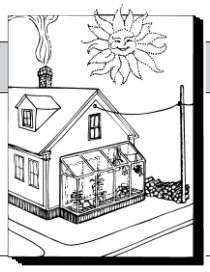


The Perfect Caulk Bead

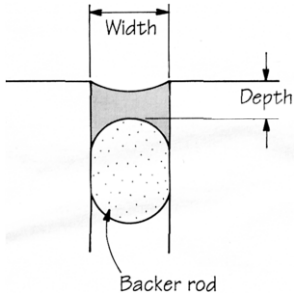
by Bruce Sullivan

Architects and engineers may spend hours designing sealant joints for curtain walls or highways. Residential buildings will never receive that kind of attention, but there are several points to keep in mind if you want your air sealing work to have a chance of lasting as long as the building.

Joint Design

A sealant must stick to the substrate (*adhesion*) and hold itself together (*cohesion*). This requires a minimum amount of sealant.

The Perfect Joint



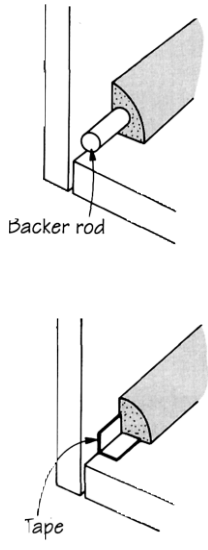
For most sealants, the perfect joint is twice as wide as it is deep. The depth should never be greater than 1/2 inch. The maximum width depends on the sealant, ranging from 1/2 inch to 2 inches. Backer rod allows you to adjust the depth. It also gives the bottom of the sealant that hourglass shape and serves as a bond breaker.

Usually a joint needs to be at least 1/4 inch wide and 1/8 inch deep. Some sealants, however, will work in smaller joints. Check with the manufacturer for the ideal size of the joint for the particular sealant you are using.

Joints can also be too big. If there's too much sealant in a joint, it may not cure before the substrate starts to move due to temperature changes or settling. No joint should be deeper than it is wide. Maximum depth should be no more than 1/2 inch. The maximum width depends on the type of sealant. For example, acrylic latex can fill gaps 1/2 inch wide, while polyurethane can fill gaps up to 2 inches. These important details appear on the manufacturer's spec sheets.

For most sealants, the ideal joint depth will be half its width. This gives the bead of sealant a thin cross-section, which allows it to stretch. The ideal bead has an hourglass shape. The wide ends stick well to the sides of the joint, while the thin middle stretches easily.

Corner Joints



If corner joints move, they need a bond breaker. Backer rod or tape in the corner allows the sealant to flex as the joint moves.

Backing

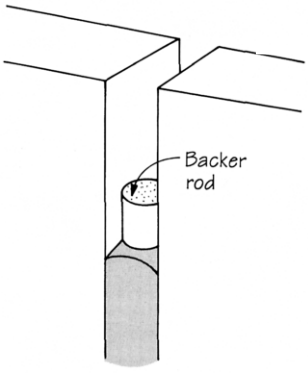
You should fill deep joints with some kind of backing. Fiberglass insulation, and just about everything else, has been used to fill gaps to the proper depth.

Fiberglass works, but the best material is *backer rod.* It's a flexible polyethylene or polyolefin cord made specifically for this purpose. Its curved surface forms the perfect hourglass bead. Backer rod comes in a variety of sizes starting at 1/4 inch. Select a size that's 25% to 50% larger than the gap to be filled.

To install the backer rod, simply push it into place with a blunt object, such as a shim shingle cut to the approximate size of the joint. Avoid using screwdrivers and putty knives, because they might tear the material.

Backer rod comes in two forms: open cell or closed cell. Both products have their fans. Closed cell material blocks air leakage by itself and serves as a secondary seal. It doesn't wick moisture. However, if the closed cell foam is punctured during installation, it can release air into the sealant, creating bubbles that weaken the bead. If you puncture the material, remove that section and replace it.

Butt Joint



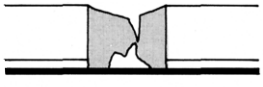
Position backer rod so that it fills the joint to the proper depth.

Proponents of open cell backer rod like its flexibility to fit into irregular joints. Since it's already open, it can't be punctured. However, it absorbs water, so avoid using it for joints in concrete slabs. Open cell foam also allows air to seep through, so make sure the bead completely fills the joint.

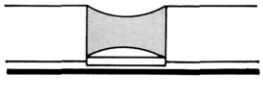
Bond Breaker

The perfect bead of sealant attaches only on the two opposite sides of the joint. When the joint opens or closes, the bead expands or compresses. You don't want sealant sticking to the back side of

Bond Breaker



Without Bond Breaker



With Bond Breaker

Three-sided joints fail because sealant sticks to the back and the bead can't move freely as the joint expands and contracts. To prevent three-sided adhesion, apply a bond breaker. Bond breaker can be any material that won't stick to sealant, such as polyethylene tape, foam weatherstripping, wax crayon, or even strips of plastic garbage bags.

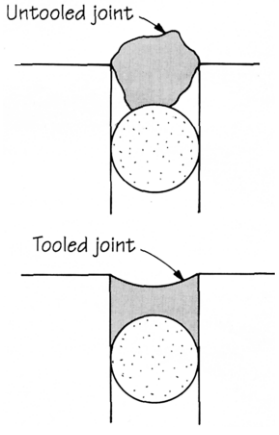
the joint. This "three-sided adhesion" can cause the sealant to tear when the joint expands.

Since sealant doesn't stick to backer rod, it serves as a bond breaker to prevent three-sided adhesion. If the joint is too shallow for backer rod, you'll need to find some other material to serve as a bond breaker. Any material that doesn't stick to sealant will work. Polyethylene tape is good. Thin strips of adhesive-backed foam weatherstripping is another option. You could even cut strips from a plastic garbage bag, or with a wax crayon you could "draw" a bond breaker onto the back of the joint. Just be careful not to touch the sides.

Cleaning

Clean the joint before applying a sealant. Remove all dirt, wood shavings, and dust with a brush or vacuum. Use compressed air only if you have a line filter because the oil from the compressor tank will prevent adhesion. Also, make sure the joint is dry. If the joint surface is oily or waxy, pour solvent on a rag to wipe the substrate. Then wipe the solvent off with a clean rag.

Tooling



Tooling pushes sealant into the joint and shapes the surface. Use an old spoon or butter knife, not your finger.

Filling the Joint

There's much more to applying sealants than slopping caulk around. Your goal is to fill the joint with sealant, without trapping air. Plus, the sealant must be pressed firmly against the substrate for good adhesion. Cut the nozzle on the tube as close as possible to the size of the bead. It's always easier to start small and enlarge if needed.

There are two basic methods for applying the caulk:

Pull and tool. Most people pull the caulking gun along the joint. That leaves a round bead that must be "tooled" or pressed into the joint and smoothed. Tooling forces caulk firmly into the joint and eliminates air pockets, and creates a concave surface to reduce the stress of joint movement. A spoon, a thin spatula, or an old table knife all make good tools. A little water or solvent on the tool will make a smooth finish. It's not a good idea to use a finger for tooling, unless your sealant is peanut butter.

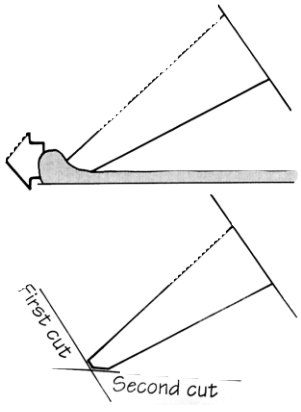
Push. Pushing the caulking gun can save a step. Pushing forces caulk into the joint and tools in one motion. Hold the caulking gun level with the top of the joint. Push it along so that a small bulge of sealant rides ahead of the tip. That bulge tells you that the joint is filled.

Cold-Weather Caulking

Sometimes you're forced to apply sealant when the temperature is colder than the 40°F listed as the minimum for most sealants. Here are some tips for cold weather:

Store the cartridges in a heated space overnight. Carry the cartridges to the site in an insulated ice chest to keep them warm until needed. Throw in a jug of warm water on really cold days.

Push Method



Push the gun so that a small bulge of sealant rides ahead of the tip. This prevents air gaps and presses the sealant firmly against the substrate. For best results, cut the tip twice as shown. This allows sealant to flow straight down into the joint.

Be sure that all surfaces are free of water and ice that will interfere with adhesion. A thin film of ice commonly covers surfaces when the temperature is below 40°F. Warm the joint with a heat gun or hair dryer immediately before application. ■

Bruce Sullivan, a writer in Eugene, Ore. specializing in energy topics for builders, is a principle of Iris Communications, Inc. and editor of Northwest Builder.