Surface Preparation and Sealant Application

INTRODUCTION

This application procedure outlines general requirements for installing DOW CORNING Silicone Building Sealants. By following these procedures closely, you will help ensure good sealant performance. To be eligible to receive a Dow Corning warranty, these procedures must be followed. Since DOW CORNING Silicone Building Sealants are applied in many different environments and situations, these procedures are not intended to be a complete and comprehensive quality assurance program. Field adhesion tests are required to ensure good sealant performance and to verify any sealant recommendation (see “Standard Field Adhesion Test").

There are five basic steps for proper joint preparation and sealant application:

1. Clean -Joint surfaces must be clean, dry, dust free, and frost free.
2. Prime - If required, primer is applied to the clean surface(s).
3. Pack - Backer rod or bond breaker are applied as required.
4. Seal - Sealant is applied by "pushing the bead" into the joint cavity.
5. Tool-Dry tooling techniques are used to create a flush joint and make certain the sealant has the proper configuration and fully contacts the joint walls.

The following sections are intended to provide more detailed information in each of these areas.

SUBSTRATE CLEANING PROCEDURES

This section provides information on cleaning solvents and general cleaning procedures for porous and non- porous substrates. The key to good sealant adhesion is a clean surface. You should always check with the supplier of the substrate to ensure that the cleaning procedures and solvents are compatible with the substrate.

1. Organic Solvent Usage

Not every contaminant is effectively removed by every solvent, and some substrates can be seriously damaged by certain solvents. Please follow the solvent manufacturer's safe handling recommendations and local, state and national regulations regarding solvent usage. Please Note that IPA (Isopropyl Alcohol) may not remove contaminants from polyester powder coated aluminum, hence xylene or white spirit is recommended.

2. Non-porous Substrates

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. Non-oily dirt and dust can usually be removed with a 50 percent solution of isopropyl alcohol (IPA) and water, pure IPA or methylated spirit. Oily dirt or films generally require a degreasing solvent such as xylene, or white spirit.

3. Porous Substrates

Building materials such as, cement board panels, concrete, granite, limestone and other stones or cementitious materials that absorb liquid are considered porous substrates. Dusting alone may be sufficient cleaning for new porous substrates. Depending on the condition of the surface, porous substrates may require abrasion cleaning, solvent cleaning or both. 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. Removal of these treatments**,** coatings or sealants by 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; it must be solvent cleaned with the ”Two-cloth" method explained later in this section. Some porous materials will trap solvents after cleaning or priming. Allow this solvent to evaporate before sealant is applied. Please note that Dow Corning's recommendations for removal of existing sealants, substrate cleaning, joint preparation and installation of DOW CORNING Sealants are not intended and may not be appropriate for remedial work involving existing sealants and/or joints containing PCBs or other potentially hazardous

substances. If you know or suspect that the existing sealants and/or joints contain PCBs or other hazardous substances, contact a knowledgeable authority on appropriate removal, handling and disposal procedures.

4. "Two-Cloth" Cleaning Method

Clean, soft, absorbent, lint-free cloths must be used. The two-cloth cleaning method consists of a solvent wipe followed by a dry cloth wipe.

a) Thoroughly clean all surfaces of loose debris.
b) Pour or dispense an acceptable cleaning grade solvent onto the cloth. A plastic (solvent-resistant) squeeze bottle works best for organic cleaning solvents. Do not dip the cloth into the container of solvent, as this will contaminate the cleaning agent.
c) Wipe vigorously to remove contaminants. Check the cloth to see if it has picked up contaminants. Rotate the cloth to a clean area and rewipe until no additional dirt is picked up.
d) Immediately, wipe the cleaned area with a separate clean, dry cloth.

Organic solvent must be removed with the dry cloth before the solvent evaporates or the cleaning will be less effective. Some surfaces or weather conditions will allow a small amount of residual organic solvent to remain. If this is the case, the surface must be allowed to dry before installing backer rod and sealant.

5. Winter/Summer Solvent Considerations

IPA is soluble in water and may be more appropriate for winter cleaning as it helps in removing condensation and frost. Xylene and toluene are not soluble in water and may be better suited for warm weather cleaning.

PRIMER APPLICATION PROCEDURE

Dow Corning® 1200 Primer Coat, and DOW CORNING 1205 Prime Coat should be applied as follows:

1. Joint surfaces should be clean and dry. Apply masking tape to the surfaces next to the joint to keep excess primer and sealant off areas where they are not intended.
2. Pour some primer into a small, clean container, and be sure to replace and tighten the cap on the primer can. To prevent deterioration of the primer, do not pour more than a 10 minute supply into the container.
3. Depending on the substrate and job conditions, two different methods can be used to apply the primer. The preferred application is to dip a clean, dry, lint-free cloth into the primer and gently wipe a thin film onto the surface. For 'Hard-to-get-to" areas and rough surfaces, apply the primer in a thin film with a clean brush.
   Caution: Overpriming can cause adhesion loss between the sealant and the primer. If too much primer has been applied, a powdery, chalky, dusty film will form on the surface. Excess primer should be removed by (dusting the joint with a clean, dry, lint-free cloth or a non-metallic bristle brush
4. Allow the primer to dry until all the solvent evaporates. This typically takes 5 to 30 minutes, depending upon the temperature and humidity.
5. Inspect the surface for dryness. If too much primer has been applied, a powdery, chalky, dusty, film will form on the surface. In this case ,remove excess primer with a clean, dry lint-free cloth or a non-metallic bristle brush before applying sealant.
6. The surface is now 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 recleaned and reprimed before applying sealant.

Do Not Apply Primer Over Backer Rod

Store primer with cap tightly closed as DOW CORNING primers will react quickly when exposed to moisture, reducing their adhesion-promoting capabilities

BACKER ROD INSTALLATION

1. Moving Joint Considerations

When designing moving joints, the following points also need consideration:

- A minimum 6 mm 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. Three-sided adhesion can be eliminated by the addition of a bond breaker tape or backer rod. With three-sided adhesion, no more than 15 percent movement can be accommodated. deliver optimum performance when the joints are shaped like an hourglass. There is no need to increase the depth beyond 12 mm.
- A thin sealant joint (depth) will absorb more movement than a thick joint. Sealants are designed to deliver optimum performance when the joints are shaped like an hourglass.
- As the sealant joint width becomes larger than 25 mm, the depth should be held at approximately 12 mm.

2. Movement During Cure

Dow Corning's 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 following these suggestions:

1. Use open-cell polyurethane backer rod.
2. Seal when the joint surface is cool and will experience minimum temperature changes, typically in the late afternoon or early evening.
3. Place no more than 6mm of sealant over the backer rod at the center.

These suggestions should help minimize wrinkling, but may not eliminate it, as all sealants are prone to this aesthetic issue.

SEALANT APPLICATION PROCEDURE

It is critical that the sealant fill 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. Although silicone sealants have excellent wide temperature gunnability, the practical application temperature can be dictated by frost formation on the joint edges, which can begin to occur below -4°C. To assist in the drying of a frost-contaminated joint, a water-soluble solvent such as IPA should be used.

Sealant should be applied as follows:

1. Masking tape should be used to keep excess sealant from contacting adjacent areas where it is not intended to ensure an aesthetically pleasing job.
2. Apply the sealant in a continuous operation using a caulking gun or pump. A positive pressure, adequate to fill the entire joint width, should be used. This can be accomplished by pushing" the sealant ahead of the application nozzle. Care must be taken to ensure complete fill of the sealant cavity,

TOOLING THE SEALANT

1. Tool the sealant with light pressure before a skin begins to form (typically 10 to 20 minutes).
   Tooling forces the sealant against the back-up material and the joint surfaces. Do not use liquid tooling aids such as water, soap or alcohols. These materials may interfere with sealant cure and adhesion and create aesthetic issues.
2. Remove the masking tape before the sealant skins over (within about 15 minutes of tooling)

Quality Assurance - General Cure and Adhesion

PRODUCT QUALITY

Dow Corning performs extensive quality assurance testing in our manufacturing facilities in accordance with rigid ISO 9000 standards. This section is intended to provide the end user with simple screening tests to verify that the material, as received and used at the job site on actual substrates, will perform as intended.

SKIN-OVER TIME/ELASTOMERIC TEST

For one-part sealants, a skin-over test and an elastomeric test should be performed once per week and on every new lot of sealant used. The purpose of this test is to check sealant working time and to ensure the sealant cures fully. Any great deviation (excessively long times) in the skin-over time may indicate an out-of-shelf-life sealant.

This test is performed as follows:

1. Spread a l mm film of sealant on a sheet of polyethylene or wax paper.
2. Every few minutes, touch the sealant film lightly with a tool.
3. When the sealant does not adhere to the tool, the sealant has skinned over. Note the time required to reach this point. If a skin has not formed within 3 hours, do not use this material; contact your Dow Corning Construction Field Specialist or distributor representative
4. Allow the sealant to cure for 24 hours. After 24 hours, peel the sealant away from the polyethylene sheet. Stretch the sealant slowly to see that it has cured. If the sealant has not cured, contact your Dow Corning Project Manager or distributor representative.
5. Record the results in the Product Quality Control Log book. This testing must be completed and results recorded, retained and available for review upon request. (See 'Project Specifications, Documentation and Warranties" included in the Technical Manual for a sample log form and additional in formation).

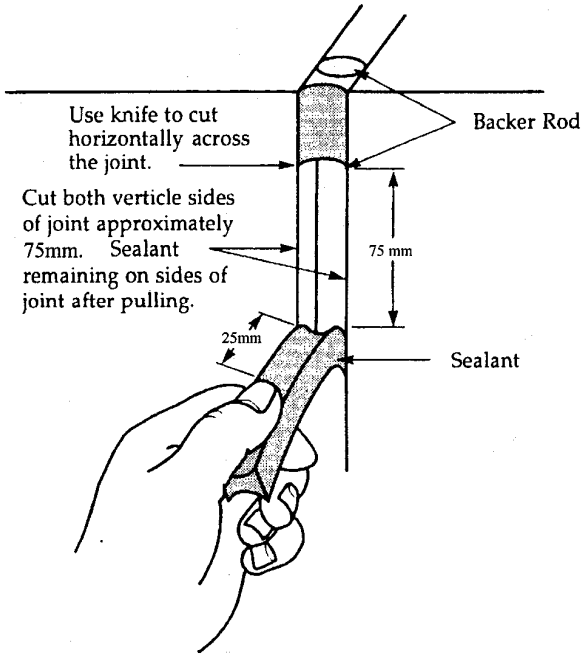
STANDARD FIELD ADHESION TEST

The field adhesion test is a simple screening procedure that may help detect application problems such as improper cleaning, use of improper primer, poor primer application or improper joint configuration. As a check for adhesion, a simple hand pull test is required at the job site after the sealant is fully cured (usually within 7 to 21 days.) Field adhesion testing should be documented using the field Adhesion Testing Log (Refer to the technical Manual Section Documentation). It is suggested that 10 tests for the first 300 meters and one test per 300 meters thereafter be submitted or one test per floor per elevation. The hand pull test procedure is as follows:

1. Make a knife cut horizontally from one side of the joint to the other.
2. Make two vertical cuts (from the horizontal cut) approximately 75 mm long, at both sides of the joint.
3. Place a 25 mm mark on the sealant tab as shown in the illustration.
4. Grasp 50 mm piece of sealant firmly just beyond the 25 mm mark and pull at a 90 degree angle.

5. If dissimilar substrates are being sealed, check the adhesion of sealant to each substrate separately. This is accomplished
   by extending the vertical cut along one side of the joint, checking adhesion to the opposite side, and then repeating for the other surface.
6. Pass/fail criteria for each sealant are shown in Table 1. If the sealant does not pass according to the guidelines provided consult your local Dow Corning Project Manager or distributor representative.
7. Inspect the joint for complete fill. The joint should not have voids, and joint dimensions should match those shown in the weathersealing details (see Joint Design section in the Technical Manual). Our Dow Corning Project Manager can assist in determining when corrective action is required.
8. Record the test results in a field adhesion test log. An example is provided in the documentation section. This log will need to be retained as a part of Dow Corning's warranty procedure. It may also be required by some building officials. NOTE: when a sealant is used to weatherseal between two dissimilar substrates, it is recommended that the sealant adhesion to each side of the joint be individually tested. (See step 5.)

Field Adhesion Test — Weatherseal Joint



SEALANT REPAIR IN ADHESION TEST AREA

Repair the sealant pulled from the test area by applying new sealant to the test area. Assuming good adhesion was obtained, use the same application procedure to repair the areas as was used to originally seal it. Care should be taken to ensure that the original sealant surfaces are clean and that the new sealant is in contact with the original sealant

Field Adhesion Test Hand Pull Test Criteria

Dow Corning 791 Silicone Weatherproofing Sealant	Pull tab 40mm (150%) without bond loss
Dow Corning 991 Silicone High Performance Sealant	Pull tab 40mm (150%) without bond loss
Dow Corning 795 Silicone Building Sealant	Cohesive Failure; no adhesion loss
Dow Corning 995 Silicone Structural Adhesive	Cohesive Failure; no adhesion loss
Dow Corning 993 Structural Glazing Sealant	Cohesive Failure; no adhesion loss
Dow Corning 790 Silicone Building Sealant	Pull tab 75mm (300%) without bond loss

ALTERNATE ADHESION TEST

Another simple screening test can be done on a flat test surface. A test piece like that shown on the below is recommended.

1. Clean and prime the surface following the project-specific recommendations.
2. Place a piece of polyethylene sheet or bond breaker tape across the flat test surface.
3. Apply a bead of sealant and tool it to form a strip approximately 200 mm long, 25 mm wide and 3 mm thick. At least 50 mm of the sealant should be applied over the polyethylene sheet or bond breaker tape.
4. After complete cure (7 to 14 days) continue with steps 3 to 5 on the previous page.

NOTE: It is often desirable to immerse the test piece in water for 1 day or 7 days and repeat the adhesion test described above. The water immersion testing should be started only after complete cure of the sealant.