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PAYING ATTENTION TO DETAIL

by Bob Cusumano

Painting contractors are often required to install caulk or sealant in exterior joints. Too often, the sealant is simply gunned into the joint until it's filled and the remainder is smeared onto the adjacent surfaces. Whether the main purpose of the caulking is weatherproofing or improving appearance, careful consideration of joint design, the physical properties of the sealant to be used, and the operating environment of the joint all play a significant role in its performance and durability.

There are many sealant types available and the selection of a particular material should be based on its physical properties. When a sealant is used in joints that are subject to movement, then the amount of expansion and contraction must be considered. Certain low cost caulking materials can only accommodate joint movement of approximately 5%. These caulking materials should only be used for static joints with limited exterior exposure. Other sealant materials can accommodate joint movement of 12.5% or higher. Other factors that should be considered when a particular caulking material is selected include its adhesion, hardness, abrasion resistance, effective temperature range, and resistance to weathering.

One of the leading modes of sealant failure is loss of adhesion when the caulking material delaminates from one of the surfaces to which it is attached as shown in photo 1. The interior of the joint must be inspected to ensure that it is clean and sound. The sealant in shown in photo 2 failed because it was applied to a corroded substrate that could not accommodate the movement of the joint. If the sealant is to be applied to a painted surface, then the adhesion of the paint to which the sealant will be applied must first be assessed. The caulking shown in photo 3 failed because the paint to which it was applied peeled.



Photo 1



Photo 2



Photo 3

Therefore, cleanliness and stability of the joint are of utmost importance. Joints should be cleaned by grinding, sanding, or wire brushing to expose a sound surface free of loose materials. All loose materials, including previously applied coats of paint, must be removed. Solvent cleaning may be required to remove surface contaminants and dust. With certain caulking materials, the sealant manufacturer will require that the joints be primed with a certain material prior to installing the sealant material.

Unfortunately, the importance of caulking joint design is often overlooked. Voids are routinely filled without much forethought. The size and shape of the sealant bead is often the reason that sealants fail. The joint must be large enough to accommodate a sufficient amount of material so that expansion and contraction can be achieved when the joint moves. Some rules of thumb for sizing joints are as follows:

1. The minimum width and depth of joints in weatherproofing situations should be $\frac{1}{4}$ inch.
2. For small joints up to approximately $\frac{1}{2}$ inch wide, the depth of the joint should be approximately equal to its width.
3. For medium sized joints that are between $\frac{1}{2}$ inch and 1 inch wide, the depth should be no more than $\frac{1}{2}$ inch.
4. For large joints over 1 inch wide, the depth of the joint should be approximately 50% of the width.
5. A bond breaker should be used in corner joints to prevent three point adhesion.

The above rules are based on performance studies that indicate that when sealant joints are too deep, the stress created will increase, likely resulting in failure of the sealant. Photo 4 shows an example of a failed sealant bead where its depth is double its width; the opposite what it should be.



Photo 4

The joint depth is often controlled by placing a compressible material called a backer rod into the joint. Backer rod is typically a foam-like material and is purchased in long lengths of various diameters and is inserted into the joint just before the sealant is applied. Photo 5 shows an open cell backer rod in a caulk joint. Another important reason for using backer rod is to prevent a condition known as “three point adhesion”. When you install caulking, it should be adhered to the two sides of the joint, but not to the rear. If the sealant is attached to both the sides and the rear of the joint, then its ability to elongate is compromised and sealant failure often occurs. The backer rod either provides a surface that the sealant will not adhere to or will be so flexible that even though the sealant adheres to it, it does allow the sealant to move properly. Bond breaker tape may also be used to prevent three point adhesion when the depth of the joint does not need

to be controlled. Photo 6 shows a sealant bead that failed due to three point adhesion in a ninety degree corner joint.

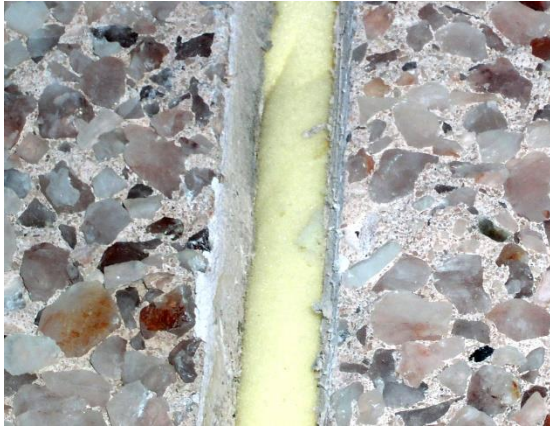


Photo 5

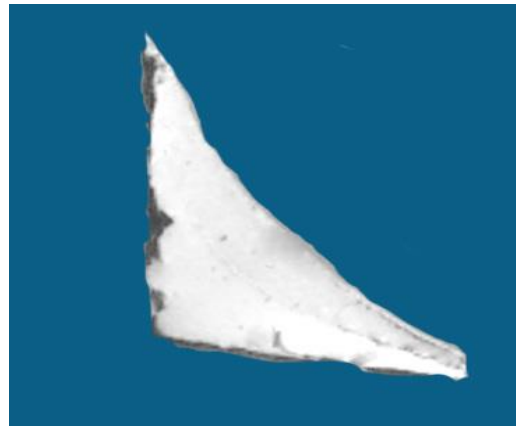


Photo 6

When re-caulking a building, many contractors only remove deteriorated caulk and then install a new bead on both areas where the old sealant was removed and areas where it remained in place. Installed a new bead over the existing one is not a recommended practice. In rare instances, an existing silicone caulk can be cut back and a new incompatible sealant, such as a urethane or acrylic, may be installed over the old bead. In this instance, the silicone will act as a bond breaker. However, it is generally wise to remove all old caulk when re-caulking.

Proper sealant installation requires that the sealant bead be pushed into the joint opening to fully wet-out and adhere to the sides of the joint. Masking tape should be placed at the sides of the joint, if needed, to avoid contact outside of the joint. Photo 7 shows a bead where the sealant was smeared over the top of the joint instead of masked. The sealant joint opening should be filled to a full and proper configuration. Vertical joints should be lapped over horizontal joints. After the sealant is placed, and before skinning or curing begins, it requires immediate tooling. This is normally accomplished with metal spatulas. The tooling process should create a smooth, uniform finish with no air pockets and good contact for optimum joint sealant adhesion within each side of the joint opening. Excess sealant should be removed from adjacent surfaces and any masking tape should be removed after the sealant is installed. The sealant manufacturer as well as ASTM Standard C-1193 will provide guidelines for proper specific joint sealant installations.



Photo 7

Successful sealant installations can provide many years of excellent service, but they don't happen by accident. Proper joint design, careful selection of the type of sealant to be used, and strict adherence to installation details are all required.