

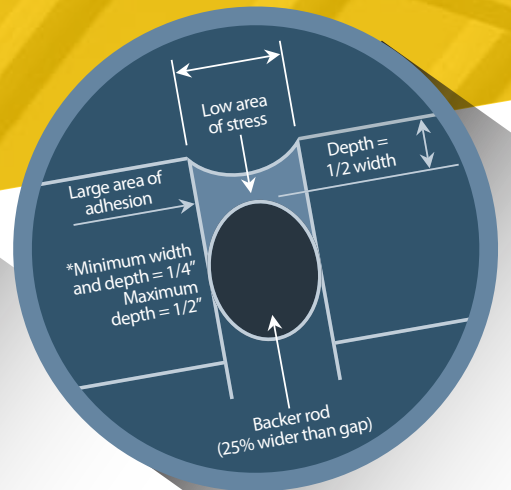


SEALANT INSTALLATION GUIDE

This guide was created to provide installation guidance on how to properly install sealant. The goal is to minimize sealant installation failures due to incorrect joint design and sealant selection. It is as important to correctly design the joint to maximize performance as it is to install the sealant properly.

STEP ONE: ANALYZE JOINT MOVEMENT

Allowing for joint movement is necessary, because all substrates will move due to temperature expansion and contraction. Joint movement measurement is critical to determine the type of sealant to use, or if the sealant is capable of performing as expected.



ESTIMATED MOVEMENT:

Find the joint movement in the table based on your intended substrate.

Recommended Joint Width = Joint Movement x (100/Class of Sealant)

It is recommended to install joints at midpoint of joint movement, which will be at the midpoint of temperature extremes, giving you equal joint movement during both ends of the temperature range.

For more detailed information on joint design, we recommend reviewing the most recent additions of 1) ASTM C1193 Standard Guide for Use of Joint Sealants and 2) ASTM C1472 Standard Guide for Calculating Movement and Other Effects When Establishing Sealant Joint Width.

Substrate	Joint movement for a 10 foot panel in x/16th of an inch
Wood (parallel to grain)	0.38 to 0.45
Aluminum	2.69 to 3.07
Steel	1.41 to 1.66
Stainless Steel	1.29 to 2.21
Copper	2.05 to 2.18
Concrete	1.25 to 1.79
Brick Masonry/Mortar	0.60 to 1.15
Glass - Plate	1.15
Granite	1.01 to 1.08
Limestone	1.02
Marble	0.70 to 1.80
PVC	6.91 to 14.08
FRP	3.20
Polyurethane	7.37
Polycarbonate	8.32 to 8.96
Acrylic	8.70 to 9.60

BACKING MATERIAL:

- Backing material is recommended for the best performance of watertight joints.
- Ideally, joints will be designed to accommodate a backing rod, as this is the preferred method of installation.
- See STEP FOUR for installation information.

Visit www.TITEBOND.com for the most up-to-date product information.

STEP TWO: CAPABILITIES

ENVIRONMENT: Environmental stresses such as UV light, temperature extremes, humidity/moisture levels, physical stress such as creep (permanent) and elastic (temporary) deformation due to wind and other variable loads and others all affect joint movement.

CLASS: ASTM C920 Class can be used to determine if the sealant has enough "stretch" to handle the dynamic joint in question. ASTM C920 incorporates a number of tests that determine cyclic movement on a number of substrates

such as accelerated weathering, peel strength and sealant staining and fade resistance.

Some sealants will work better than others on certain substrates. See specific product details to determine which sealant is right for your desired substrate. Staining can occur if a sealant is used on a non-recommended substrate.

STEP THREE: PRIOR TO INSTALLATION

Review sealant precautions prior to application.

REPLACING OLD SEALANT: It is recommended to remove old or damaged sealant from a joint prior to installing new sealant. Remove sealant by cutting away product with a knife or razor and follow steps below for preparing the substrate.

SUBSTRATE PREPARATION: Substrate preparation should be done on the same day you apply the product. Surfaces should be clean (free of dirt, dust, oils, water repellants and old sealant compounds), stable (substrate must handle movement/hold together as the joint moves), dry (free of ice, frost and standing water), and primed (if required by sealant or needing additional substrate stabilization) prior to sealing. Be sure to test any product on the substrate before installation.

Surface sealers and coatings often end up repelling sealants. Whenever possible, sealers and coatings should be applied after the sealant is cured, as it is extremely difficult to apply such materials onto the surface without contaminating the joints.

BUTT JOINTS: Be sure to correctly determine joint movement if you would like to install a butt joint, due to its high risk of joint failure.

CONSIDER TEMPERATURE:

- Sealant should be applied within the specified temperature range stated on the product label. Not doing so may alter the application and resulting performance of your product.
- For best performance, apply sealant at the mid-range of expected temperature extremes. This will minimize joint movement in each direction, reducing stress on the sealant (see troubleshooting).
- Do not apply product in hot and dry conditions, or when heavy rain or freezing temperatures are anticipated.

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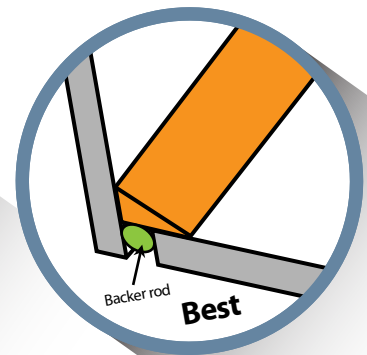
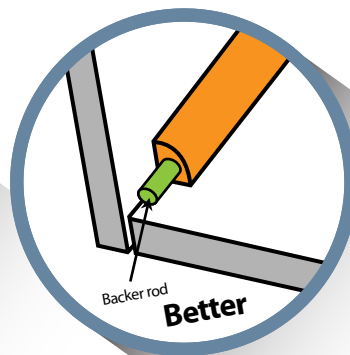
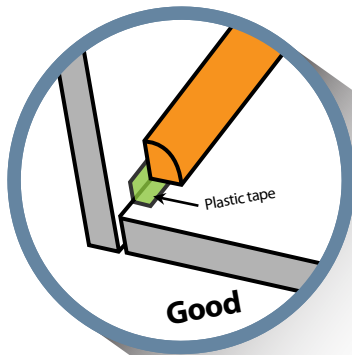
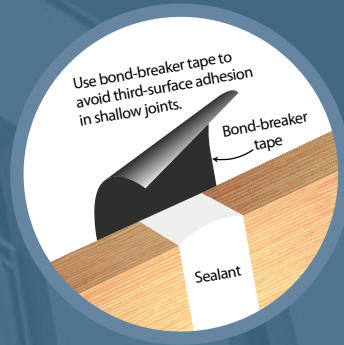
STEP FOUR: FILLING THE JOINT

BACKING MATERIAL: Backing materials such as open cell, closed cell, or bicellular backer rods or bond breaker tape/backing tape are used to control the depth of the sealant. Backing material functions as a bond breaker to eliminate three-sided adhesion and to allow the sealant to expand and contract properly as designed.

Backer rods should be approximately 25% wider than the gap. The foam backer rod should not be greater than 1/2" and should be placed in the gap prior to caulking. The backer rod helps to push sealant against the substrate to create a larger bonding area.

Bond breaker tape should be used on a firm bottom surface and where the joint is too shallow to fit a backer rod. Size the tape appropriately; if it is too large, the tape will wrap around the sides of the joint, eliminating bonding area required for good adhesion.

Closed-cell backer rods should not be used with moisture-cure sealants. Open-cell backer rods should not be used where moisture absorption into the backer rods can be a problem, including horizontal and submerged joints.



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TO INSTALL:

- Use blunt tool when inserting a closed cell backer rod to avoid puncturing it (prior to sealant installation), as this will cause bubbling in sealant.
- Length-wise stretching, twisting or braiding of the backer rod should be avoided.

SEALANT APPLICATION:

- Prior to use, confirm that sealant is within its shelf life.
- Ensure the use of proper tools for a consistent and uniform application.
- To make clean-up easier and force product to lie in a straight line, tape off areas adjacent to joints and around the joint area to prevent sealant from attaching to unintended surfaces.
- To function properly, a sealant must not be bonded on three sides (only the joint sides, never the base) or applied too thick. Sealant bonded on three sides can fail adhesively, cohesively or both (see Failures).
- Read instructions on caulk cartridge prior to use. Caulk cartridge should have a nozzle of proper size, and be cut on a slant and the foil seal needs to be punctured before placing cartridge in cartridge gun.
- Extrude product into joint with steady, consistent pressure in a rounded bead form – free of ridges, wrinkles, sags, air pockets and embedded impurities.
- Use color coated nails if recommended by the fiber cement board manufacturer.
- Do not fill nail holes; do not tool, smear, feather or wipe sealant to a thin consistency or film outside of joint or masked area as these films may discolor (see troubleshooting).

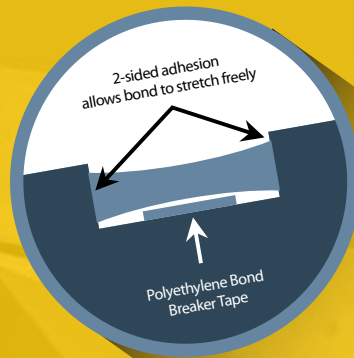
CLEANUP:

Once sealant is dry to touch and does not transfer, remove tape if applied. Uncured polymer-based sealants may be cleaned with isopropyl alcohol or acetone (mineral spirits or similar solvent for translucent). Uncured water-based sealants will clean-up easily with water and a damp rag. Sealants are difficult to remove once cured, as they are designed to be permanent – excess sealant must be cut or scraped away. Follow solvent vendor's precautions when using solvents.

CURE TIME AND PAINTABILITY:

Make sure to vary your wait time based on the humidity level, as reactive sealants will cure slower when it is cooler and less humid, and water-based sealants will dry slower when it is cooler or more humid. Once a skin is formed it can be tested for durability and may be painted over at this time. Check specific product information for preferred type of paint, how long to wait after application before applying paint, and if compatibility tests are recommended for paint (other than water-based latex).

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IDEAL BEAD:

Forms an hourglass shape twice as wide as it is deep, allowing the bead to stretch without tearing or pulling away from the substrate. The sealant should be no thicker than 1/2 inch and not thinner than 1/8 inch.

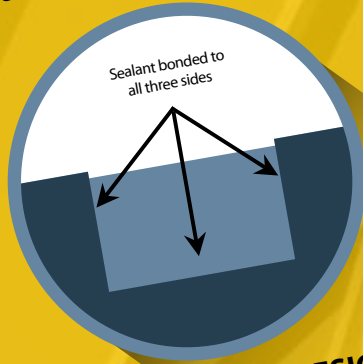
We recommend that consumers NOT use caulk in any electrical application.

TOOLING:

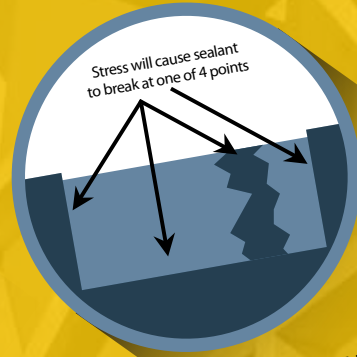
- It is NOT recommended to tool sealant into thin films unless they will be painted. It is best if the sealant stays in bead form.
- If you decide to tool the sealant, joints should be neatly tooled as soon as possible before sealant forms a skin layer.
- Tooling can be done wet or dry, using various techniques, depending on the sealant type and project.
- As stated in sealant application above, taping the area prior to application is recommended (unless sealant will be painted over) to avoid spreading sealant too thin, which may cause bleaching or discoloring of the sealant (see troubleshooting).
- Tooling is typically done to eliminate air pockets which may expand and rupture during hot weather or voids. It also ensures good substrate wetting for optimum adhesion to gain a low stress area (which can prevent the sealant from pulling away from the sides of the joint).

TROUBLESHOOTING:

Joints that are too narrow will push the sealant out during substrate expansion or split from too much expansion during substrate contraction which may cause leaks. Wide joints can handle more movement but need backing material to form a seal not thicker than 1/2 inch with large attachment areas on each substrate.



THREE-SIDED ADHESION



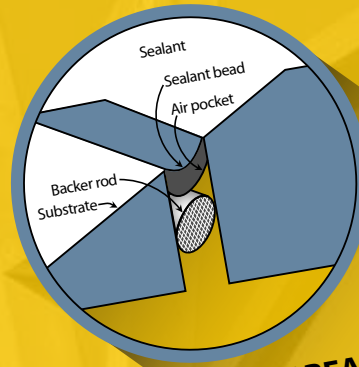
AVOID THREE-SIDED ADHESION

APPLYING IN LOW TEMPERATURES:

- The cold air usually lacks moisture and may retard the cure for some sealants.
- When substrates are below 0°C (32°F), they are always subject to frost. Even when melted, water may remain and there is the possibility of frost occurring, poorly bonding the sealant to the substrate. Warm sealant to 60-80°F before use, so the sealant is not too thick to extrude.

APPLYING IN HIGH TEMPERATURES:

- Three-sided adhesion will cause sealant to be severely compressed at the high end of the temperature range (substrate expansion), which can cause the sealant to "pop" out of the joint.
- Improper substrate preparation is the most common mode of sealant failure (adhesion failure). If the bead is too narrow, there may be insufficient material to accommodate the joint movement and the sealant will split (cohesive joint failure). Under-filling of joints normally leads to adhesion loss.



IDEAL SEALANT BEAD SHOULD NOT HAVE AIR POCKETS