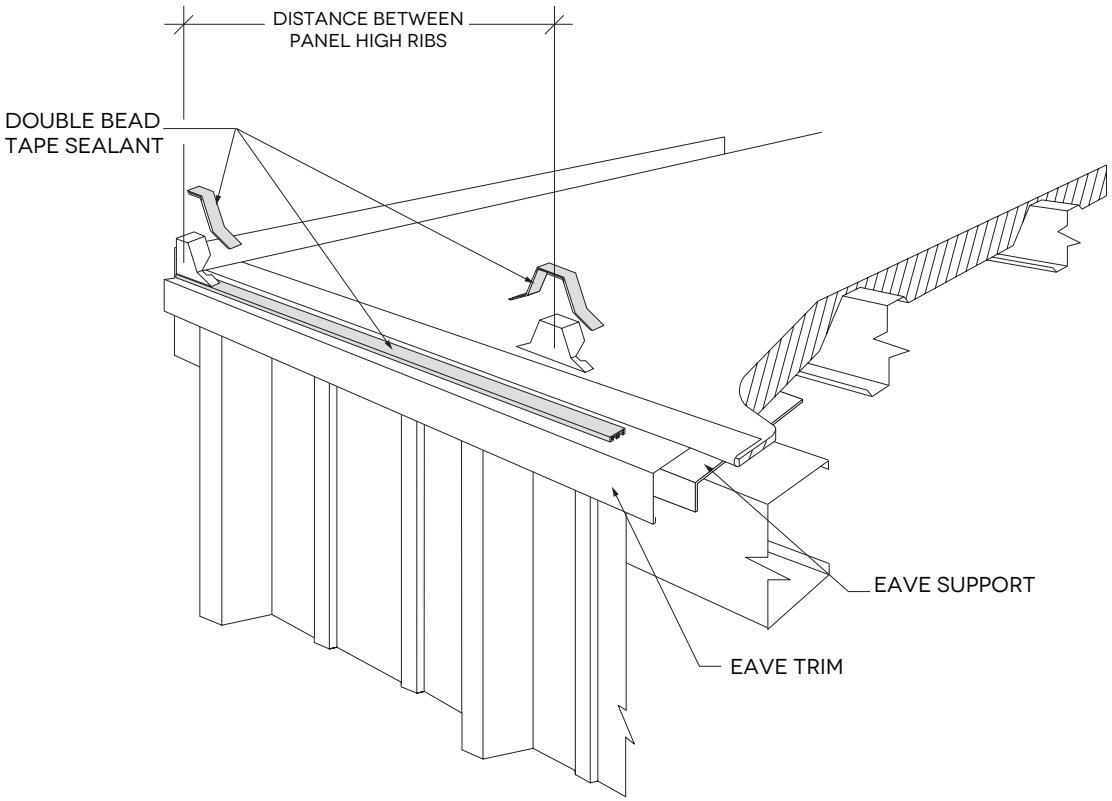
INSIDE METAL CLOSURE ATTACHMENT

Using roof fasteners, attach the first inside closure to the eave strut and eave support, ensuring that the face of the inside closure aligns with the steel line.

Position additional closures at intervals between the high ribs of the panels from the first closure to maintain panel module. Attach each closure with roof fasteners, installing two fasteners per closure. The first fastener should be inserted through the slotted hole to allow for any necessary adjustments.

Apply double bead urethane tape sealant on the top and side of each closure to ensure a complete seal at the eave. These sealants may be pre-applied before installation.

To maintain panel module, metal inside closures must be installed at the distance between panel high ribs. Measure from tab to tab located on the metal inside closure.



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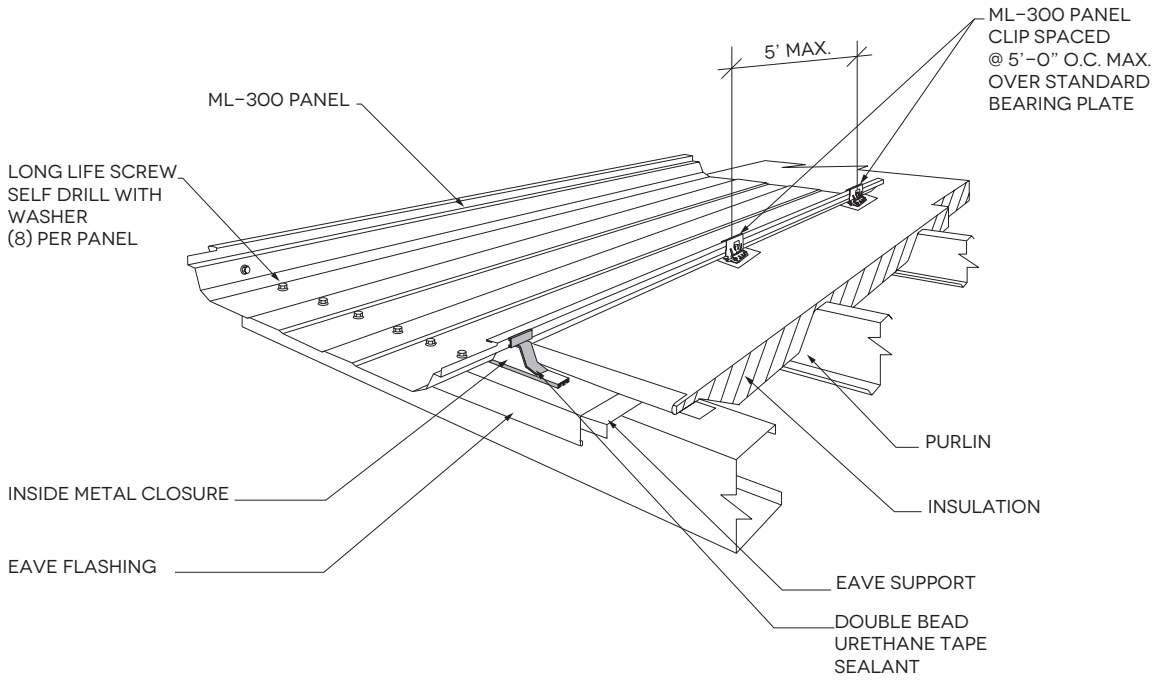
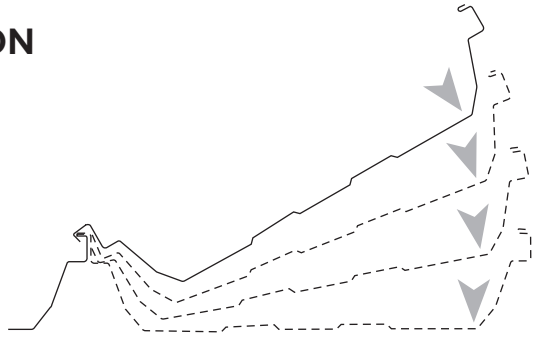
PANEL INSTALLATION

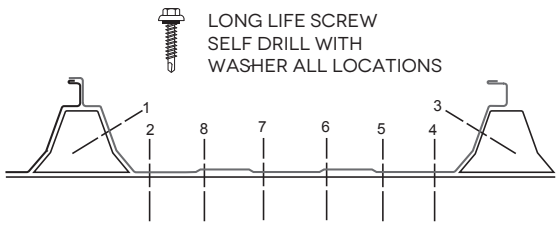


SUBSECUENT PANEL INSTALATION

While holding the male side of the next panel up, position the female lip on top of the male leg of the adjacent panel, ensuring it is flush at the eave. Rotate the panel down, visually inspecting to ensure that the female lip is fully engaged onto the male leg of the adjacent panel along its entire length. If further alignment is necessary and the panel needs to be raised, caution should be exercised to avoid pulling the factory-applied mastic from the female lip.



Install long-life self drill fasteners with washers at the eave in the recommended sequence. Eight fasteners are required at this location.



FASTENER SEQUENCE AT EAVE

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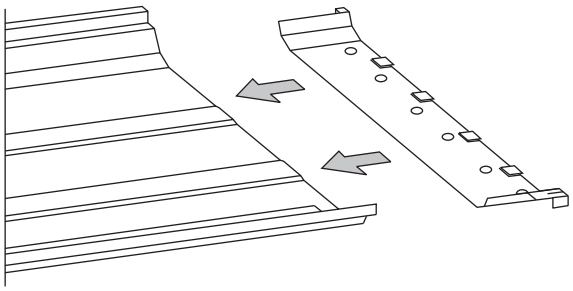
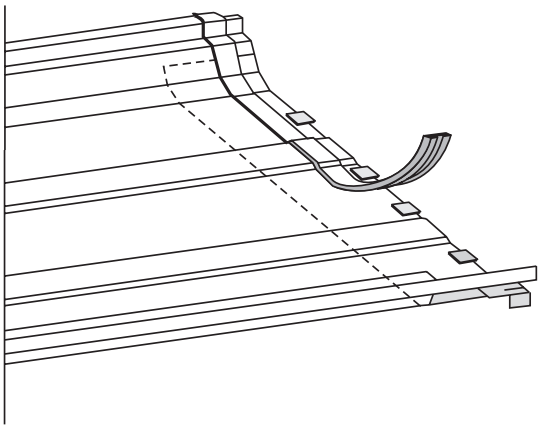
BACK UP PLATE @ HIGH EAVE

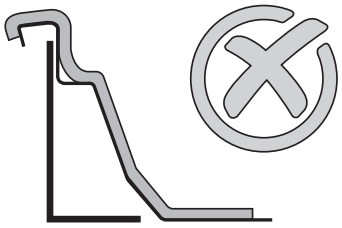
At the high eave, install a back-up plate to maintain the panel module.
Slide a back-up plate onto the end of the panel, ensuring that the teeth on top of the back-up plate are positioned atop the panel.



Apply double bead urethane tape sealant over the entire width of the panel."



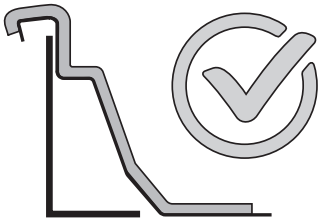
To ensure proper adhesion and seal, it is important to verify the correct application of the double bead urethane sealant.



WRONG WAY

Improper application of urethane tape sealant during panel installation is a common mistake. When attempting to force the tape into corners, the sealant's thickness may be compromised, leading to inadequate sealing where it is most essential.

This oversight can result in significant issues, from water leaks penetrating the roof to improper air infiltration, ultimately compromising the subsequent steps of the installation process.



RIGHT WAY

To ensure proper adhesion and seal, the tape sealant must be compressed between the panel and flashing surfaces with firm and uniform pressure. In most cases, the required pressure is applied by the clamping action of screws pulling the adjoining surfaces together. However, it's important to note that the tape sealant's resistance to pressure increases in cold weather conditions.

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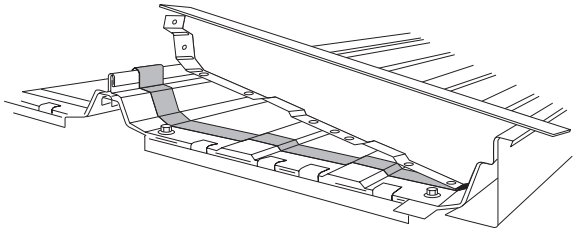
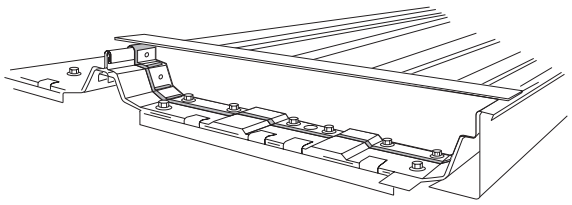
OUTSIDE METAL CLOSURE

Once all panel runs are installed and seamed, return to the first panel run at the ridge. Install Double Bead Urethane Tape Sealant across the full width of each panel.

Rotate the outside closure into position, ensuring it contacts the female side of the panel first. Use an awl to align the first hole on the female side of the outside closure with the corresponding hole in the panel and back-up plate. Install a long-life self-drilling screw with a washer in this hole.

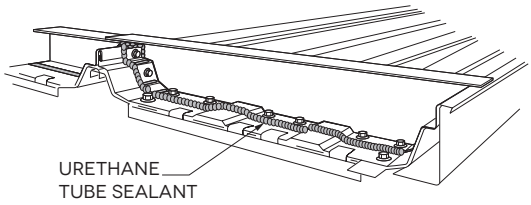


Push the other end of the outside closure into position. Install a Self-Drill Long-Life With Washer Fastener in all remaining holes except for the hole at the panel seam. Do not install the panel seam fastener at this time.



Ensure the closures are tightly fastened but not overly compressed, which could deform them and reduce their effectiveness.

Install all outside closures on both sides of the ridge.

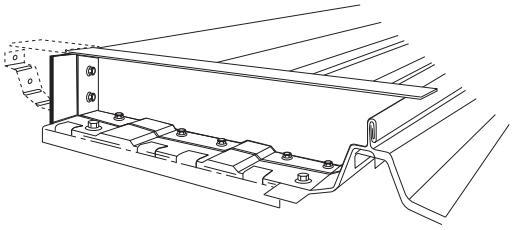


Install a Long-Life Self Drill screw with a washer in the remaining hole at the panel seam and the corresponding hole in the adjacent outside closure. Use urethane sealant to fill any voids around the panel seam on the upslope side of the outside closure.

If the last panel was cut on-site as part of the roof design, the final outside closure on this panel will also need to be modified on-site. A tab should be created at the end of the outside closure for attaching it to the upturned leg of the roof panel (also formed on-site). Secure this tab to the panel using two Long-Life Self-Drilling screws with washers.

These fasteners will ensure the closure is firmly attached, providing stability and preventing any movement.

This ensures a proper fit and effective sealing of the roof.



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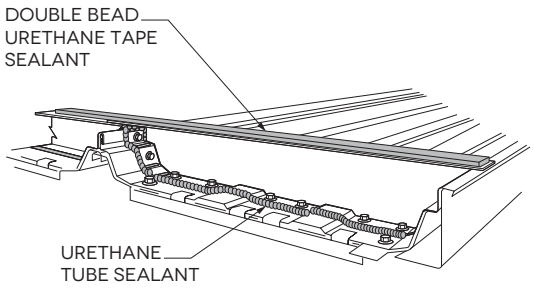
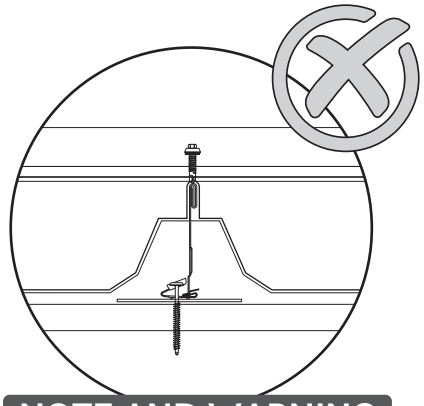
RIDGE CAP

Apply a continuous double bead urethane tape sealant along the top of the panel closure.

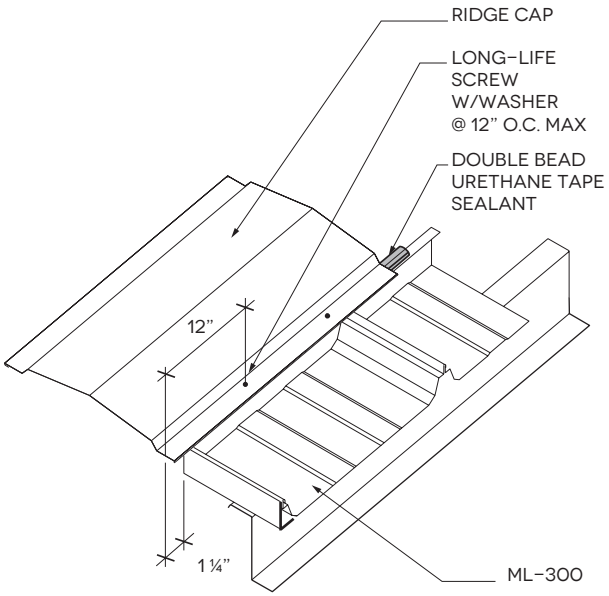


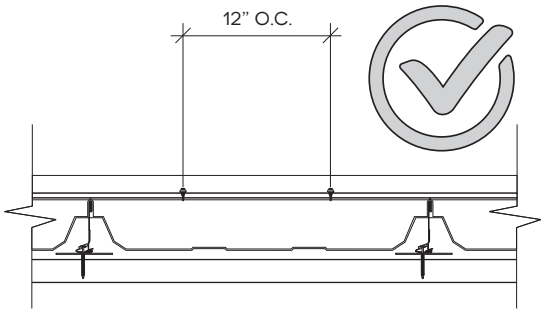
Install the ridge flashing, ensuring it starts and ends 1 1/4" beyond the wall thickness outside the steel line. Secure the ridge flashing to the outside closures using Long-Life Self-Drilling screws with washers. Place a fastener 1 1/2" from the panel seam on both sides of the panel, and install additional fasteners directly above the minor ribs of the panel.



NOTE AND WARNING

DO NOT INSTALL ANY SCREW FASTENERS OVER THE HIGH RIB OF THE PANEL. THIS WILL DAMAGE THE ROOF'S INTEGRITY, SIGNIFICANTLY AFFECTING ITS PERFORMANCE AND INCREASING THE LIKELIHOOD OF AIR AND WATER LEAKS





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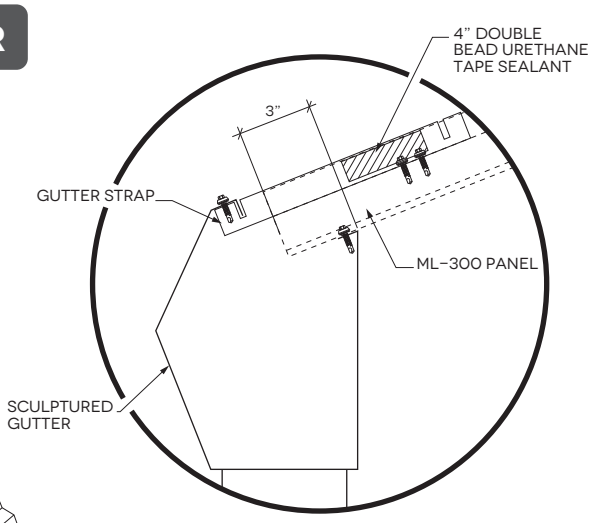
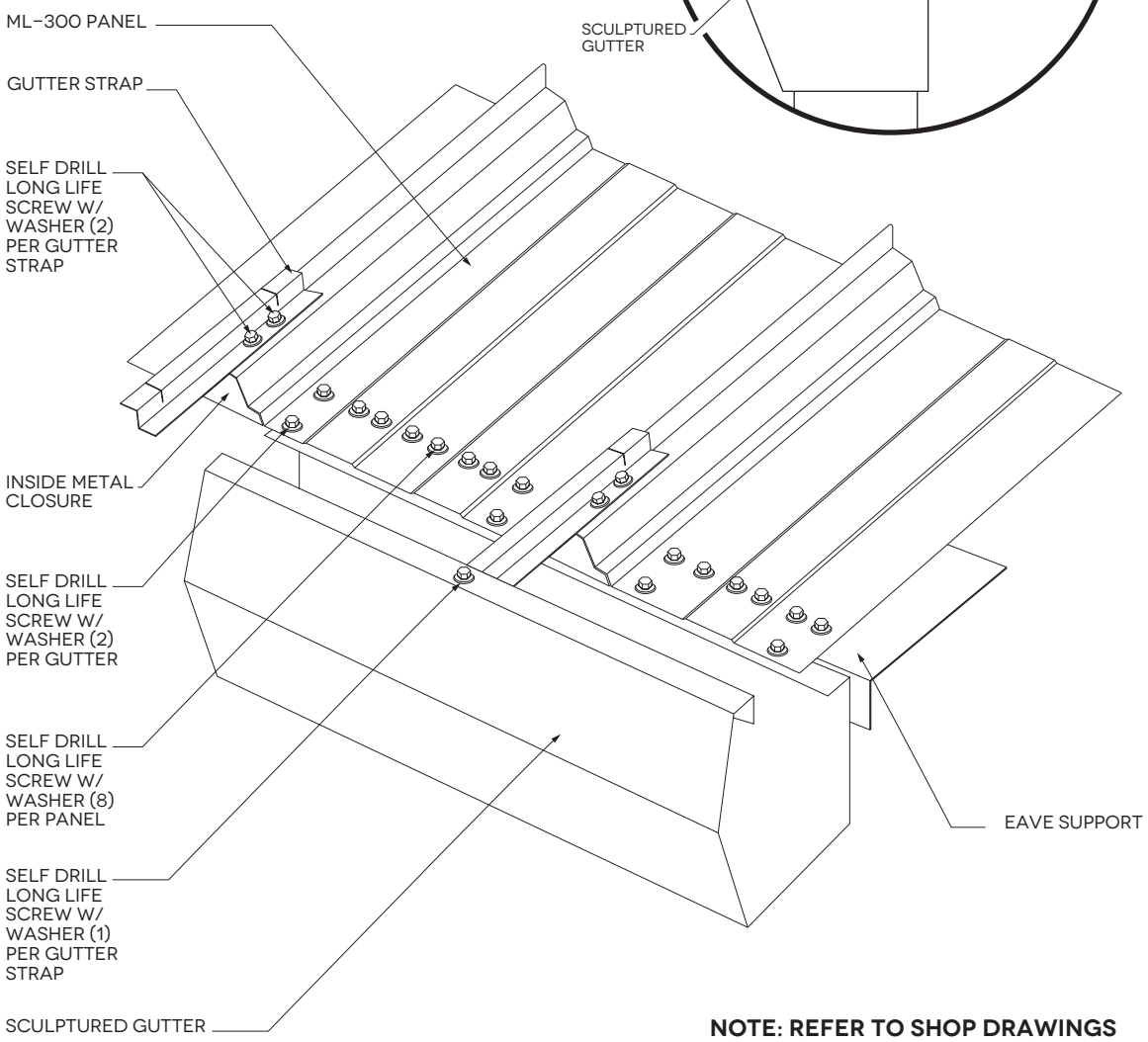
SCULPTURED GUTTER

Install the gutter support and fasten it to the high rib of the roof panel, applying at least 3 inches of double bead urethane tape sealant. Then, lift the gutter and insert the top part into the slot of the gutter strap and fasten it to the sculptured gutter.





NOTE: REFER TO SHOP DRAWINGS FOR GUTTER SUPPORT SPACING.

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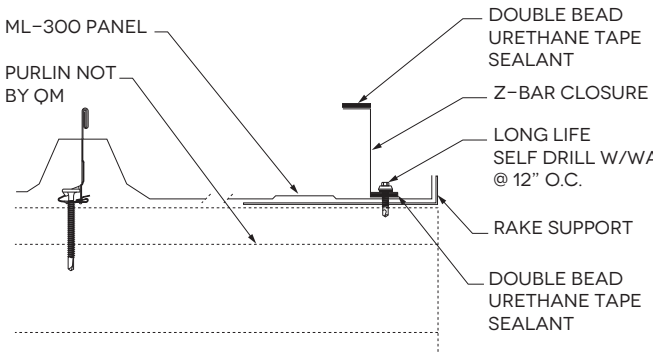
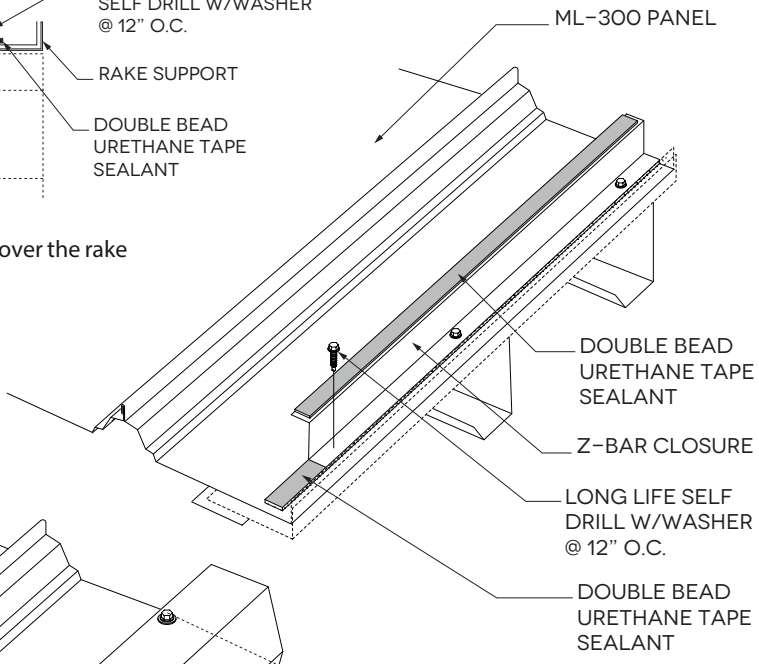
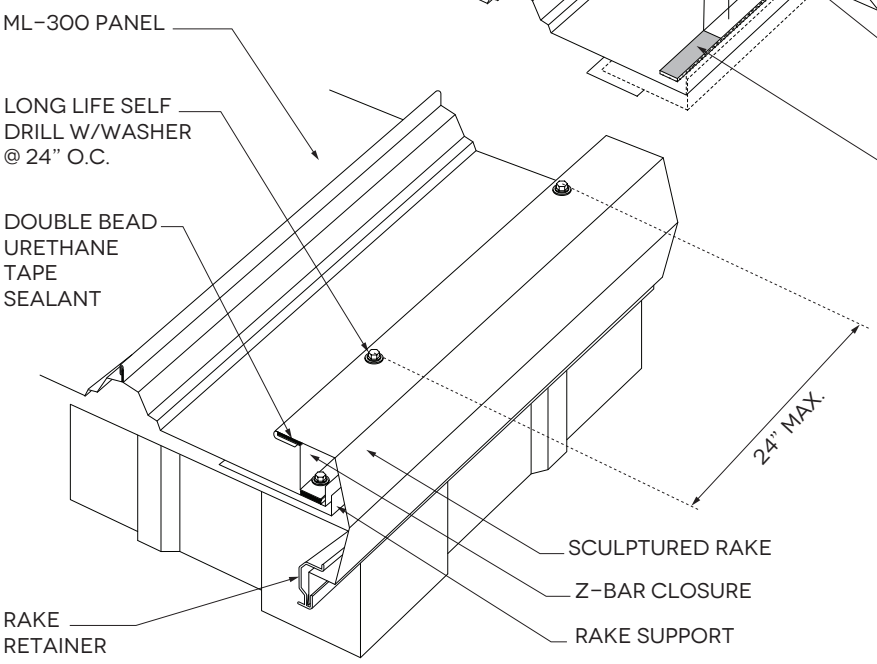
SCULPTURED RAKE



Cut the panel on site and bend it 1 inch over the rake support.





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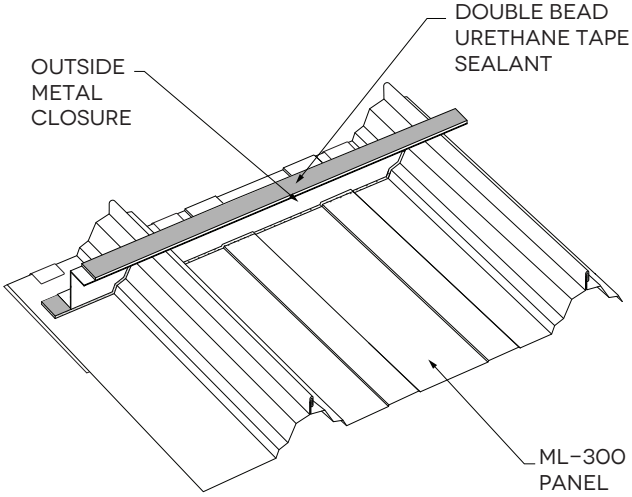
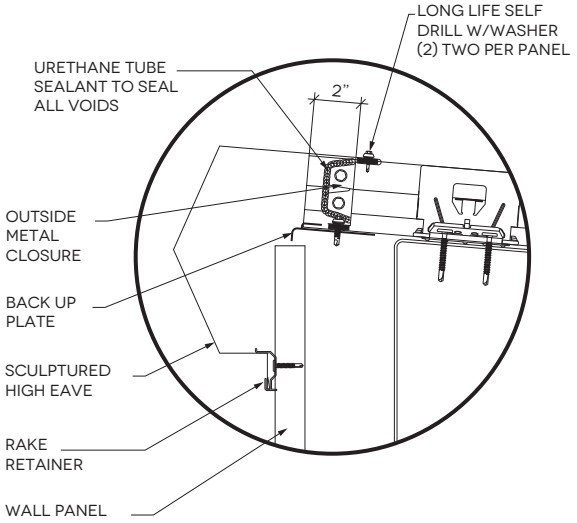
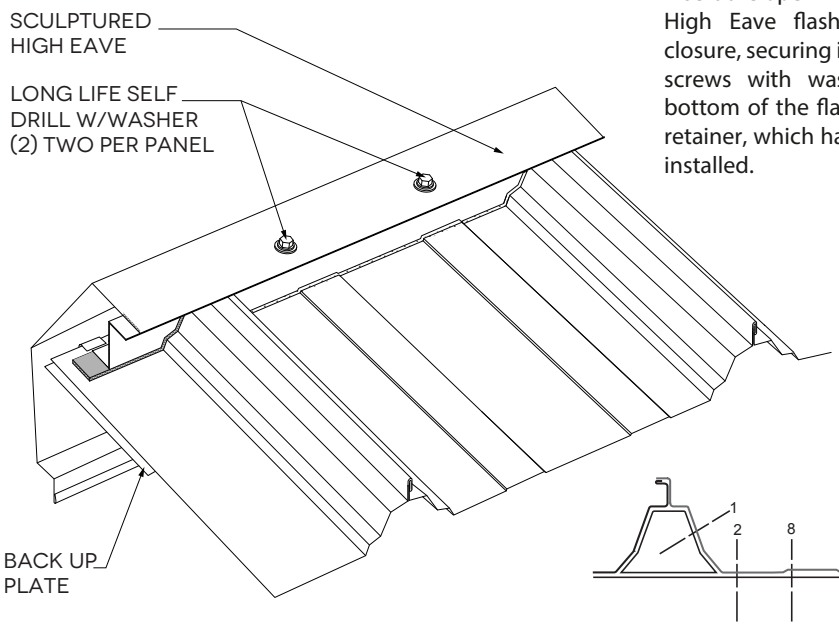
SCULPTURED HIGH EAVE

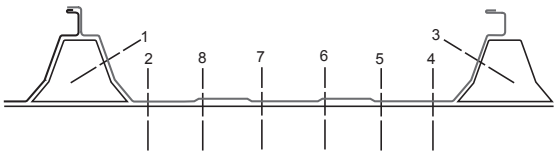




Apply a continuous double bead of urethane tape sealant along the top of the panel closure.

Insert the open hem at the top of the Sculptured High Eave flashing into the outside metal closure, securing it with two long-life self-drilling screws with washers per panel. Ensure the bottom of the flashing is inserted into the rake retainer, which has been previously aligned and installed.





FASTENER SEQUENCE AT EAVE

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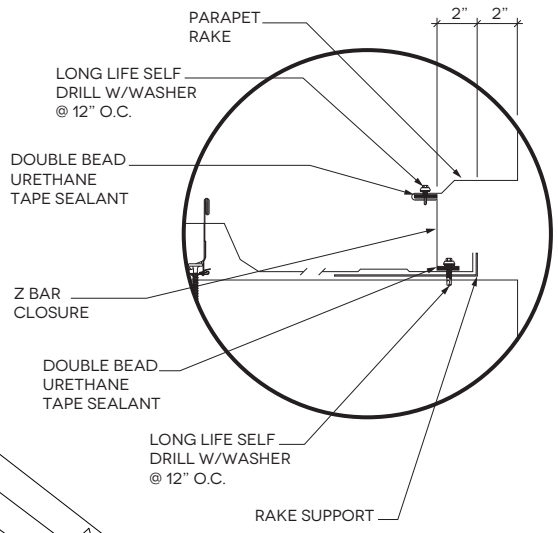
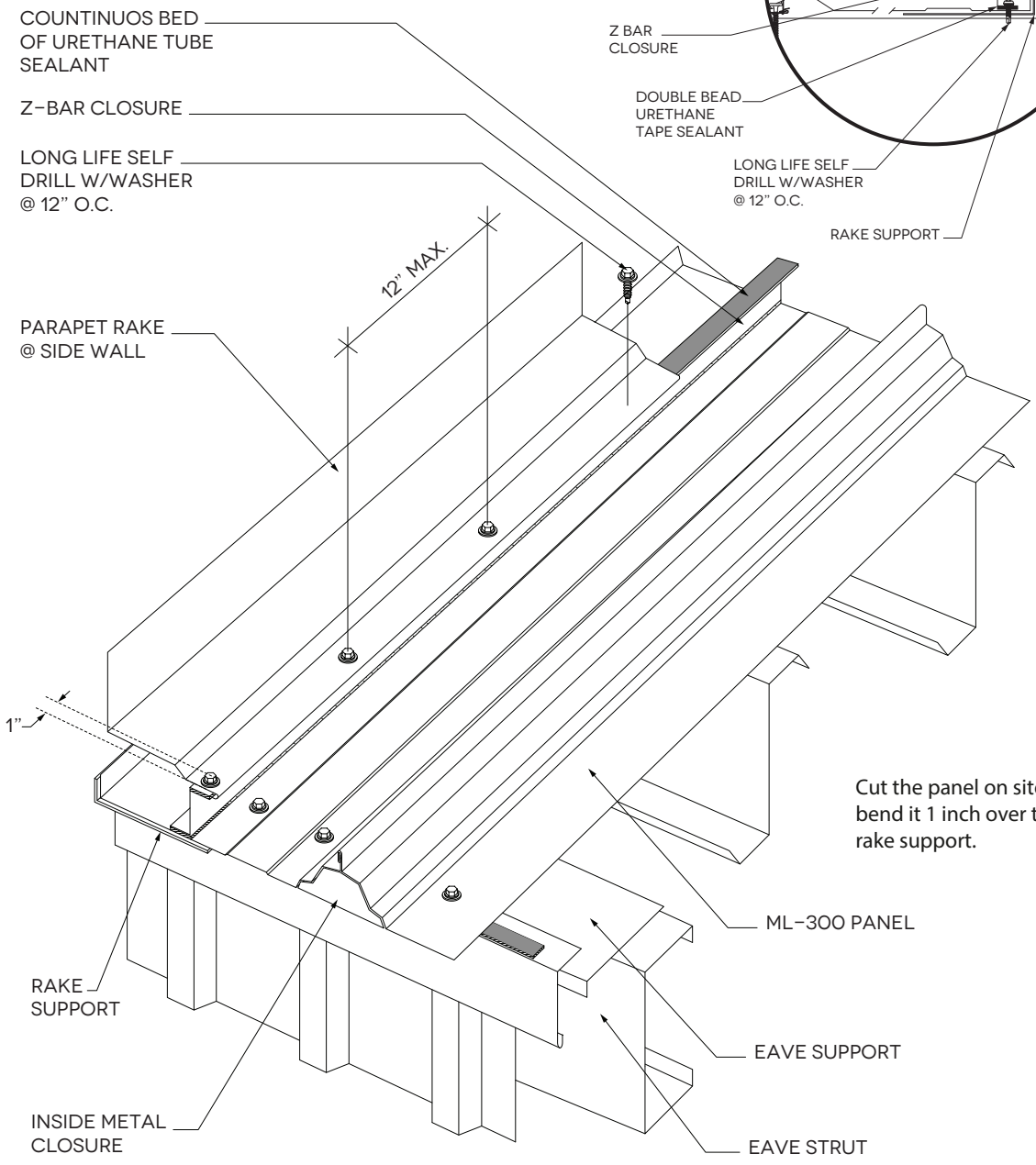
SIDE WALL





Cut the panel on site and bend it 1 inch over the rake support.

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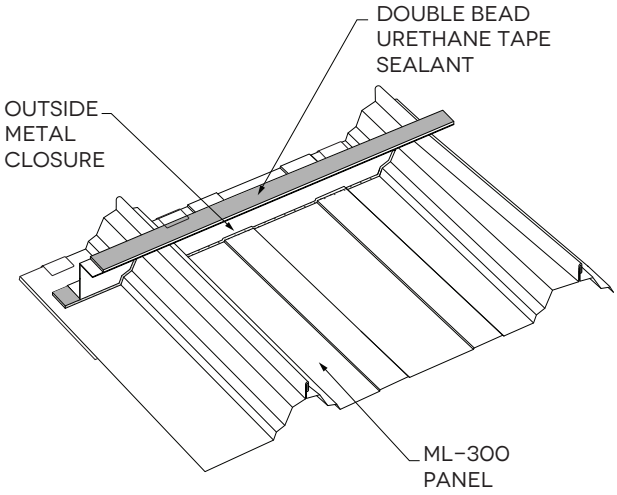
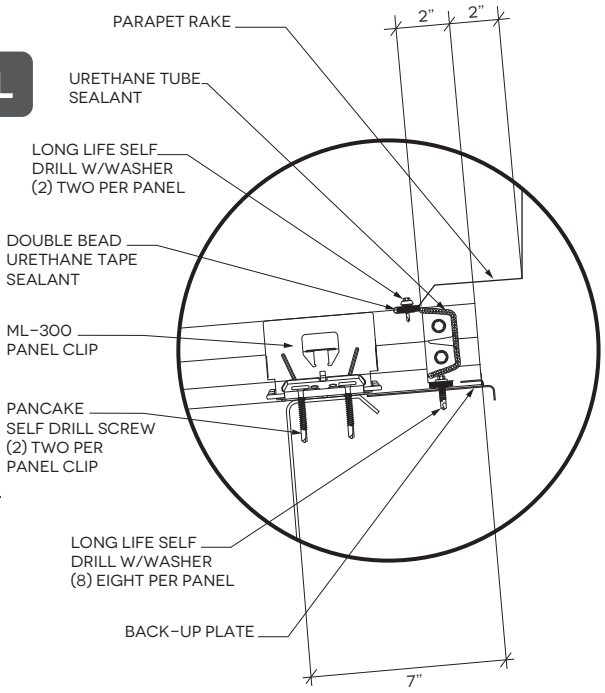
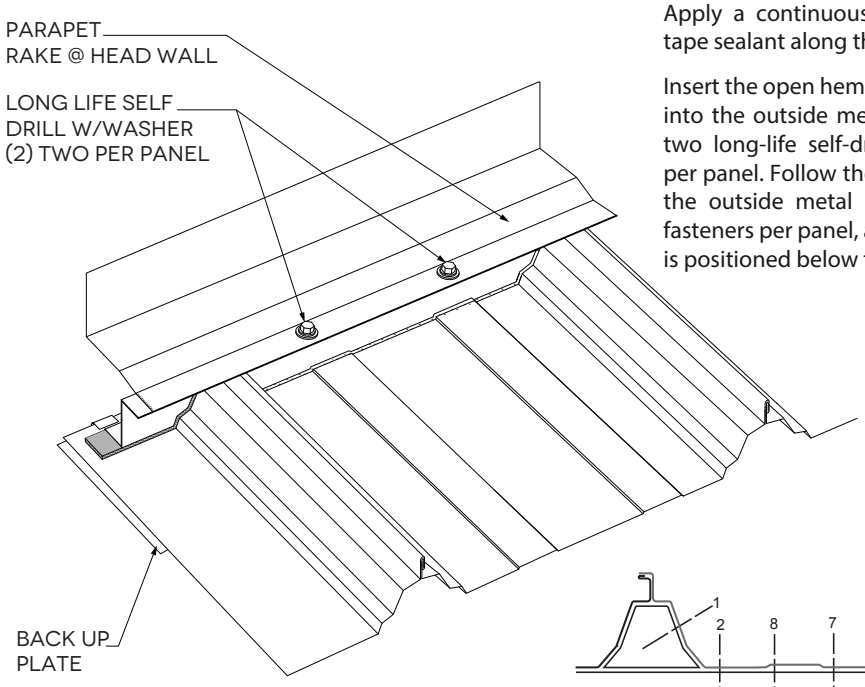
HEAD WALL

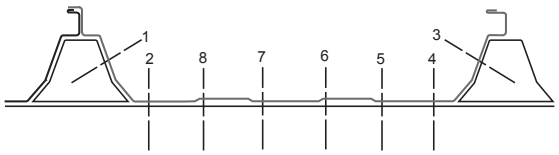






Apply a continuous double bead of urethane tape sealant along the top of the panel closure.

Insert the open hem of the Parapet Rake flashing into the outside metal closure, securing it with two long-life self-drilling screws with washers per panel. Follow the screw pattern sequence at the outside metal closure, installing eight (8) fasteners per panel, and ensure the backup plate is positioned below the panel.



FASTENER SEQUENCE AT EAVE

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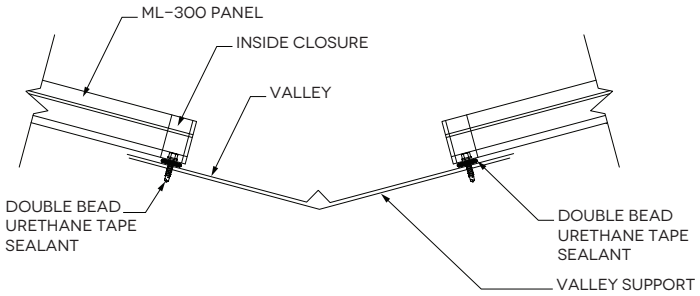
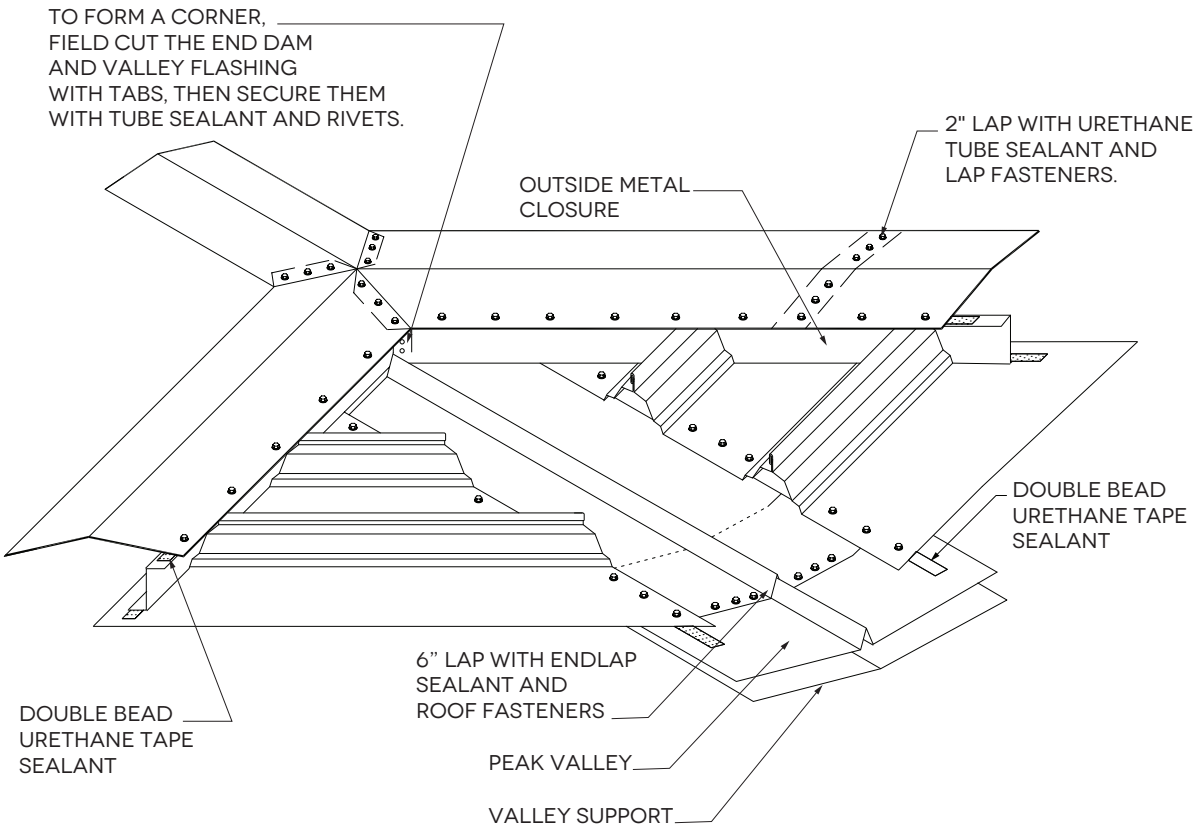
VALLEY





The above illustrations depict typical hip and valley details. For specific hip and valley configurations, please refer to the erection drawings.
Hip conditions are similar to ridge conditions, with the exception that special end dams and backup plates are required.

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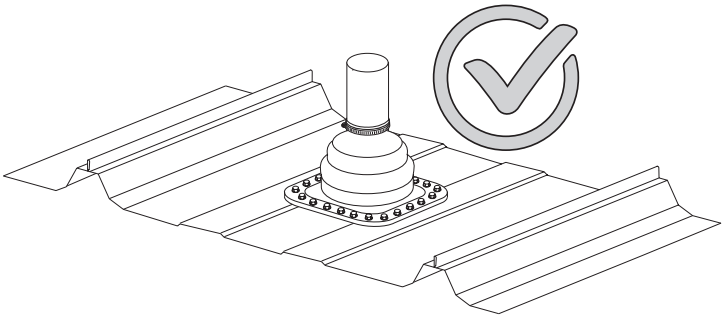
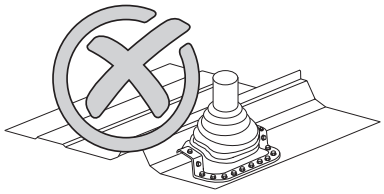
PIPE PENETRATION

RECOMMENDED SMALL PIPE PENETRATION INSTALLATION

Install the pipe in the center of the panel to ensure the base of the rubber roof jack lays flat.



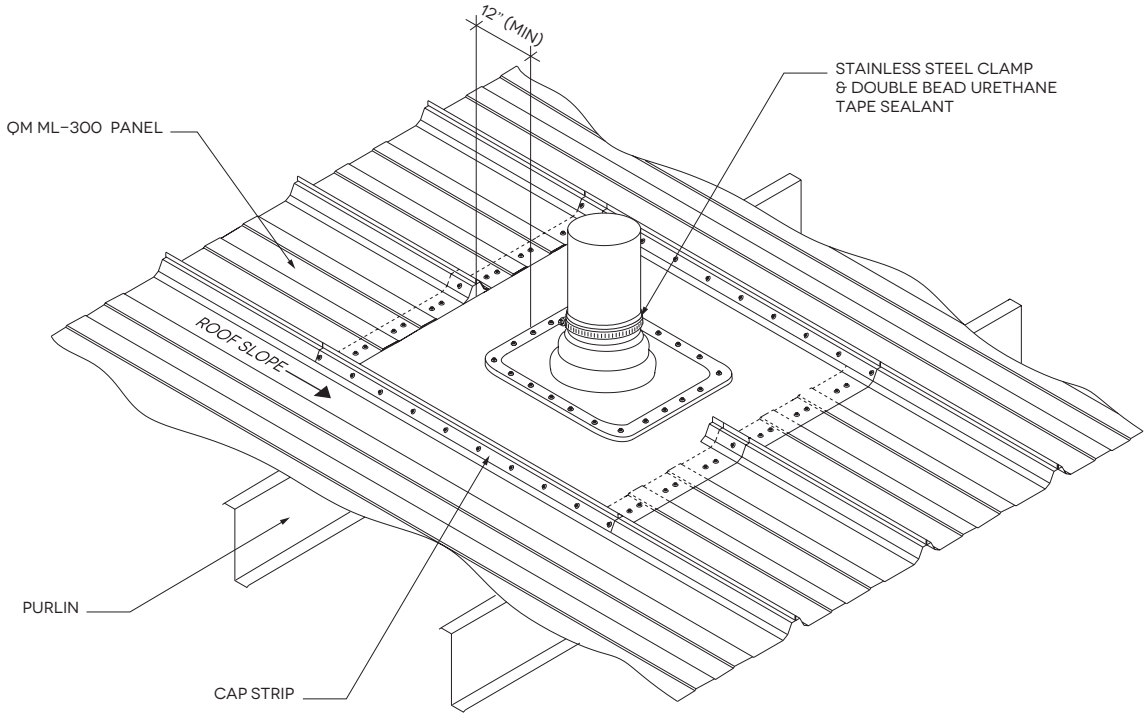
RIGHT WAY



WRONG WAY

RECOMMENDED SMALL LARGE PENETRATION INSTALLATION

This method should be used whenever a pipe penetration intersects a panel rib or when the pipe is too large to allow adequate water flow down the panel.



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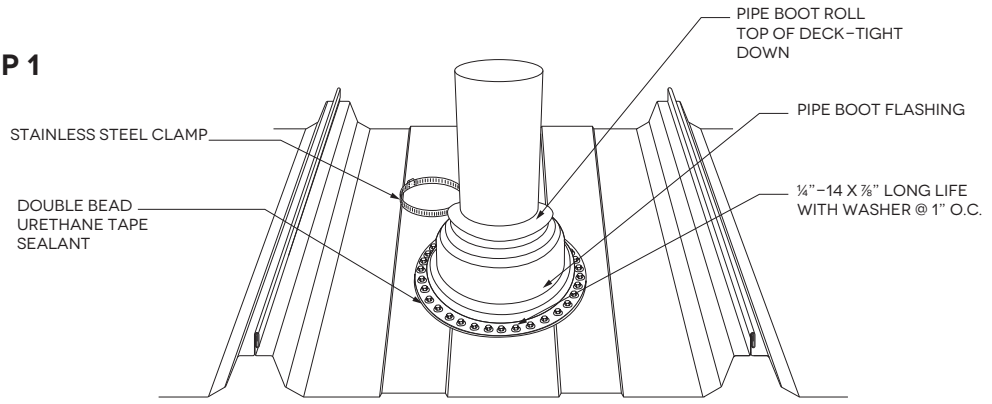
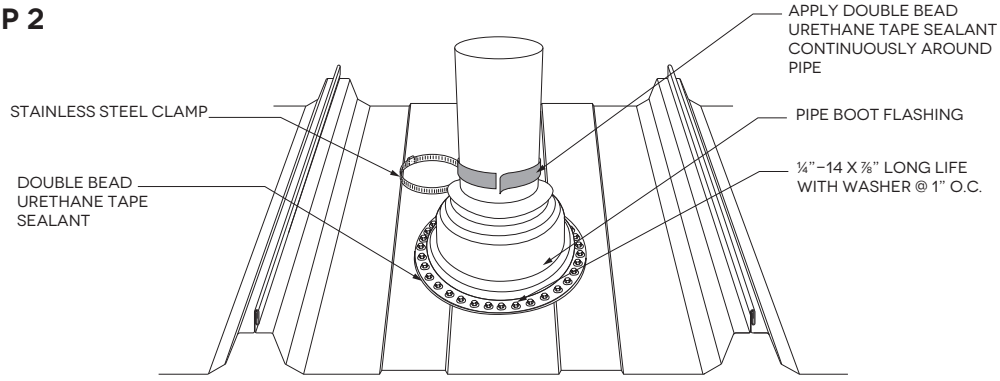
PIPE PENETRATION

PIPE BOOT INSTALLATION

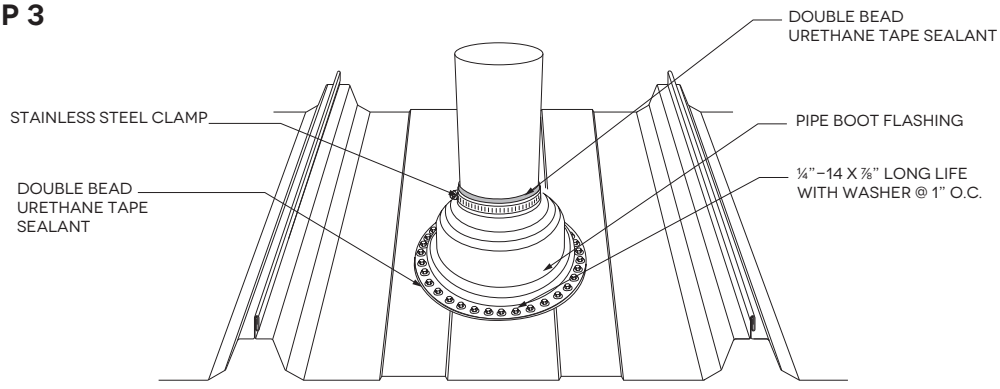
STEP 1



STEP 2



STEP 3



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