Surface Preparation and Proper Application Integral to Sealant Success

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"Call backs" cost money. They also undermine customer satisfaction and complicate scheduling. When working with sealants, the most common cause of "call backs" is sealant failure due to improper surface preparation and sealant application.

There are five basic steps for proper joint preparation and sealant application. Care must be taken during each of these steps to insure sealant success. In fact, most manufacturers require that these procedures are followed in order to be warranty eligible. Let's look at each of these steps in depth:

1. Clean

The key to good sealant adhesion is a clean surface. Non-porous surfaces must be cleaned with a solvent before the sealant is applied. The solvent used will depend on the type of dirt or oil to be removed and the substrate to be cleaned. To avoid damaging the substrate, make sure that the cleaning procedures and solvents you're using are compatible with the substrate. Non-oily dirt and dust can usually be removed with a 50% solution of isopropyl alcohol (IPA) and water, a 70% solution of IPA and water (rubbing alcohol) or pure IPA. Oily dirt or films generally require a degreasing solvent such as Xylene. Be sure to use the "two cloth" cleaning method, meaning a solvent wipe followed by a dry cloth wipe. Allowing solvent to dry on the surface without wiping with a second cloth negates the entire cleaning procedure, because the contaminants are re-deposited as the solvent dries.

Porous substrates absorb liquid and include such building materials as EIFS, cement board panels, concrete, granite, limestone and other stone or cementitious materials. Dusting alone may be sufficient, but, depending on the condition of the surface, abrasion cleaning, solvent cleaning or both may be necessary. Laitance and surface dirt must be completely removed. Concrete form-release agents, water repellents and other types of surface treatments, protective coatings, and old sealant all affect sealant adhesion. For proper removal, abrasion cleaning may be required to obtain acceptable adhesion.

Abrasion cleaning involves grinding, saw cutting, sand or water blasting, mechanical abrading, or a combination of these methods. Remaining dust and loose particles should be removed by dusting the surface with a stiff brush, vacuuming, or blowing the joints with oil-free compressed air. Once the abraded surface is clean and dry, the sealant can be applied. If the surface is dirty, the "two-cloth" cleaning method is again recommended. Some porous materials will trap solvents after cleaning or priming. Allow this solvent to evaporate before sealant is applied.

Most primers and sealants cannot be removed with organic solvents. Where aesthetics are important, be sure that uncured primers and sealants do not contact non-abradable surfaces in areas where the sealant is not intended. Mask these surfaces or use extreme care to prevent any contact with the surface during priming and sealant application.

When utilizing the "two-cloth" cleaning method, be sure to use clean, soft, absorbent, lint-free cloths and to not dip the cloth into the solvent container. This will contaminate the cleaning agent. Instead, it is best to use a plastic, solvent-resistant squeeze bottle. Keep rotating the cloth to clean areas and re-wipe until no additional dirt is picked up. Then, immediately wipe the solvent-cleaned area with a separate, clean dry cloth. IPA and Methylethylketone (MEK) are soluble in water and may be more appropriate for winter cleaning as they help remove condensation and frost. Xylene and Toluene are not soluble in water and may be better suited for warm weather cleaning.

2. Prime

Many sealants do not require a primer on properly cleaned substrates. Generally, priming will improve adhesion to any substrate and is inexpensive insurance. When priming is recommended by the sealant manufacturer for specific substrates, use the following guideline.

Before applying the primer, be sure that the joint surfaces are clean and dry and that the proper surfaces are masked. Two different methods of primer application may then be used, depending on the substrate and job conditions. The preferred application is to dip a clean, dry, lint-free cloth into the primer and gently wipe a thin film onto the surface. A thin film of primer, applied with a clean brush is best for "hard-to-get-to" areas and rough surfaces such as EIFS. Be careful not to overprime, because this can cause adhesion loss between the sealant and the primer. Allow the primer to dry until all of the solvent evaporates. The surface is then ready for application of the backer rod and sealant.

Sealant must be applied the same day the surfaces are primed. Any surfaces primed but not sealed on the same day, must be re-cleaned and re-primed before applying the sealant.

3. Pack

When designing moving joints, a minimum 1/4" joint width is recommended. Wider joints accommodate more movement than narrow joints. Three-sided adhesion limits the amount of movement that a joint can accept without inducing a tear. (The rule of thumb is that no more than ± 15% movement can be accommodated.)

Three-sided adhesion can be eliminated by the addition of a backer rod or a bond breaker tape. Backer Rod is an integral part of the joint in which it is installed and are available in a variety of diameters to accommodate different size joints. This backup material eliminates the need for a bond breaker, and helps control the depth of the sealant. Because the sealant does not bond to the rod, it can stretch and recover with joint movement, while minimal stress is put at the points of adhesion to the substrate. Bond breaker tape is usually used on joints too shallow for backer rods. It creates a two-sided adhesion, thereby allowing more joint movement.

A thin sealant joint (1/4" ± 1/8" depth) will absorb more movement than a thick joint. Sealants are designed to deliver optimum performance when the joints are shaped like an hourglass. In this configuration, the sealant is gunned and tooled to be thinner in the middle and wider at the bonded sides, providing more stretching and recovery with joint movement. As a practical matter, as the sealant joint width becomes larger than 1", the depth should be held at approximately 3/8". There is no need to increase the depth beyond 3/8".

One-part sealants cure by taking moisture out of ambient air. Joint movement during cure can cause unsightly aesthetics due to joint wrinkling. Premature adhesion loss can also occur because the adhesive characteristics of the sealant are obtained after the sealant has cured. Adhesion loss due to movement during cure can be minimized by the use of a primer. Primers can decrease the adhesion cure time lag.

Minimize wrinkling by using open-cell polyurethane backer rod, in non-EIFS or vertical applications. This allows air and moisture to the backside of the one-part sealant. It is best to seal when the joint surface is cool and will experience minimum temperature changes, typically in the late afternoon or early evening.

Two-part sealants cure with the aid of a catalyst. Cure times are typically shorter, and wrinkling is usually not an issue.

4. Shoot (The Sealant Application Procedure)

It is critical that the sealant fills the entire joint or cavity and firmly contact all surfaces intended to receive sealant. If the joint is improperly filled, good adhesion will not be achieved, and sealant performance will be weakened. To obtain full adhesion, sealants require a clean, dry frost-free surface. Because frost formation can begin to occur below 4°C (40°F), it is best not to apply sealant at temperatures below that mark unless the frost is first removed using solvent when cleaning the surface. To assist in the drying of a frost-containing joint, a water-soluble solvent such as MEK or IPA should be used.

Apply the sealant in a continuous operation, using a caulking gun or pump. Positive application pressure, adequate to fill the entire joint width, should be used. This can be accomplished by "pushing" the sealant ahead of the application nozzle. Be sure to completely fill the sealant cavity.

5. Tool

Before a skin begins to form on the sealant, it must be tooled. There are several different types of tools available for this step, including spatulas of different size and shapes and stick tools. Tooling forces the sealant against the back-up material and the joint surfaces. Tool the sealant with light pressure. At this point a concave configuration can be shaped at the top of the sealant, creating the recommended hourglass shape. Do not use liquid tooling aids such as water, soap or alcohol, such as IPA. These materials may interfere with sealant cure and adhesion, and may create aesthetic issues. Remove the masking tape before the sealant skins over.

NOTE:

Improper Sealant Selection Also Leads to Sealant Failure

C.R. Laurence Co., Inc. (CRL) markets and distributes a very inclusive selection of sealants, adhesives, fastening supplies, and tools for the construction, repair and manufacturing industries. CRL's sealant specialists are trained in assisting customers with proper sealant selection for their projects. If you're not sure of the compatibility of your sealant, you can contact CRL's sealant specialists for clarification by calling Toll Free (800) 421-6144 in the United States or Canada, or you can also e-mail CRL Technical Sales.

Improper sealant selections that are sure to cause problems and

should be avoided are:

· Using Low Performance Sealants in igh movement joints

· Using Silicone Sealant if the surface is to be painted

· Butyl Sealants on wide pre-cast panel joints

· Urethane Sealants on structural glazing

· Sealants in underwater applications

· Solvent Base Sealants with certain paints, plastics and foams

· Silicone Sealants with marble and natural stone (staining)

· Urethane or Acrylic Sealants as a glazing cap bead (U.V. breakdown)

Sealants may also react with materials that are deemed to be incompatible with that sealant. Some incompatible applications are:

· Acetoxy Silicone to Copper

· Latex to Bare Steel

· All Silicones to Neoprene Rubber

· Acetoxy Silicone to Neutral Cure Insulating Glass Silicone

· Solvent Base Sealants to Plastic and Rubber (test)

· Oil Base Caulk to Unpainted Drywall