PRECURED SILICONE SEALANT IN BUILDING ENVELOPE RENOVATION APPLICATIONS

By Jason Bakus

Many different types of liquid-applied sealants have been used over the years in the construction industry. These sealants, which will be referred to as "wet sealants," include acrylic, polyurethane, polysulfide, silicone, modified silicone, siliconized polyurethane, and other technologies. While these wet sealants have been used successfully for many years in the industry, precured sealant is becoming more popular due to its inherent advantages over wet sealants. Precured sealant is produced by extruding sealant material and allowing it to cure to a rubbery, elastomeric product in a controlled manufacturing environment. Precured sealant is packaged in cured form, often in rolls instead of typical liquid-form packaging (tubes, pails, etc.). It is installed using a thin layer of wet sealant on each side as the adhesive to attach the material to the substrate being sealed. With the outer edges adhered to the substrate, the middle of the precured sealant, which is not bonded to the substrate, acts as the area for expansion and contraction.

Several types of precured sealant have been used in the industry over the years, ranging from polyurethane and polysulfide to silicone. Each type offers unique chemical and physical characteristics. Silicone precured sealant has been most commonly used in construction applications for several reasons.

First, because of its molecular structure and high bond energy, silicone has excellent aging characteristics and is more resistant to ultraviolet light and weathering than organic materials such as polyurethane and polysulfide, giving silicone a much longer effective lifespan than these organic materials. In fact, there is silicone sealant that has been in place on building exteriors for over

Figure 1 – Precured silicone sealant.

40 years that is still performing well. This characteristic of silicone is critical because precured sealant is often used in restoration and repair applications where the material is expected to provide a long-lasting solution.

Because silicone does not degrade when exposed to the elements, it is possible for manufacturers to produce the material very thin (1-2 mm). Thin, precured sealant minimizes expansion and contraction forces on the substrate and creates the aesthetically pleasing appearance of a flat profile.

Additionally, the movement capability for silicone precured sealant can be as high as 200% or more, which is significantly higher than any wet sealant. This combination of high movement capability and thin material allows precured sealant to handle multidirectional movement.

Further advantages include a wide operational temperature range and better resistance to color fading. For these reasons, silicone is the preferred precured sealant material used in the construction industry today. See *Figure 1*.

Over the past two decades, precured sealant has been used in the construction industry, mainly for renovation applications. One example of a typical application for precured sealant is repair of failed sealant joints. When precured sealant is used to repair a failed traditional wet sealant joint, there is no need to remove the old sealant. Installation is straightforward—the precured sealant is simply applied over the old joint using a thin layer of silicone adhesive on each side of the joint. The precured sealant is then simply pressed into place to ensure intimate contact between it and the adhesive, as well as between the adhesive and the substrate. Finally, any excess adhesive is removed and the installation is complete. See *Figures 2* and *3*.

Two of the most important advantages of using precured sealant are a decrease in time required to complete a project and a reduction in overall project cost. Labor costs will be lower, since several labor-intensive steps are removed from the process when precured sealant is used. For example, as discussed previously, the old sealant does not need to be removed when using precured sealant. Additionally, the substrate does not need to be abraded to ensure the complete removal of the old sealant. Also, precured sealant does not need to be tooled after installation. Each of these factors can help reduce project cost when using precured sealant.

This system for repairing failed sealant joints is especially useful with soft substrates such as exterior insulation finishing systems (EIFS). With EIFS, removal of the old sealant can damage the substrate and ruin the integrity of the joint. Because of this, many EIFS manufacturers recommend the use of precured sealant when repairing EIFS sealant joints. Several precured sealant manufacturers have the ability to produce textured material to match an EIFS system, giving the repaired joint a more uni-

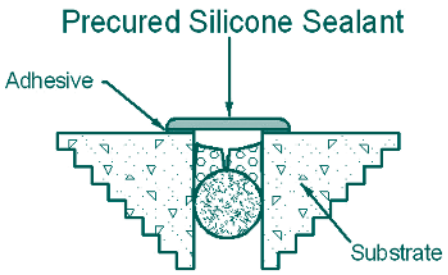


Figure 2 – Precured silicone sealant repair joint.

Figure 3 – Precured silicone sealant repair joint installation.

form appearance (*Figure 4*).

Another situation where precured sealant is used instead of wet sealants is one in which the width of the joint is not sufficient to handle the movement of the joint. This occurs frequently in buildings that are lacking an adequate number of expansion joints in the building envelope, causing the joints to expand and contract beyond the movement capability of the wet sealant. In this case, precured sealant works well because the material can handle the extreme movement in these types of joints.

Another example of this phenomenon is with window systems in which the window opening does not leave adequate space for a working perimeter sealant joint. Because the sealant

Figure 4 – EIFS joint repaired using textured precured silicone sealant.

Figure 5 – Precured silicone sealant installed in an aluminum window system.

adhesive is only used on the edges of the material, the precured sealant system creates its own artificial joint width to handle the movement. This allows the precured sealant to effectively seal in these and similar applications. These types of applications are expected to become more visible with the increased focus on weatherizing of homes and businesses to improve energy efficiency.

Precured sealant is also commonly used in butt joint applications where the joint depth does not meet the minimum 0.25 in. for wet sealants to bond to the substrate. This situation is routinely found in applications such as aluminum window systems and metal roofing applications. Aluminum window systems are an application in which precured sealant has been used to repair many major water intrusion problems. Because most aluminum window systems contain numerous metal-to-metal joints and other potential leak areas, when these systems fail, it can be very difficult to seal the leaks with traditional wet sealant. Precured sealant can be applied over the leaking areas in these systems, and when using a color-matched material, the precured sealant may be aesthetically inconspicuous (*Figure 5*).

Besides those already discussed, precured sealant is used successfully in many other applications, including:

- Curtainwall seals
- Skylights
- Roofing and parapet seals
- RV, marine, and transportation seals
- HVAC system seals
- Seals for showers and tubs

Precured sealant is available in a variety of standard sizes and colors. Some manufacturers also offer custom color and

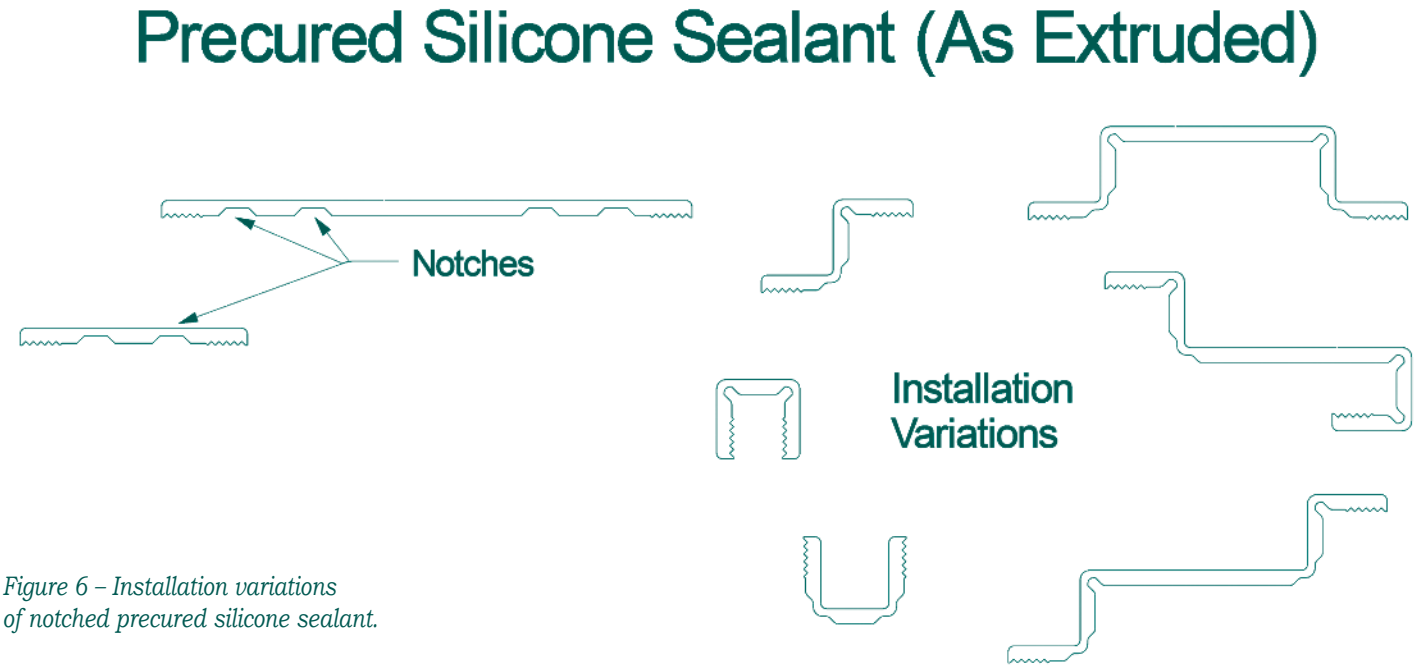


Figure 6 – Installation variations of notched precured silicone sealant.

custom design material to fit various application requirements, including the textured material previously discussed. Custom design materials can be produced with one or more notches in the extrusion. These notches allow the precured sealant to follow complex bends on a building in applications such as inside and outside corners, parapet caps, and window mullions. *Figure 6* shows some installation variations of the notched material. With a myriad of custom options available with precured sealant, a wide array of waterproofing application problems can be solved using these products.

Precured sealant has been used for many years in a variety of building envelope restoration applications and has recently (within the past five to six years) begun to be used by some forward-thinking manufacturers and erectors in the metal building industry.

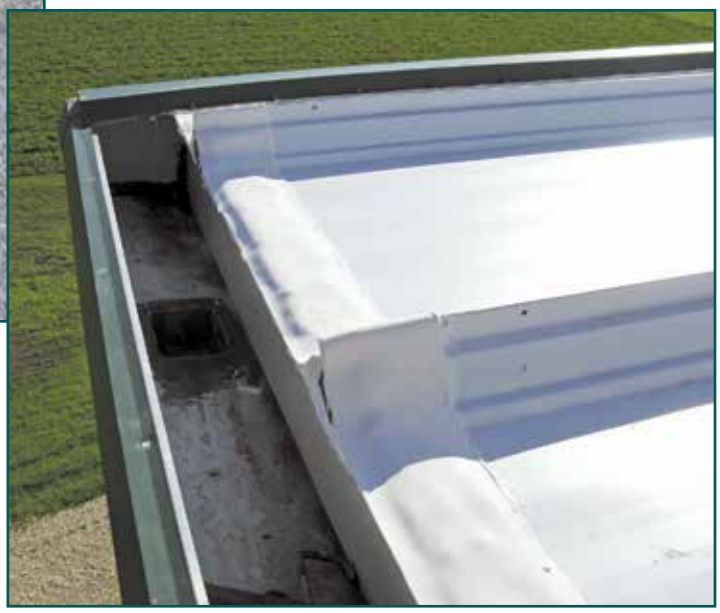
There are a host of features of precured sealant that allow it to perform successfully in a variety of metal building-related applications. Flexibility and high movement capability make precured sealant well suited for sealing areas with a large amount of thermal expansion and contraction, a situation commonly found in metal building and roofing applications. Its UV stability keeps precured sealant from degrading under the intense, long-term exposure to weather and the elements regularly found in metal roofing applications. *Figure 7* shows a standing-seam metal roof ridge condition sealed using a

Figure 7 – Metal roof ridge condition sealed using precured silicone sealant.

Figure 8 – Precured silicone sealant installed in a metal roof-to-wall transition application.

Figure 9 – Hole in a metal roof deck repaired using precured silicone sealant.

Figure 10 – Repair of metal standing-seam roof using precured silicone sealant.



precured sealant. Because of the UV and weather resistance of this material, there is no need for a cover plate to protect it.

Precured sealant systems are currently being installed successfully in numerous metal building-related applications, including:

- Expansion joints
- Ridge applications (*Figure 7*)
- Roof-to-wall transitions (*Figure 8*)
- Roof height change details

- Joints between new and existing buildings
- Pipe and other penetrations
- Roof curb seals
- Many miscellaneous repair applications

In addition to the applications discussed above, precured sealant is commonly used in various repair applications—often in metal roofing. Some of these repair applications include repair of holes in roof decking (*Figure 9*), repair of failed standing seams (*Figure 10*), and other roofing repairs.

Finally, precured sealant can help address an issue that is clearly becoming important. The use of precured sealant can help result in a greener building. Most buildings—both new and existing—have numerous leaks in the building envelope, often in the joint areas. Many of these leak areas can be sealed using precured sealant. Once these leaks are sealed, the building is more energy-efficient and can realize a significant reduction in heating and cooling costs. In fact, improved energy efficiency and other factors allow precured sealant to be an integral part of obtaining LEED certification for either new construction or existing buildings, particularly in the areas of Minimum Energy Performance (Prerequisite 2), Optimize Energy Performance (Credit 1), Low-Emitting Materials: Adhesives and Sealants (Credit 4.1), and Thermal Comfort: Design (Credit 7.1).

As leaders in the construction industry begin to realize the impact that cost savings, product performance, and building efficiency can make in a variety of applications, it is expected that the market share for precured sealant will continue to grow. The scope and magnitude of the use of these materials in the construction industry will greatly depend upon collaboration among contractors, architects, engineers, consultants, and manufacturers.

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