# Dow Americas Technical Manual

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Dow Americas Technical Manual

Introduction
This manual is intended to give guidance on proper application procedures and assist in the development of a quality assurance program for the application of DOWSIL™ silicone sealants for structural and weathersealing systems.

As construction projects vary in many aspects, such as design, customer requirements and environment, this manual cannot be considered a comprehensive quality assurance program for all situations.

Any review, recommendation or statement made on behalf of Dow relating to an engineering design, architectural drawing, product formulation, end-use specification or similar document is limited to the knowledge of product properties as determined by laboratory testing of material produced by Dow. Any comments or suggestions relating to any subject other than such product properties are offered only to call to the attention of the engineer, architect, formulator, end-user or other person considerations that may be relevant in his/her independent evaluation and determination of the appropriateness of such design, drawing, specifications, document or formula.

Dow assumes no responsibility for the comments or suggestions relative to subjects other than such product properties and expressly disclaims any warranty or responsibilities for them.

SITE ADHESION TESTING MUST BE VERIFIED ACCORDING TO THE CRITERIA ON PAGE 75 TO CONFIRM PROPER SURFACE PREPARATION PROCEDURES HAVE BEEN FOLLOWED.

Technical Information Center
This service center provides a process and the resources to manage customers’ product and technical information inquiries. This includes (but is not limited to): Environmental Health and Safety information, product recommendations, product troubleshooting, competitive cross-references, and application assistance. Inquiries are received via telephone, e-mail, contact us forms, fax and Live Help.

Telephone:
+1 800 346 9882 (press #1 on menu)

E-mail:
construction@dow.com
Product Offering

Structural Glazing Sealants
Dow has a full line of high-performance silicone structural sealants. Following is a brief summary of each DOWSIL™ brand product offered for structural glazing applications. These sealants should be selected based upon the unique properties that each has for specific applications. Specific product information, such as physical properties, application and limitations, can be found in data sheets available at consumer.dow.com/construction.

DOWSIL™ 983 Structural Glazing Sealant
DOWSIL™ 983 Structural Glazing Sealant Curing Agent is a two-component, fast-cure, neutral-curing silicone sealant intended for structural bonding of glass, metal and other building components, as well as weatherseals in curtainwall units. DOWSIL™ 983 Structural Glazing Sealant cures to a high modulus adhesive sealant with excellent adhesion to a wide range of substrates. Available in black and gray.

DOWSIL™ 995 Silicone Structural Sealant
DOWSIL™ 995 Silicone Structural Sealant is a one-part, medium modulus, neutral-curing silicone sealant with superior unprimed adhesion for structural glazing applications. Available in black, gray and white.

DOWSIL™ 795 Silicone Building Sealant
DOWSIL™ 795 Silicone Building Sealant is a one-part, medium modulus, neutral-curing silicone sealant for structural glazing and weathersealing. Available in a wide variety of colors.

DOWSIL™ 121 Structural Glazing Sealant
DOWSIL™ 121 Structural Glazing Sealant is a two-part, fast-cure, neutral-curing silicone sealant intended for structural bonding without the need of a two-part pump. It is ideal for repairs and/or replacement of structurally glazed glass and other substrates, for on-site structural glazing and in-shop structural glazing where the use of a two-part pump is not viable. It is supplied in dual-cartridge kits and it is available in black and gray.

Weatherproofing Sealants
Dow has a full line of high-performance weatherproofing sealants. Following is a brief summary of each DOWSIL™ product offered for weatherproofing applications. These sealants should be selected based upon the unique properties that each has for specific applications. Specific product information, such as physical properties, application and limitations, can be found in data sheets available at consumer.dow.com/construction.

DOWSIL™ 795 Silicone Building Sealant
DOWSIL™ 795 Silicone Building Sealant is a one-part, medium modulus, neutral-curing silicone sealant for structural glazing and weathersealing. Available in a wide variety of colors.

DOWSIL™ 791 Silicone Weatherproofing Sealant
DOWSIL™ 791 Silicone Weatherproofing Sealant is a one-part, medium modulus, neutral-curing silicone sealant for general weathersealing applications. Available in a wide variety of colors.
**DOWSIL™ 790 Silicone Building Sealant**
DOWSIL™ 790 Silicone Building Sealant is a one-part, low modulus, neutral-curing silicone sealant for use in high-movement weathersealing applications. DOWSIL™ 790 Silicone Building Sealant has excellent primerless adhesion to concrete and most porous substrates. Available in a wide variety of colors.

**DOWSIL™ Contractors Weatherproofing Sealant**
DOWSIL™ Contractors Weatherproofing Sealant is a one-part, medium modulus, neutral-curing silicone sealant for use in non-specified general weathersealing applications. Available in a wide variety of colors.

**DOWSIL™ Contractors Concrete Sealant**
DOWSIL™ Contractors Concrete Sealant is a one-part, low modulus, neutral-curing silicone sealant for use in non-specified tilt-up concrete weathersealing applications. DOWSIL™ Contractors Concrete Sealant has excellent primerless adhesion to concrete and most porous substrates. Available in a wide variety of colors.

**DOWSIL™ 123 Silicone Seal and DOWSIL™ Silicone Seal Custom Designs H.C.**
DOWSIL™ 123 Silicone Seal is a preformed, low modulus silicone extrusion that can be used as a bridge joint in a variety of applications, including restoration of failed sealant joints.

DOWSIL™ 123 Silicone Seal HC is a custom extrusion or mold made of higher durometer silicone rubber used in custom applications. Widths from 1" (25 mm) to 12" (300 mm) and custom shapes are available in a wide variety of colors and textures.

DOWSIL™ 795 Silicone Building Sealant, DOWSIL™ 791 Silicone Weatherproofing Sealant, DOWSIL™ 756 SMS Building Sealant or DOWSIL™ 758 Silicone Weather Barrier Sealant may be used as an adhesive.

For more information, see the *EIFS Restoration Guide*, Form No. 62-510.

**DOWSIL™ 756 SMS Building Sealant**
DOWSIL™ 756 SMS Building Sealant is a one-part, medium modulus, neutral-curing silicone sealant designed specifically for weathersealing sensitive substrates where the aesthetic performance of the sealant is important. The sealant is intended for weathersealing skylights, glass facades, porous natural stone, and panel systems where staining and residue rundown streaking must be minimized.

**DOWSIL™ 758 Silicone Weather Barrier Sealant**
DOWSIL™ 758 Silicone Weather Barrier Sealant is a neutral, one-part silicone sealant designed for adhering to low energy surfaces common in sheet or peel-and-stick weather-resistant barriers. Available in white.
**DOWSIL™ Parking Structure Sealants**

DOWSIL™ NS, SL and FC Parking Structure Sealants are low modulus, neutral-curing silicone sealants for use in vertical and horizontal joints in parking structures and stadiums. DOWSIL™ NS Parking Structure Sealant is a one-part, non-sag sealant for vertical or horizontal joints. DOWSIL™ SL Parking Structure Sealant is a one-part, self-leveling sealant for horizontal joints. DOWSIL™ FC Parking Structure Sealant is a two-part, fast-curing sealant for dynamic moving horizontal expansion joints. Available in gray.

For more information, see the *Parking Structure Sealants Installation Guide*, Form No. 62-481.

**Primers**

Dow has a full line of high-performance primers for sealants. Primers are used to enhance adhesion of sealants to specific substrates.

**DOWSIL™ 1200 OS Primer**

DOWSIL™ 1200 OS Primer is a one-part, VOC-compliant silane primer for use with DOWSIL™ sealants in many applications. Available in clear.

**DOWSIL™ Primer-C OS**

DOWSIL™ Primer-C OS is a one-part, low VOC, film-forming primer for use with DOWSIL™ sealants on painted and plastic surfaces to promote rapid adhesion. The primer features a unique fluorescent feature using a UV flashlight (365 nm wavelength) to identify areas where primer was applied.

**DOWSIL™ Construction Primer P**

DOWSIL™ Construction Primer P is a one-part, film-forming primer for use with DOWSIL™ sealants on porous and cementitious surfaces to promote adhesion. DOWSIL™ Construction Primer P should not be used with DOWSIL™ 790 Silicone Building Sealant, DOWSIL™ Contractors Concrete Sealant or DOWSIL™ Parking Structure Sealants.
Building Sealant Recommendations and Surface Preparation Guide for Weatherseal Applications

**Weatherseal**

Dow has a full line of high-performance primers for sealants. Primers are used to enhance adhesion.

<table>
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<th>Substrate</th>
<th>DOWSIL™ 756 SMS Building Sealant</th>
<th>DOWSIL™ 790 Silicone Building Sealant&lt;sup&gt;1&lt;/sup&gt;</th>
<th>DOWSIL™ 791 Silicone Weatherproofing Sealant</th>
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### Substrate Surface Prep

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<th>DOWSIL™ 790 Silicone Building Sealant</th>
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</table>

Key: 1200 OS: DOWSIL™ 1200 OS Primer; Primer-C OS: DOWSIL™ Primer-C OS; Primer P: DOWSIL™ Construction Primer P.

Dow must test all materials for adhesion in structural applications.

Field adhesion tests must be performed at the jobsite to verify sealant adhesion.

1. When using a primer with DOWSIL™ 790 Silicone Building Sealant, apply the primer before installing backer rod and allow the primer to dry. Cold weather and porous surfaces require additional drying time.

2. Do not apply sealant to EIFS finish coat unless approved by EIFS manufacturer.

3. Cleaning procedures for EIFS systems should be followed (page 73).

4. The extremely porous nature of some marble, particularly white marble, can contribute to the potential for fluid migration into this substrate. Contact a Dow Specialist when working with marble.

5. Laminated glass with polyvinyl butyrol (PVB) interlayer may delaminate up to 1/4" at the edges when in contact with a sealant.

6. Do not use DOWSIL™ 790 Silicone Building Sealant on copper sputter coated glass.

7. See Organic Solvent Usage in this Dow Americas Technical Manual (page 69) for comment.

8. Some limestone and other porous stone substrates contain iron and other impurities that can interact with DOWSIL™ 756 SMS Building Sealant, causing discoloration of the sealant and/or substrate. Prior to use, DOWSIL™ 756 SMS Building Sealant should be tested for compatibility with these substrates using water immersion.

This surface preparation guide is intended to aid in proper selection of surface preparation techniques and primers, if necessary, to gain adhesion that meets Dow’s requirements. The suggestions in this guide are not blanket-approval recommendations; Dow requires all surface prep recommendations in this guide be verified by field or shop adhesion testing and documented prior to starting the project for each substrate/sealant combination. Failure to verify and document adhesion results may result in adhesion loss that is not covered by the Dow Warranty. Recommendations in this guide have been shown to be the best overall recommendations but do not cover every substrate for each material type or finish listed in this guide. Additionally, substrate manufacturers should be contacted to obtain recommendations for proper cleaning solvents for use with their materials. The entire Weatherproofing section of this manual should be read and understood before proceeding with the evaluations. The following sections must be followed to verify and document adhesion:

- Substrate Cleaning Procedure (page 69)
- “Two Cloth” Cleaning Method (page 70)
- Primer Application Procedure (page 71)
- Field Adhesion Testing Procedure (page 78)
- Field Adhesion Hand Pull Test Criteria (page 79)
- Field/Shop Adhesion Log and Sealant Quality Control Logs (pages 82-84)
Structural
All structural applications must be tested by the Dow test lab.

<table>
<thead>
<tr>
<th>Substrate</th>
<th>DOWSIL™ 795 Silicone Building Sealant</th>
<th>DOWSIL™ 983 Structural Glazing Sealant</th>
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<td>No Primer</td>
<td>No Primer</td>
<td>No Primer</td>
</tr>
<tr>
<td>Tinted</td>
<td>No Primer</td>
<td>No Primer</td>
<td>No Primer</td>
<td>No Primer</td>
</tr>
<tr>
<td>Ceramic Frit Coating</td>
<td>No Primer</td>
<td>No Primer</td>
<td>No Primer</td>
<td>No Primer</td>
</tr>
<tr>
<td>Reflective Glass</td>
<td>No Primer</td>
<td>No Primer</td>
<td>No Primer</td>
<td>No Primer</td>
</tr>
<tr>
<td>Low E High (T) Glass</td>
<td>No Primer</td>
<td>No Primer</td>
<td>No Primer</td>
<td>No Primer</td>
</tr>
</tbody>
</table>

Key: 1200 OS: DOWSIL™ 1200 OS Primer; Primer-C OS: DOWSIL™ Primer-C OS.
Dow must test all materials for adhesion in structural applications.
Field adhesion tests must be performed at the shop or jobsite to verify sealant adhesion.

This surface preparation guide is intended to aid in proper selection of surface preparation techniques and primers, if necessary, to gain adhesion that meets Dow’s requirements. The suggestions in this guide are not blanket-approval recommendations; Dow requires all surface prep recommendations in this guide be verified by field or shop adhesion testing and documented prior to starting the project for each substrate/sealant combination. Failure to verify and document adhesion results may result in adhesion loss that is not covered by the Dow Warranty. Recommendations in this guide have been shown to be the best overall recommendations but do not cover every substrate for each material type or finish listed in this guide. Additionally, substrate manufacturers should be contacted to obtain recommendations for proper cleaning solvents for use with their materials. The entire Weatherproofing section of this manual should be read and understood before proceeding with the evaluations. The following sections must be followed to verify and document adhesion:

- Substrate Cleaning Procedure (page 29)
- “Two Cloth” Cleaning Method (page 29)
- Primer Application Procedure (page 30)

5Laminated glass with polyvinyl butyrol (PVB) interlayer may delaminate up to 1/4” at the edges when in contact with a sealant.
7See Organic Solvent Usage in this Dow Americas Technical Manual (page 29) for comment.
Silicone Structural Glazing

Introduction
Silicone structural glazing utilizes a high-performance silicone sealant to attach glass, metal or other panel materials to a metal frame in lieu of gaskets and mechanical attachments. The windload stresses are transferred through the structural silicone sealant to the structure of the building. The structural silicone sealant must maintain its adhesive and cohesive properties in order to support the panels under windload.

Only silicone sealants are suitable for use in structural glazing applications. A considerable amount of time has been spent developing and testing silicone sealants to meet the needs of structural glazing applications. Whenever a silicone sealant is used to structurally attach panels, a comprehensive quality control procedure must be established to ensure the smooth, efficient, trouble-free completion of the project.

Specific quality control procedures must be followed on all structural glazing projects in order to obtain a Dow Structural Warranty.

Structural Joint Design
Structural Glazing Design

Structural Bite
Structural bite is the minimum width or contact surface of the silicone sealant on both the panel and the frame. The structural bite requirement is directly proportional to the windload on the building and the size of the glass. The higher the design windload and the larger the size of the glass, the greater the structural bite requirement. The structural bite must be sized appropriately to allow the windload on the glass or panel to be transferred to the structure. The structural bite for windload (live load) is calculated using the specified windload, glass or panel dimension and sealant design strength of 20 psi (14,000 kg/m² or 138 kPa).

Structural Bite Calculation
Following is the calculation used to determine the required structural bite dimension:

$$\text{Bite (inches)} = \frac{0.5 \times \text{short span length (ft)} \times \text{windload (psf)}}{12 \text{ in/ft} \times \text{sealant design strength (20 psi)}}$$

For example, a 4' x 8' lite of glass, exposed to a 60 psf windload, requires a silicone bite of 1/2". Always round up to the nearest 1/16" and never round down.

$$\text{Bite (mm)} = \frac{0.5 \times \text{short span length (mm)} \times \text{windload (kg/m²)}}{\text{sealant design strength (14,000 kg/m²)}}$$

For example, a 1219 mm x 2438 mm lite of glass, exposed to a 290 kg/m² windload, requires a silicone bite of 13 mm. Always round up to the nearest millimeter and never round down.

$$\text{Bite (mm)} = \frac{0.5 \times \text{short span length (mm)} \times \text{windload (kPa)}}{\text{sealant design strength (138 kPa)}}$$

For example, a 1219 mm x 2438 mm lite of glass, exposed to a 3.5 kPa windload, requires a silicone bite of 16 mm. Always round up to the nearest millimeter and never round down.
Deadload
In unsupported deadload designs, the weight of the panel places constant load upon the sealant. DOWSIL™ brand structural sealants can support the weight of the panel or glass when used within the following guidelines:

- For DOWSIL™ 795 Silicone Building Sealant, DOWSIL™ 983 Structural Glazing Sealant, DOWSIL™ 995 Silicone Structural Sealant and DOWSIL™ 121 Structural Glazing Sealant, the allowable deadload design strength is 1 psi or 6.9 kPa.
- The weight of the panel divided by the total silicone contact area must not exceed 1 psi, the deadload design strength of the sealant. Insulating glass unit manufacturers require deadload support for their insulating glass units.

The deadload structural bite requirement is calculated as follows:

\[
\text{Bite} = \frac{\text{weight of glass in lb}}{\text{sealant contact length (inches)}} \times \text{sealant design strength (1 psi)}
\]

For example, a 4' by 8' lite of monolithic glass at a weight of 3.3 psf will have a weight of 105.6 lb and a glass perimeter of 288". Based on a 1 psi deadload design strength, a bite of 3/8" is required.

\[
\text{Bite (mm)} = \frac{\text{weight of glass in N}}{\text{sealant contact length (m)}} \times \text{sealant design strength (6.9 kPa)}
\]

\[
\text{Sealant Design Strength (SDS) (6.9 kPa)} = \frac{\text{weight of glass (N)}}{\text{sealant contact length (m)} \times \text{bite (mm)}}
\]
For example, a 1219 mm by 2438 mm lite of monolithic glass at a weight of 145 N/m² will have a weight of 431 N and a glass perimeter of 7.314 meters. Based on 6.9 kPa deadload design strength, a bite of 9 mm is required.

**Sloped Glazing**
Sloped glazing is a form of structural glazing used in skylights and similar non-vertical applications. Conventional structural glazing guidelines can be followed for sloped glazing with modifications to the windload accounting for the slope. The structural glazing calculation takes into account the weight of the glass counteracting the negative design windload on the building. The flatter the slope of the glazing system, the greater the reduction in the windload effect on the structural joint.

For many slope-glazed systems, the glass sets on a gasket and the structural joint is installed to the edge of the glass. The sealant in this application acts as both the structural seal and the weatherseal. Dow permits the use of its sealants in this manner provided that the joint maintains an aspect ratio of 1:1 where the depth of the sealant is equal to or greater than the width of the joint opening. The structural bite in this design is the depth of the joint along the edge of the glass. The sealant in this design must be structurally attached to a fin that can support the structural load on the glass. Glass tolerances must be considered.

Glass that is sloped outward from vertical imposes a deadload upon the glazing that must be added to the windload, even when there is contact with setting blocks. If the outward slope is greater than 15 degrees from vertical, it is prudent to perform your calculations as if the entire weight of the glass is supported by the silicone. If there are no setting blocks, the entire lite is supported by the structural silicone. The design load on the silicone for live and deadload must be determined and the bite dimension sized appropriately. For these designs, contact Dow at [consumer.dow.com/construction](http://consumer.dow.com/construction).

**Outward Sloping:**

\[
\text{Bite (in)} = \frac{0.5 \times \text{short span length (ft)} \times \left[ \text{windload (psf) + sine(}\beta\text{) \times \text{lite deadload (psf)} \right]}{12 \text{ in/ft} \times \text{sealant design strength (20 psi)}}
\]

\[
\text{Bite (mm)} = \frac{0.5 \times \text{short span length (mm)} \times \left[ \text{windload (kPa) + sine(}\beta\text{) \times \text{lite deadload (kPa)} \right]}{\text{sealant design strength (138 kPa)}}
\]

Where \((\beta)\) is the angle between vertical and the lite.

**Glueline Thickness**
A minimum glueline of 1/4” (6.4 mm) is required. Consideration should be given to increase the glueline based on type of sealant used as well as movement due to thermal effects of the panel or lite. For application purposes, the glueline should be sufficient to allow proper fill of the structural joint and demonstrated in deglaze activities. For one part sealants, a bite-to-glueline ratio should be maintained at 3:1 or less to enable reasonable curing to the full depth of joint. One part sealants cure via reaction from moisture in the air, so deep section joints, 3/4” (19 mm) or greater, may take several months to fully cure in depth. Use of two part sealants allow for greater ratios of bite-to-glueline ratios (such as projects in
high velocity hurricane zones with excessive windloads) as long as the joint can be adequately filled and that the parts are properly mixed to ensure proper reaction for property formation.

All panels that are structurally glazed undergo repeated expansion and contraction due to variation in temperature. Glueline thickness must be properly designed to accommodate these movements. The thermal movement can be calculated for any panel or framing member if the length of the material, material type (e.g., glass, aluminum) and coefficient of thermal expansion (CTE) are known.

Joint movement for a particular panel can be calculated as follows:

Movement (inches) = panel length (inches) * CTE (inches/inches/°F) * temperature change (°F)

For example, for a 4' by 8' high lite of glass fixed at the sill and a temperature change of 180°F, glass with a CTE of 5.1 x 10^-6 will show movement of 0.088". Aluminum with a CTE of 13.2 x 10^-6 will move 0.228". Differential movement between the glass and aluminum will be 0.228" minus 0.088", which is 0.14".

Movement (mm) = panel length (mm) * CTE (mm/mm/°C) * temperature change (°C)

For example, for a 1219 mm by 2438 mm high lite of glass fixed at the sill and a temperature change of 82°C, glass with a CTE of 9.2 x 10^-6 will show movement of 1.84 mm. Aluminum with a CTE of 23.8 x 10^-6 will move 4.76 mm. Differential movement between the glass and aluminum will be 4.76 mm minus 1.84, which is 2.92 mm.

The dimension of glueline required (a) for the differential movement (b) can be calculated using the Pythagorean Theorem. Likewise, the allowable movement (b) for a particular glueline dimension (a) can also be calculated. The new glueline thickness (c) is limited by the movement capability of the sealant in shear in a structural joint configuration.
For the example discussed above where differential movement of 0.14" (b) is expected, and the sealant has an original glueline thickness of 0.25" (a), the sealant will elongate to a new glueline thickness of 0.287" (c). Extension of the sealant from 0.25" to 0.287" will be 14.8%.

For DOWSIL™ 995 Silicone Structural Sealant, DOWSIL™ 795 Silicone Building Sealant, DOWSIL™ 983 Structural Glazing Sealant and DOWSIL™ 121 Structural Glazing Sealant, maximum extension from thermal expansion is 15% in any structural silicone joint. The lower allowable movement capability in structural joints is due to the joint design, where the joint width, or glueline, is less than the joint depth, or structural bite.

**NOTE:** Coefficients of Thermal Expansion Values for common building materials are available in the Weatherproofing section of this technical manual.

The direction of the panel movement would also need to be considered. Consider whether thermal movement will take place in one direction due to the setting blocks preventing any downward movement of the glass panel or in the case of an unsupported system where the thermal movement can be taken by the glass in both directions. This will need to be taken into consideration when designing the sealant joint dimensions.

**Structural Silicone Used in Shear**
Structural silicone can be used in shear for live load applications at the same design strength (20 psi, 138 kPa, 14,000 kg/m²) as it is used in tension. This application encompasses Total Vision Systems (Fin Glazing), some skylight designs and the use of the silicone to reinforce the structure through diaphragm loading.

The modulus of the structural silicone in shear is lower than in tension (consider the calculations through the Pythagorean Theorem from the Glueline Thickness section of this manual). Therefore, combinations of shear and tension loading cannot be added without understanding the stress-strain relationship of each joint. Contact Dow Technical Service for more information.

**Structural Silicone Used in Seismic Applications**
This information is provided as a guide for structural engineers designing in seismic zones. Seismic movement capability of Structural Sealants primarily results in shear stresses in the structural sealants. Based on the stress strain properties of the structural sealant (DOWSIL™ 995 Silicone Structural Sealant, DOWSIL™ 795 Silicone Building Sealant, DOWSIL™ 983 Structural Glazing Sealant and DOWSIL™ 121 Structural Glazing Sealant) the allowable design limit for seismic movement capability is 25% in any structural silicone joint. This allowable movement is based on a SSG sealant with an ultimate strength of no less than 50 psi (345 kPa) or a 2.5:1 factor of safety, in accordance with ASTM C 1184.

For a case study regarding the use of structural seals in an earthquake, please refer to DOWSIL™ structural glazing sealants help the tallest building in Chile withstand glass breakage during a magnitude 8.8 earthquake, Form No. 63-1216.

Additional seismic design information is available in the following ASTM articles:

Splice Joints in Curtainwalls

Splice joints in aluminum curtainwall framing are the highest-movement, fastest-moving joints on a curtainwall system. Splice joints absorb the thermal expansion of 13' to 16' (4 m to 5 m) of aluminum framing exposed to the building’s exterior on a daily basis. Field-installed stick curtainwalls use splice joints to also absorb building deflection, live loads and wind sway.

It is best to avoid splice joints within a structural joint. Placing 13' to 16' (4 m to 5 m) of aluminum frame thermal movement and live load deflection of the floor into the shearing of a 1/4" (6 mm) wide structural silicone joint will: 1) exceed the design stress of the silicone, causing fatigue; 2) place excessive loading onto glass, causing possible failure; or 3) cause premature fogging of the insulating glass unit.

If splice joints cannot be avoided within a structural silicone joint due to the requirements of field-applied structural silicone in a stick system, then the splice joint should be applied to within 1" (25 mm) of the head of a piece of glass. If silicone failure occurs due to excessive joint movement, a minimum of forces will be placed onto the glass due to the placement.
Best Design

Better Design

Poor Design

LIVE LOAD AND THERMAL MOVEMENT FROM ABOVE

LIVE LOAD AND THERMAL MOVEMENT FROM ABOVE

LIVE LOAD AND THERMAL MOVEMENT FROM BELOW
Structural Glazing Guidelines
Following are general guidelines that should be followed for all structural glazing applications. All exceptions must be handled on a project-specific basis and documented in writing by the Dow Technical Service Representative.

- The structural bite must be a minimum of 1/4" (6.4 mm).
- The glueline thickness must be a minimum of 1/4" (6.4 mm).
- The structural bite must be equal to or greater than the glueline thickness.
- For one part sealant, the bite-to-glueline ratio must be between 1:1 and 3:1.
- The structural sealant joint must be able to be filled using standard sealant application procedures.
- The joint design must allow the sealant exposure to air so that it can cure and obtain its ultimate physical properties.
- For two part sealant, bite-to-glueline ratio may be greater than 3:1 with the understanding that the joint can be properly filled and the two part materials is mixed at proper ratio during application.
- The structural sealant joint must be fully cured and adhered prior to removing temporary fasteners in the field.
- Before moving units in shop, fabricators should verify that substantial cure has occurred and adhesion achieved. (See the Movement of In-Shop Structurally Glazed Units section on page 40)

NOTE: Closing off the joint opening with a weatherseal immediately after application of an exterior applied structural joint will drastically slow down the cure of the structural sealant.

All exceptions to these guidelines must be reviewed and approved by a Dow Technical Service Representative.

Substrate Suitability
Dow project services include adhesion and compatibility testing according to ASTM standards. These methods do not encompass any substrate approval; therefore, adhesion or compatibility reports from Dow should not be interpreted as substrate approvals.

Dow does recognize typical substrates for use in silicone structural glazing based on historical and industry practices, (e.g., anodized aluminum). Dow will reject the use of DOWSIL™ brand structural sealants in designs with non-typical substrates without further confirmation of substrate suitability and durability.

Where non-typical substrates are specified, a system design professional should be consulted regarding material suitability for structural glazing based on feedback from industry guidelines and substrate manufacturer input. Discussion will need to take place on its durability prior to its acceptance and use in structural applications. Dow may require the customer provide independent confirmation of a substrate’s suitability.

Substrates for Adhesion

Metals:
When selecting aluminum substrates for structural glazing, the joint design and adhesion of the structural silicone must be considered. A flat surface with no gasket races, key slots, serrations or other
irregularities is required. Some off-the-shelf extrusions may not be suitable for all structural glazing applications. The width of the extrusion must be adequate to achieve the calculated minimum structural bite with a suitable spacer attached.

Extruded mill finish aluminum is not an appropriate surface for structural silicone application due to poor adhesion. The graphite lubricant used in the extrusion process causes a highly variable surface to which adhesion is not always predictable. Therefore, aluminum must have a minimum of an anodine finish for structural glazing applications. Anodizing and thermal set paints such as fluorocarbon and polyester powder coat are also suitable aluminum finishes. In addition, high-grade stainless steel (316) can also be specified, as verified by past adhesion tests and actual projects.

Carbon steel, painted steel and galvanized steel are generally not appropriate surfaces for structural silicone glazing due to substrate durability concerns when exposed to corrosive agents. Exceptions can be made based on the merit of design and exposures. Examples may include steel components painted with high-performance industrial-grade coatings or use of structural sealants to adhere galvanized steel backpans in spandrel conditions to secure an insulated cavity where panels are not exposed to exterior elements. Acceptable conditions must be approved, in writing, upon testing and review by Dow, the substrate manufacturer and the coating manufacturer.

**Masonry:**
Masonry and cementitious substrates are typically not suitable structural members for structural silicone attachment. The alkalinity of the substrate can be a variable in the durability and longevity of adhesion necessary for structural silicone. When structural attachment to masonry is required, mechanical anchors should be installed into the masonry to anchor a metal plate, and the structural silicone should then be bonded to the metal. The metal must be compatible with masonry and have a high-performance finish.

**Insulating Glass**
Insulating glass units are widely used in structurally glazed facades to improve the thermal performance of a facade. By using insulating glass units, architects and specifiers can increase the areas of glass that can be used on a facade without compromising the thermal performance of the building. This allows the designer much greater scope when designing a building facade using the latest building materials and concepts.

When using IG units in any structurally glazed facade, specifically developed DOWSIL™ silicone IG sealants should be used. These sealants are resistant to attack from ultraviolet light that provides a structural seal that bonds the outer glass of the IG unit to the inner glass, thereby providing a system that is structurally bonded from the outer glass of the IG unit through to the building structure. Silicone sealants are the only products that are specified in national and international standards for this application. Not only does the silicone IG sealant provide structural integrity for the IG unit, it also firmly holds the two glass elements together and prevents damage to the primary PIB (polyisobutylene) seal, which controls the ingress of moisture into the unit. DOWSIL™ products have a proven track record in this application.

**Laminated Glass Considerations**
Laminated glass with polyvinyl butyrol (PVB) interlayers may delaminate ¼" (6 mm) or more at the edges when in contact with any sealant, silicones and organics. Some PVB interlayer plasticizers can migrate, causing edge delamination due to shrinkage of the interlayer. Some PVB interlayers have been seen to show edge delamination without any sealant contact. For further information, contact the laminated glass manufacturer.
Compatibility should be checked on a job-by-job basis with the actual sheet-form laminate. Compatibility verifies the laminate does not cause the sealant to discolor and should not be considered an indicator of whether or not delamination will occur.

**Back-Painted Glass**

Back-painted glass is not an appropriate substrate for silicone structural glazing because of substrate durability concerns and adhesion of the coating to the glass. Adhesion testing completed by Dow only addresses adhesion of the sealant to its direct substrate and does not encompass adhesion of the coating to the glass.

- Typically, back-painted glass has been used in interior applications that offered additional mechanical support. Dow can complete adhesion testing in order to help you make your sealant choice for non-structural applications.
- Additionally, compatibility of the sealant to the coating should be addressed by the coating manufacturer. Dow is not responsible for the adhesion of the coating to the glass and any effect the sealant may have on this adhesion.
- Back-painted glass in which the edges have been deleted or not coated along the structural sealant bondline may be tested for structural sealant adhesion and be considered a clear glass substrate.

**Substrates for Compatibility Testing**

In addition to suitability of substrates for adhesion, gasket and accessory materials must be compatible with DOWSIL™ sealants. The spacer material and setting blocks used in structural glazing must be fully compatible with the structural silicone. Dow uses ASTM C 1087-00 (Standard Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structurally Glazed Systems) to test the compatibility of various accessories (setting blocks, gaskets, etc.) with DOWSIL™ silicone products. This testing only assesses the impact that these accessories may have on the performance of the silicone sealant and does not imply compatibility or performance of the other products used in the curtainwall or window systems (i.e., insulating glass, laminate interlayers, glass coatings, spacer bar materials, etc.) in the presence of the silicone sealant.

Based on historical testing and success, most silicone setting blocks, composed of 100% silicone, are found to be compatible for full contact with structural silicones. 100% silicone setting blocks are thereby our primary recommendation for 4-sided SSG applications.

Other materials such as EPDM, neoprene, SCR (Silicone Compatible Rubber – an EPDM-based material) and other similar organic materials may cause discoloration of light-colored silicone sealants. When discoloration is noted, per the criteria in ASTM C1401 Section 34.3, these materials will not be approved for full contact in structural glazing applications.

When using these materials in structural glazing applications, light-colored or gray sealants should not be used. When using gray DOWSIL™ 983 Structural Glazing Sealant, gray DOWSIL™ 121 Structural Glazing Sealant, gray DOWSIL™ 982 FS Insulating Glass Sealant and gray DOWSIL™ 982 Silicone Insulating Glass Sealant, 100% silicone accessory materials are recommended.
When using EPDM, neoprene, SCR (Silicone Compatible Rubber, an EPDM-based material) and other similar organic materials for weatherseal applications, only dark-colored (black, charcoal or bronze – NOT gray) silicone sealants will be recommended for contact with these organic extrusions. Where discoloration is severe, even dark-colored silicone sealants may not be approved for weatherseal applications, due to potential long-term adhesion loss.

When using insulating glass, the IG manufacturer should be contacted for specific recommendation of setting blocks to ensure compatibility with the IG unit components (spacer, PIB, glass coatings, etc.).

**NOTE:** When applying a weatherseal over the silicone setting block, a 1/8” minimum sealant thickness is required. See the figure on page 10.

**Project Review Services**
Dow professionals are available to assist you in selecting the best sealant for your specific application. All silicone structural glazing applications using DOWSIL™ sealants must be reviewed on a project-specific basis by our technical service staff prior to any product selection. The review and testing must be successfully completed, along with factory or site QA documentation, before Dow will issue a warranty. A project submission form is available at [consumer.dow.com/construction](consumer.dow.com/construction). The following services are offered by Dow:

**Product Recommendations**
After reviewing project drawings and specifications and having performed laboratory testing, Dow will assist in the selection of the correct DOWSIL™ sealant/primer and/or surface preparation for the specific application.

**Print Review**
Guidelines for silicone structural glazing details are provided in this section.

Dow must review all structural details before any approval or acceptance is given. Typical horizontal and vertical details, plus any non-typical details, should be submitted for review. Also provide elevations indicating glass dimensions and design windload values for the building. Dow has found that a few underlying principles are critical to consider in virtually all joint designs using silicone sealants.

Dow will review joints for compliance with these underlying design principles, provide suggestions or changes, and/or identify limitations of the designs. It will also allow Dow’s technical staff to check that all components that will need to be tested as part of the project review have been supplied. This will include bonding substrates, spacers, setting blocks, gaskets, etc.

**Adhesion Testing**
Dow will evaluate the adhesion of our product to materials representative of those to be used on the job (i.e., glass, metal, masonry, composites, etc.) using a modified ASTM C794 peel adhesion test. All samples submitted for testing should be a minimum of 8” (200 mm) in length. For example, for aluminum extrusions, supply one 8” (200 mm) sample for each sealant to be tested. For glass, one standard 12” by 12” (300 mm by 300 mm) sample is sufficient. Upon completion of this testing, Dow will forward in writing product recommendation, surface preparation and primer recommendation (if needed). Testing takes approximately four weeks from receipt of samples.
Compatibility Testing
Chemically incompatible glazing accessories (gaskets, spacers, setting blocks, etc.) can lead to sealant discoloration and/or loss of sealant adhesion to the substrate. To ensure a product’s suitability, Dow tests the compatibility of job site representative accessory materials with its silicone sealants using ASTM C1087. For each sealant to be tested, supply 4” (100 mm) minimum length of the gasket, spacer or setting block. Results of the compatibility test will be forwarded in writing. Testing takes approximately four weeks from receipt of samples.

Silicone sealant may yellow when in contact with EPDM, neoprene, bitumen, asphalt and other organic-based membranes, coatings and gaskets. Dark-colored sealants will typically mask the yellowing. ASTM C1087 compatibility testing will confirm the degree of yellowing. Testing may be performed with questionable materials upon request. See the comment below discussing the application of sealants to membranes.

Upon completion of testing, approvals for full contact or incidental contact will be provided. Incidental contact is defined as the contact between the structural sealant joint and complementary material used in the construction of structurally glazed systems where the contact area is no greater than the cross-sectional area of the gasket or structural joint or the face width of the setting block in contact with the structural joint. An incidental contact test result for gaskets implies use of the sealant should be for 1- and 2-sided silicone structurally glazed applications in which the sealant contacts the gasket at an intersection.

Approval for full contact means the sealant can be in contact with the accessory component for any contact area greater than the component’s cross-sectional area. Full contact approval implies the use of the sealant is acceptable for any application of the sealant being in contact with a gasket for the length of a glazing leg, which is typical of a 4-sided silicone structural glazing design.

Some studies have shown that the addition of DOWSIL™ Construction Primer P will significantly reduce or eliminate the yellowing or discoloration because it is a film-forming barrier. However, this must be verified in field testing on a project-specific basis.

Non-Stain Testing
If natural stone is being used on the project, Dow can test and evaluate the performance of its sealants to determine if fluid in the sealant has the potential to migrate into porous substrates such as granite, marble, travertine and limestone. Job site representative samples of the stone need to be tested using a modified ASTM C1248 procedure. For each stone type and sealant to be tested, supply two samples of the dimension 1” by 3” (25 mm by 75 mm) the thickness of the stone. Larger samples can be cut for testing. Testing takes approximately six weeks from receipt of samples.

Other Test Requirements
Dow can accommodate special, non-standard testing requirements. Please consult your local Dow Representative at the beginning of the project to determine whether Dow is capable of such testing services. Dow may charge a service fee for non-standard testing.

Mock Ups
Mock-up Testing Curing Minimums for Structural Load Testing – The structural sealant must be fully cured and adhered to the substrates prior to running structural load testing. With one-part structural sealants (DOWSIL™ 795 Silicone Building Sealant or DOWSIL™ 995 Silicone Structural Sealant), it
is best to leave the weatherseal open until complete cure and adhesion occurs for “exterior applied” designs. Closing off the joint opening with a weatherseal immediately will drastically slow down the cure of the structural sealant if shot and applied from the exterior.

A one-part sealant can be applied from the interior at the same time the weatherseal is applied. This type of application is illustrated in the Joint Composition diagram shown previously in the Structural Joint Design section of this manual. A 12” “mini mock-up” sample can be made and destructively tested for complete cure and adhesion.

**Classification of Silicone Structural Glazing**

**2-Sided Structural Glazing**
This method uses structural silicone sealant to support the glass on 2 sides (either vertical or horizontal edges) and utilizing mechanical support on the other 2 sides. Two-sided structural glazing can be fabricated in the factory or on-site.
4-Sided Structural Glazing
Glass is supported on all 4 sides with structural silicone. Structural silicone is used for bonding all 4 edges of the glass to the support frame, and the deadload can either be supported mechanically by a fin and setting block or by the structural silicone. It is generally recommended that 4-sided structural glazing be performed in-shop.

Application Methods for Structural Glazing Systems

Factory (Shop) Glazing
Curtainwalls assembled in a factory environment are assembled in individual units. This system is referred to as unitized curtainwall. Factory construction of the curtainwalls provides a controlled environment where proper surface preparation and sealant application procedures can be maintained and quality control programs can be implemented and documented. After the units are assembled and sealant has been allowed to fully cure and develop adhesion, units are shipped to the construction site where they are erected onto the building structure.

Site (Field) Glazing
Site glazing is a method that applies structural sealant directly at the construction site. Panels are attached to the mullions and transoms, which are already attached to the structure. Site glazing is suitable for 2-sided structural systems, but it is generally recommended that 4-sided systems are factory glazed.
Temporary mechanical fasteners are required to firmly hold and prevent movement of the panels until the structural sealant is fully cured and adhered.

**NOTE:** Special attention to cleaning and sealant application is required under the following conditions:

- Occurrence of severe wind during application may cause undue stress on the curing structural silicone
- Extremely high or low temperatures – optimum application temperature range is 10-35°C (50-95°F). For applications below 10°C (50°F), the potential for dew point and frost must be considered. For applications in higher temperatures, sealant must not be applied when substrate temperatures are in excess of 50°C (120°F)
- Rain-contaminated joints – remove all moisture from the substrate surface, then solvent clean, prior to glazing

**Structural Glass Systems (Bolted or Point Fixed Glazing)**

The structural glass or bolted glass system generally has holes drilled at each corner of a glass element and a bolt is used to provide mechanical support for the glass and fixes the glass facade to a metallic structure, which is secured to the main structural member of the building. A high-quality silicone sealant is then used to provide the weatherseal between the glazing elements.

Insulating glass units can also be installed using bolted glass technology including systems only drilling through the interior lite of an insulating glass unit. In this system, a high-performance silicone insulating glass sealant should be used to produce an edge seal of the insulating glass units to secure the exterior lite to the assembly while maintaining the integrity of the primary PIB seal to protect the interior gas space of the insulating glass. Silicones are used due to their excellent resistance to ultraviolet light, which would attack organic-based sealants. In this design, the internal glass is bolted back to the main structure, while the external glass is structurally bonded to the inner glass around its perimeter.

One of the latest developments in structural glass design is the elimination of the bolted system and the need to drill the glass by using structurally bonded patch plates as an alternative. Dow’s range of structural adhesive sealants enables the designer to do away with the cost of drilling holes in glass and the use of very expensive stainless steel spider systems. This results in a system that has a reduced cost of manufacture, increased visibility and improved aesthetics. For more information, please refer to literature regarding Transparent Silicone Structural Adhesive (TSSA) available at [consumer.dow.com/CrystalClearBonding](http://consumer.dow.com/CrystalClearBonding).

Structural glass systems are often referred to as structural glazing, which is often confused with structural silicone glazing, as both techniques use this generic term. Therefore, architects and specifiers should be sure which system is being offered.
Total Vision Systems (Fin Glazing)
Total vision or fin glazing is a system that is used to maximize the area of glass at the front of the building, reducing the visible mechanical fixings and increasing the unobstructed vision area of the façade. Total vision glazing is a 2-sided structural glazing system in which the glass is normally mechanically fixed at head and sill and the vertical edges are structurally attached to glass fins or mullions. The glass is bonded to the glass fin using DOWSIL™ structural silicone sealants. The structure is then made watertight using DOWSIL™ weathersealing sealants. This technique is widely used for lobbies, showrooms and racetracks where the unobstructed visibility is an advantage.

Structural Attachment of Non-Glass Materials
Materials other than glass have been successfully attached to buildings with silicone sealants for many years. The benefits of structural silicone have been used with materials such as thin stone panels, including granite or marble; ceramic tile; plastic; and aluminum composite materials. In all cases, Dow has performed extensive testing of specific materials prior to approving the use of its sealant as a structural adhesive. The durability of the non-glass material must be evaluated by the manufacturer to determine its suitability for this application.

Certain materials, such as plastics, may have high coefficients of thermal expansion that may cause undue stress on the structural silicone and/or bowing of the panels. Dow must review all designs, whether glass or non-glass materials, where its sealants are used as structural adhesives.

See also Substrate Suitability on page 19.

Panel Stiffeners
For aluminum composite materials that are mechanically attached around the perimeter and the sealant is used to attach an aluminum stiffener, Dow permits glueline thickness dimensions of less than 1/4" (6 mm). In this application, there is a negligible amount of differential movement between the two aluminum components, and shear stress on the sealant is minimal. A best practice is to use a spacer material to establish a sealant joint, which can be controlled for width and thickness. Ensure use of suitable sealant for these applications by following the project specification.

Protective Glazing Systems
Dow offers structural glazing products that have successfully been used in protective glazing systems designed to meet the demands of missile impact and bomb blast testing. The demands of missile impact and bomb blast testing are great on any sealant. The sealant is only one component of a glazing system that includes the framing system, glass and laminate. In missile impact testing required to withstand flying debris from hurricanes and windstorms, the glazing must stay intact through either a small or large missile impact. The sealant then must “anchor” the laminated glass through repeated wind cycles that duplicate a hurricane.

For bomb-blast mitigation glazing, the sealant must also anchor the laminated glass through an air blast explosion. Dow does not approve bomb blast designs because of the intricate interactions between the sealant, glazing and framing. Potential users should either test their system and have it approved, or work with a bomb blast consultant who can review the design and determine the sealant requirements. Dow can provide the consultant with either ASTM D412 Tensile or ASTM C1135 Tensile sealant strength data for analysis.
Both DOWSIL™ 983 Structural Glazing Sealant and DOWSIL™ 995 Silicone Structural Sealant have the high strength and tear propagation properties required to pass either missile impact or bomb blast test requirements. Numerous glazing systems have successfully passed both tests with these two products.

Surface Preparation and Sealant Application

Introduction
The Dow application procedures outlined in this manual describe the general requirements for installing DOWSIL™ Silicone Building Sealants. By following these procedures closely, you will help ensure good sealant performance. To be eligible to receive a Dow warranty, these procedures must be followed. Since DOWSIL™ 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.

Following are the basic steps required for proper structural sealant joint preparation and sealant installation:

1. **Cleaning** – joint surfaces must be clean, dry, dust-free and frost-free
2. **Priming** – if required based on testing, primer must be applied to the cleaned surfaces
3. **Applying Sealant** – sealant is applied by “pushing the bead” into the structural joint cavity
4. **Tooling Sealant** – sealant is tooled into the structural joint to ensure it wets out and contacts both sides of the joint and the spacer without any voids in the sealant joint
Substrate Cleaning Procedure
This section provides information on cleaning solvents and general cleaning procedures for porous and non-porous substrates. One of the key requirements of good sealant adhesion is a clean surface. Proper cleaning is accomplished through the use of the “two-cloth” cleaning method. Always confirm with the supplier of each substrate that the cleaning procedures and solvents are compatible with their material.

Organic Solvent Usage
The proper use of solvents is an important part of the surface preparation requirements for substrates that are to be structurally bonded. Solvents all differ in their effectiveness in removing certain contaminants. Dow will test with the specific solvents selected, and cleaning and priming recommendations will be based on the use of this solvent. Dow recommends caution when using denatured alcohol due to potential contamination from the denaturants.

Please be aware that certain aggressive solvents can adversely affect finishes such as polyester powder-coated aluminum. Therefore, milder solvents such as IPA (isopropyl alcohol) or high quality white spirit (greater than 98% pure) can be used without damaging the substrate surface. Check with the substrate supplier for solvent compatibility with their materials.

Please follow the solvent manufacturer’s safe handling recommendations and local, state and national regulations regarding solvent usage.

Non-Porous Substrate – Solvent Considerations
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% 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.

Porous Substrates – Solvent Considerations
Porous stone substrates such as granite or marble might not be sufficiently cleaned by solvent cleaning. 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.

High pressure water blasting is an effective cleaning method, or a bristle brush with running water may suffice. Porous materials may absorb water or solvents after cleaning or priming. Hence, water or solvents used for cleaning must be allowed to evaporate completely before sealant is applied.

“Two-Cloth” Cleaning Method
Clean, soft, absorbent, lint-free cloths, along with the appropriate choice of solvent, must be used. The “two-cloth” cleaning method consists of a solvent wipe followed by a dry cloth wipe to lift and remove the solvent and contaminants suspended in the solvent. Multiple cleanings may be required to properly clean a substrate.

1. 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.
2. Wipe vigorously to remove contaminants. Check the cloth to see if it has picked up contaminants. Rotate the cloth to a clean area and re-wipe until no additional dirt is picked up.
3. Immediately wipe the cleaned area with a separate clean, dry cloth before the solvent has evaporated. This technique will allow dirt and contaminants suspended in the solvent to be lifted and removed with the second dry cloth. Multiple cleanings may be required to adequately clean a substrate.

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 continuing with the sealant installation.

**Primer Application Procedure**

DOWSIL™ primers should be applied in the following manner only to surfaces that have been properly cleaned and are dry and free of frost:

1. Apply masking tape to the surfaces next to the joint to keep excess primer and sealant off areas where they are not intended.
2. Ensure that primer is being utilized such that the container is not open to the atmosphere. Alternatively, pour primer into a small, clean container and replace and tighten the cap on the primer can to prevent exposure to atmospheric moisture that will contaminate the primer. Use small amounts of primer in the separate container – for example, enough primer to last for 30–60 working minutes or less.
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 small container of primer, or apply primer from container onto the cloth. Then 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:** Over-priming with DOWSIL™ 1200 OS Primer 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 sealant. Sealant must be applied the same day the surfaces are primed. Any surfaces primed but not sealed on the same day must be covered to prevent contamination or re-cleaned and re-primed before applying sealant.

**Sealant Application Procedure**

After cleaning and priming (if required), the sealant may then be gunned into the sealant joint. The spacer may already be in place during the cleaning and priming process or it may need to be installed after the metal substrate has been cleaned and primed. The glass is typically cleaned before it is put in position. It is critical that the sealant fills the entire joint or cavity and firmly contacts all surfaces intended to receive sealant. If the joint is improperly filled, good adhesion will not be achieved, and sealant performance will be weakened. This is critical since the effectiveness of the silicone in structural applications is largely dependent on the sealant bite (contact area).
**Keyway considerations:** It is recommended to always use a flat surface for structural glazing. At times, when additional structural bite is required, it may become necessary to use a keyway as part of the structural bite. If use of a keyway becomes necessary, please follow these guidelines:

When a keyway is used as part of the glazing surface contributing to the structural sealant bite, the sealant installation must be carried out as a separate step. The keyway must be cleaned, primed if necessary, sealant installed and tooled as its own procedure prior to the remainder of the structural sealant being installed. This is to ensure full joint fill and adhesion to a surface that is contributing to structural bite.

Sealant should be applied as follows:

1. To ensure an aesthetically pleasing job, masking tape should be used to keep excess sealant from contacting adjacent areas where it is not intended.
2. Apply the sealant in a continuous operation using a caulking gun, pump or glazing table. 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. This is critical, since the effectiveness of the silicone in structural applications is largely dependent on the sealant bite (contact area).
3. Tool the sealant with firm pressure before a skin begins to form (typically 10 minutes). Tooling forces the sealant against the spacer 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.
4. Remove the masking tape (if used) before the sealant skins over (within about 15 minutes of tooling).

**Setting Procedure**
Many of the specific requirements of glazing are beyond the scope of this guide. For detailed information, a guide such as the Glazing Association of North America (GANA) Glazing Manual should be consulted. Some general rules to follow when using silicone sealant in glazing applications are as follows:

1. Care must be taken to ensure that joint surfaces that have been prepared are not contaminated.
2. In some field glazing applications, the silicone may not be applied the same day the glass is set. Joint preparation (cleaning and priming) must be accomplished immediately prior to applying the silicone unless the environment can be proven to not contaminate the cleaned and primed surface; or steps are taken to prevent contamination so that glazing can occur within 24 hours after cleaning and priming.
3. Temporary fasteners or clips must be used to retain the structurally glazed lites or panels until the silicone has fully cured. A two-sided adhesive tape, used as the structural spacer, may be considered sufficient temporary support provided the tape manufacturer has approved the use of their product for this application.

**Sealant Cure Requirements**
In all silicone structural glazing applications, the silicone must be fully cured and adhered before the adhesive is stressed. The exact time can be determined by fabricating several small samples that replicate the joint design of the units. These test specimens should be cured along the curtainwall units. These samples can be cut apart to determine the degree of cure as a function of time. These samples
would also be used to check the adhesion of the sealant to the substrates. Full frame deglazes are also used to determine time to full cure, plus to test adhesion and joint fill (structural bite).

**Construction Site (Field) Glazing Considerations**
Temporary support of adjoining materials must be used during the cure of the structural silicone sealant. This is to prevent any stress on the sealant prior to full development of sealant adhesion and strength. DOWSIL™ 995 Silicone Structural Sealant and DOWSIL™ 795 Silicone Building Sealant typically require 7–14 days but can require up to 28 days or more in cold, dry conditions, depending on joint size, temperature and relative humidity. DOWSIL™ 121 Structural Glazing Sealant typically achieves the necessary strength and adhesion properties in 24 hours but can require up to 48 hours in colder, drier conditions depending on joint size, temperature and relative humidity.

**Factory (Shop) Glazing – One-Component Silicone**
If DOWSIL™ 995 Silicone Structural Sealant or DOWSIL™ 795 Silicone Building Sealant is used, complete cure of the silicone must be achieved before the units are moved or stressed in any way. This will typically require 7–14 days but can require up to 28 days or more in cold, dry conditions, depending on joint size, temperature and relative humidity. The time may be shortened in some cases as well (warm, humid conditions).

**Factory (Shop) Glazing – Two-Component Silicone**
DOWSIL™ 983 Structural Glazing Sealant cures in deep section within three hours and generally achieves full adhesion within 24 hours. DOWSIL™ 121 Structural Glazing Sealant generally cures in deep section and achieves adhesion in 24–48 hours. However, time to full cure depends on joint design, substrate type, temperature and humidity. For example, adhesion to a metallic fluorocarbon may take several days to achieve full adhesion, although the time can be shortened by priming the fluorocarbon paint with DOWSIL™ Primer-C OS.

Another consideration is the effects of temperature over the course of a large project. Full adhesion may occur in 24 hours when the project starts in mid-summer, but may drift out to 48 hours as the temperature decreases in winter. The silicone must not be stressed until full adhesion has developed. It is preferable to allow horizontally glazed units to remain on the fabrication tables until full adhesion develops, especially when no two-sided adhesive tape is used. (Two-sided adhesive tapes can be used to prevent stressing of the sealant when moving and transferring units during the cure period.) Adhesion testing should be carried out to confirm that full adhesion has been achieved. Once full adhesion is verified, units may be moved in a more rigorous manner.

When multiple substrates are glazed on unitized panels, special attention must be given to the support requirements of each substrate.

**Replacement and Remedial Glazing**
Glass breakage may occur during any phase of construction or long after a building is completed. How a system will be reglazed is an important design consideration.

The specifics will vary from project to project. Always contact your Dow Representative for specific advice. Following are some general guidelines regarding the silicone that should remain common to most all projects.
Replacement Glazing Due to Individual Unit Breakage
The following procedure assumes that a DOWSIL™ structural adhesive was originally used on the project, and that the original recommendations are available to the contractor performing the repairs.

If this information is not available, contact your Dow Representative, who may need to determine whether DOWSIL™ products have been used on the site.

1. Perform a field adhesion test to confirm the adhesion of the existing silicone to the substrates. If excellent adhesion is not observed, contact your Dow Representative immediately.
2. Deglaze the area. Depending on the joint design, this may require specially designed tools or piano wire to cut behind the silicone.
3. Cut away the silicone, leaving a thin film (approximately 0.02–0.04"/0.5-1 mm thick) of adhesive on the frame. Do not damage the surface finish of the substrate. Or, completely remove all sealant, but take care not to damage the substrate finish.
4. Clean the residual sealant with solvent using the “two-cloth” cleaning technique described previously. If fresh sealant will be applied immediately after cutting the cured sealant, then cleaning of the residual cured sealant may not be necessary.
5. Fresh sealant will adhere to cured sealant without primer. Primer may be necessary if sealant has been completely removed.
6. The silicone may absorb some solvent. Allow this solvent to evaporate so the existing cured sealant is completely dry before applying additional sealant.
7. Clean the new glass or panel and set in place. Install temporary fasteners. Mask the joint.
8. Fill the joint with a bead of fresh structural sealant. Refer to the Sealant Application Procedures section of this manual.
9. After the sealant has fully cured, check that full adhesion has been achieved and then remove the temporary fasteners.

NOTE: In some instances, the structural joint cannot be accessed once the glass has been set. In such instances, the sealant can be applied directly to the frame and the glass set in place, compressing the sealant in the joint. The joint must be filled in excess with sealant, and the glass must be set within 10 minutes or before the sealant begins to skin. Under-filled structural joints are workmanship issues. It is the responsibility of the sealant applicator to ensure proper joint fill. Dow will review and comment upon reglazing procedures.

Replacement Glazing Due to System Failure
If the scope of reglazing involves a major remedial operation, please consult with your Dow Representative as early in the planning process as possible. Remedial glazing utilizing silicone structural adhesives most typically occurs when a conventionally glazed building has experienced leakage problems and the entire curtainwall is refaced. In any major remedial situation, it is very important to assess the problem with the system and carefully record dates and locations of specific failures.

Quality Assurance – Structural Applications
Dow 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 at the job site, has not been abused or damaged in transit.
One-Part Sealants
The following procedure outlines a series of steps to ensure that the quality of the DOWSIL™ 995 Silicone Structural Sealant or DOWSIL™ 795 Silicone Building Sealant is adequate for structural sealant applications.

Shelf Life and Storage Conditions
DOWSIL™ 995 Silicone Structural Sealant must be stored at temperatures below 32°C (90°F). The “use by” date is clearly displayed on the product packaging.

DOWSIL™ 795 Silicone Building Sealant must be stored at temperatures below 27°C (80°F). The “use by” date is clearly displayed on the product package.

Skin-Over Time/Elastomeric Test
For one-part sealants, a skin-over and elastomeric test should be performed once per week and on every new lot of sealant used. The purpose of the test is to check the sealant’s working time and to ensure the sealant cures fully. Any great variation (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 bead of sealant into a 0.04" (1 mm) film on a sheet of polyethylene.
2. Every few minutes, touch the sealant film lightly with a tool.
3. When the sealant does not adhere to the tool, the sealant is said to have 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 Representative.
4. Allow the sealant to cure for 24 hours. After 24 hours, peel the sealant from the polyethylene sheet. Stretch the sealant slowly to see that it has cured. Release the stretch and check to see that it returns to approximately the original length. If the sealant has not cured, contact your Dow Project Manager.
5. Record the results in the project log book. This testing must be completed and results recorded, retained and available for review upon request. A project quality control log for recording test results is available later in this manual.

Multi-Component Sealants

a. DOWSIL™ 983 Structural Glazing Sealant

Shelf Life and Storage Conditions
The maximum storage temperatures for both the catalyst and base of DOWSIL™ 983 Structural Glazing Sealant can be found on the product labels. The packaging also clearly displays the “use by” date as well as a manufacturing batch number on both the base and catalyst.

Incoming Material Inspection
Prior to using, bring all materials inside and store at shop temperatures. Check for any dents that may prevent the follower plate from working properly.

DOWSIL™ 983 Silicone Structural Glazing Sealant Catalyst, Initial Inspection – When opening a new pail of catalyst, check for any clear fluid separation on the top. If present, this fluid should be
lightly remixed with a long spatula in a motion from bottom to top, similar to how a paint is remixed. The remixing should take 1 to 2 minutes to complete for a homogeneous catalyst. Place the pail immediately underneath the follower plate of the pail pump and bleed off any residual air according to pump instructions. Do not leave opened for extended periods of time, because the catalyst will react with air and moisture and start to form a cured crust. Pumps that sit idle for greater than 7 days should have the pail of curing agent inspected for separation and remixed by the above method if separation has occurred.

DOWSIL™ 983 Structural Glazing Sealant, Initial Inspection – Remove the top plastic disc prior to placing underneath the follower plate of the drum pump and bleed off any residual air according to pump instructions. There is no reason to remix the base. An opened drum of base alone will not cure but may become dirty on the top surface.

Application Temperatures: DOWSIL™ 983 Structural Glazing Sealant
DOWSIL™ 983 Structural Glazing Sealant is a two-part structural glazing adhesive intended for in-shop fabrication of structurally glazed curtainwall units and panel systems. The product has an adjustable cure rate to compensate for handling difficulties during gradual cooling or warming trends due to seasonal changes. However, this product should not be used in unheated shops during the winter.

Hence, it is recommended that DOWSIL™ 983 Structural Glazing Sealant be applied between temperatures of 12 to 35°C (50 to 95°F). Variable adhesion properties have resulted when the product was applied to curtainwall units in an unheated shop during the winter.

Drums of base and pails of catalyst should be stored indoors to maintain the temperature within the materials. The packaged materials are normally transported in unheated trucks and will be cold in the winter. Once received, the material should be brought indoors and warmed for a few days before using to help maintain consistency of cure and adhesion times. Cold base and cold catalyst will cure slower (even if the shop temperatures are warm), so the material should be allowed to equilibrate for consistency of these properties. For each drop of 10°C, the reaction rate (cure, snap time, adhesion) is decreased by approximately ½. It is not uncommon to see these properties drop during the winter from typical properties seen in the summer. This change in initial properties will not affect the cured performance of the sealant.

Mix Ratio for DOWSIL™ 983 Structural Glazing Sealant
The recommended mix ratio for DOWSIL™ 983 Structural Glazing Sealant is between 8:1 and 10:1 by volume (standard ratios typically set by pump manufacturers). Based on these volumetric ratios, the weight ratio for DOWSIL™ 983 Structural Glazing Sealant – Black corresponds to 10.3:1 to 13.0:1 (base to catalyst). For DOWSIL™ 983 Structural Glazing Sealant – Gray, using the same volumes, the weight ratio should be 11.0:1 to 13.5:1 due to a difference in the specific gravity of the Black versus Gray catalyst. This difference is outlined on the DOWSIL™ 983 Structural Glazing Sealant product data sheet.

Dispensing Equipment for DOWSIL™ 983 Structural Glazing Sealant
DOWSIL™ 983 Structural Glazing Sealant requires a plural component meter-mixing device. Two-part sealant pump manufacturers include but are not limited to Graco, H&G Industries, Reinhardt Technik Liseck, Nordson and Erdman Automation. For further information on the advantages and disadvantages, the reader is encouraged to discuss this with the distribution network of each of these pump manufacturers.
The two-part sealant pumps available all require maintenance and trained operators. It is beyond the scope of Dow as a sealant supplier to provide pump maintenance, spare parts and troubleshooting. The quality control program recommended by Dow, including snap time, butterfly test, shop adhesion testing and deglazing, will show pump problems. Sporadic cure rate, non-uniform color, presence of air and uneven hardness of the finished sealant are issues generally associated with the pump.

A method to evaluate the consistency of mix from the pump is to dispense a winding, snake-like bead of sealant onto a cardboard sheet. Tool the bead to an approximate 1/4" (6 mm) thickness and monitor the cure rate of the sealant. Type A durometer hardness can be used to monitor the rate of sealant cure. If soft spots remain after the bulk of the sealant is cured, there may be a problem with the pump. Please notify your pump manufacturer for assistance.

DOWSIL™ 983 Structural Glazing Sealant will work only when it is metered and mixed without incorporation of air. This requires a properly maintained pump with qualified, trained operators. Critical processing parameters are down pressure on the curing agent and base platens, effective purging during drum or pail exchange, seal integrity, and proper exchanging of a pail or drum before the system runs “dry” or cavitates.

If a pump has been idle between projects, it is suggested that a thorough cleaning and refurbishing of maintenance items be performed. This can be done with the assistance of the pump manufacturer or its distributor.

Dispensing equipment must be used to airlessly meter and mix DOWSIL™ 983 Structural Glazing Sealant. The specific operation and maintenance of the pump are beyond the scope of this document. The applicator must have a start-up, shut-down and maintenance procedure for the pump to properly apply structural glazing adhesives.

When starting the pump, the curing agent line should be opened and material pumped through the line until the sealant exiting the dispensing gun ceases to be white or streaked. Instead, it should be a consistent black color, indicating a mix of the base and curing agent components.

Before shutting down the pump, the static mixer and hoses should be purged with base material and cleaned with an approved cleaning solvent. The amount of wasted material resulting from the start-up and shutdown of the pump varies with the type of pumping equipment used.

As the volume of the hose after the static mixer location decreases, so will the amount of wasted material resulting from start-ups and shutdowns.

Quality control testing to be performed on start-up of the equipment includes the butterfly test and the snap-time test. Descriptions of each follow. Results of these tests must be recorded in a log similar to the example in the Documentation section of this manual.

These are guidelines based on Dow’s experience and are not meant to supersede any recommendations or documentation from the pump manufacturer.
Butterfly Test
The butterfly test must be performed every time the pump is started up, including start-ups that occur after extended breaks. The purpose of this test is to check for an adequate mix of base and curing agent components.

The test is performed as follows:

1. Fold a piece of plain white paper.
2. Apply a minimum 6" (150 mm) bead of DOWSIL™ 983 Structural Glazing Sealant to the crease or fold in the paper.
3. Press the paper together, smearing the sealant bead to a thin film.
4. Pull the paper apart and visually inspect the sealant smear formed.
5. Properly mixed material should have no white streaks of unmixed base. If streaks are present, then more material must be pumped through the lines to improve the mixing quality. If the sealant smear is a consistent black color, the sealant is properly mixed and ready for use.
6. If gray or white streaks continue, equipment maintenance may be needed. Cleaning or changing the mixing system, dispensing hose, dispensing gun or ratio system ball check valves can often correct this problem. Consult the equipment manufacturer for maintenance requirements.

Application of structural glazing sealant should not proceed with sealant that shows streaking during a butterfly test.

Snap-Time Test
Once full mix of the two-part sealant (as confirmed by the butterfly test) is achieved, a snap-time test should be performed. This test must be performed on a daily basis. Snap time is an indicator test that can vary from technician to technician. The snap-time test relates the base-to-catalyst mix ratio to the cure rate of the sealant and provides an indication of working time and deep section cure. The snap-time test is performed as follows:

1. Fill a small container with DOWSIL™ 983 Structural Glazing Sealant.
2. Place a stick, pencil or spatula into the sealant. (Wooden chopsticks or paint-stirring sticks work well.) Note the time.
3. Every 3 to 5 minutes, pull on the stick. Do not stir the sealant or incorporate air into the mixed sealant.
4. If the sealant does not tear within itself (cohesively) when the stick is pulled out, the sealant has not snapped. The time at which the sealant tears cohesively when the stick is pulled out is termed the “snap time.” Note the snap time in a log.
5. The snap time will vary depending on atmospheric conditions, temperature, humidity and the individual doing the test. A snap time varying more than 25 minutes from what is expected may indicate an equipment or sealant problem. Such problems include plugged hoses, clogged filters, bad check valves or out-of-shelf-life sealant. Consult Dow and the pump manufacturer before continuing to use this material.

Regardless of the results of the snap-time tests, ultimately one should be concerned only if the sealant does not cure. Assuming that the sealant does cure, it is most important that the sealant develops adhesion to the substrate. Snap-time test is an indicator and should be considered as a part of an overall quality assurance program.
**Pump Seal Maintenance Check (Snake Test)**

Worn seals on the volumetric (dual-action) catalyst displacement cylinders can cause a variable mix ratio which can result in an inconsistent cure and should be checked when a pump is started up for the first time or if soft spots are noticed in the sealant bead. When cylinder seals wear, they can allow an inconsistent amount of catalyst to be mixed into the sealant. This typically occurs as the catalyst volumetric cylinder cycles from one direction to the other and allows back pressure to let catalyst escape from one side. This is a typical maintenance item that should be added to the overall Quality Control program.

1. Turn on the pump and lay a continuous bead back and forth in a “snake-like” pattern on a piece of cardboard. Allow the pump to extrude for 3 to 5 minutes so that 2 complete cycles of the catalyst cylinder are completed.
2. Let the sealant cure for 2 hours.
3. Check the entire bead by pressing your finger into the surface every 2" to 3" and ensuring the entire sealant bead is fully cured along the entire length.

If soft spots are present, it is likely the problem needs to be addressed with a pump technician who will replace the pump seals. The soft spots will typically occur in a consistent fashion (or specified length) along the extruded bead of sealant.

**b. DOWSIL™ 121 Structural Glazing Sealant**

**Shelf Life and Storage Conditions**

DOWSIL™ 121 Structural Glazing Sealant must be stored at temperatures below 30°C (86°F). A “use by” date is clearly displayed in the label of the cartridge.

**Application Temperatures: DOWSIL™ 121 Structural Glazing Sealant**

DOWSIL™ 121 Structural Glazing Sealant is a two-part structural glazing adhesive intended for in-field or in-shop structurally glazed curtainwall units and panel systems.

It is recommended that DOWSIL™ 121 Structural Glazing Sealant be applied between temperatures of -20 to 37°C (-5 to 100°F).

Cold kits of material will cure slower (even if the shop temperatures are warm). For each drop of 10°C, the reaction rate (cure, snap time, adhesion) is decreased by approximately ½. It is not uncommon to see these properties drop during the winter from typical properties seen in the summer. This change in initial properties will not affect the cured performance of the sealant.

**Dispensing Equipment for DOWSIL™ 121 Structural Glazing Sealant**

DOWSIL™ 121 Structural Glazing Sealant curing agent and base must be thoroughly mixed using an airless mixing system. DOWSIL™ SGS 121 Structural Glazing Sealant is compatible with existing pneumatic dispensing tools which accommodate 2 x 200 mL cartridges. Dow has successfully tested this product with the following pneumatic dispensing tools.

- Sulzer MIXPAC DP 400-100-01
- Albion P/N AT400 Standard 400 ml Cartridge Air Gun
- Cox A400HPMR
- Newborn VR400A85
If you would prefer to use another manufacturer, please contact your local Dow representative to ensure you will get proper sealant mix.

Please note that use of dispensing equipment of a model or a manufacturer not listed in this document will void any DOWSIL™ product and structural adhesion Limited Warranties. The only exception to this would be if Dow publishes an updated version of this document and/or issues a document indicating the approval of another manufacturer or dispensing equipment model for use with DOWSIL™ 121 Structural Glazing Sealant.

Twelve 18-element, ½-inch diameter static mixers are included in the packaging with the sealant and are required to mix the material. A new static mixer must be used for each cartridge to ensure proper mixing of the material. Neither hand-mixing nor mechanical mixing is satisfactory due to the incorporation of air, resulting in altered physical properties.

1. Attach air hose to compressor and to end of pneumatic sealant tool. The air pressure should not exceed 90 psi or the maximum air pressure listed on the gun, whichever is greater.
2. Ensure the dual pistons are to the back of the gun, so the cartridge can be put in. This can be done using the reverse function on the pneumatic dispensing tool.
3. Remove cap from top of cartridge. Remove the plug on the dispensing end of the cartridge by inserting a flat screw driver or similar tool into the rectangular slot on the plug. Use the tool to bend the plug 90 degrees as if to make it perpendicular to the cartridge. This movement will release the plug. A second option is to invert the cartridge, firmly tap the top plug on the cartridge on a hard, flat surface, then remove the plug out from the top of the cartridge.
4. Now the cartridge can be inserted. The cartridge should snap into the tool so that the ends of the cartridge are aligned with the dual pistons.
5. Once the cartridge is inserted, ensure that the pistons are set to move in the forward direction. Then, press and hold the trigger until material comes out of BOTH the curing agent and base cartridges.

Once both curing agent and base are being extruded from the cartridge, wipe off the excess sealant.
6. Attach a new static mixer. The end of the static mixer can be cut using a sharp knife or scissors to make the tip larger or to slant it at an angle. Do not remove any of the mixing elements in the mixer.

7. With the static mixer screwed on, depress the trigger until the static mixer is completely full and the DOWSIL™ 121 Structural Glazing Sealant can be seen coming out the end of the mixer. This is best done over a waste area. Wipe off the initial material that comes out of the static mixer.

**Quality Check:** The first inch (25.4 mm) of the static mixer closest to the cartridge should have a distinct white area and dark (black or grey) area, approximately dividing the static mixer in half. If you do not see this, you may have skipped step 5.

8. The material is now ready to use. For information on installing the sealant into the joint, refer to the Sealant Joint Installation Procedure section of this manual.

9. Once the cartridge is emptied, reverse the dual plungers. Remove the cartridge and static mixer from the dispensing tool and dispose. The static mixer should not be reused. To use another cartridge of DOWSIL™ 121 Structural Glazing Sealant, repeat steps 3–7.

10. Once you have completed your sealant installation, turn off the air compressor and shut off the air to the gun. Pull the trigger until the air pressure reads zero and then disconnect the air hose from the gun.

**Quality Control**
In lieu of the traditional butterfly test and snap test that is required for the DOWSIL™ 983 Structural Glazing Sealant, a small amount of material should be extruded into a cup or onto a piece of paper or cardboard. This material should be checked to ensure that it starts to cure into a rubber in 4–8 hours.

**Sealant Joint Installation**
Once the joint has been prepped and the sealant is ready to use, the sealant may then be gunned into the sealant joint. It is crucial that the sealant fills the entire joint or cavity and firmly contacts all surfaces intended to receive sealant. If the joint is improperly filled, good adhesion will not be achieved, and
sealant performance will be weakened. This is crucial since the effectiveness of the silicone in structural applications is largely dependent on the sealant bite (contact area).

**Keyway considerations:** It is recommended to always use a flat surface for structural glazing. When additional structural bite is required, it may become necessary to use a keyway as part of the structural bite. If use of a keyway becomes necessary, please follow these guidelines:

When a keyway is used as part of the glazing surface contributing to the structural sealant bite, the sealant installation must be carried out as a separate step. The keyway must be cleaned, primed if necessary, sealant installed and tooled as its own procedure prior to the remainder of the structural sealant being installed. This is to ensure full joint fill and adhesion to a surface that is contributing to structural bite.

Sealant should be applied as follows:

1. To ensure an aesthetically pleasing job, masking tape should be used to keep excess sealant from contacting adjacent areas where it is not intended.
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. This is critical, since the effectiveness of the silicone in structural applications is largely dependent on the sealant bite (contact area).
3. Tool the sealant with firm pressure before a skin begins to form (typically 10 to 20 minutes). Tooling forces the sealant against the spacer 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.
4. Remove the masking tape before the sealant skins over (within about 15 minutes of tooling).

Some general rules to follow when using silicone sealant in glazing applications are as follows:

1. Care must be taken to ensure that joint surfaces that have been prepared are not contaminated.
2. In some field glazing applications, the silicone may not be applied the same day the glass is set. Joint preparation (cleaning and priming) must be accomplished immediately prior to applying the silicone.
3. Temporary fasteners or clips must be used to retain the structurally glazed lites or panels until the silicone has fully cured. A two-sided adhesive tape, used as the structural spacer, may be considered sufficient temporary support provided the tape manufacturer has approved the use of their product for this application.
Movement of In Shop Structurally Glazed Units

Once a structurally glazed unit has been sealed, it needs to be stored and left until the sealant has cured and adhesion has been built up between the sealant and the substrates used. It must be understood at this stage that the cure of the sealants and the adhesion build-up are not linked. Therefore, if a sealant has reached full cure, this does not necessarily mean that full adhesion to the substrates has been achieved. This is particularly true of two-part sealants. Therefore, it is critical that the curtainwall units be allowed sufficient time for adhesion to develop before units are subjected to stress. Two-sided adhesive tape helps to prevent failure during the cure by forming a tight bond with the panel and substrate.

There are many ways to handle fabricated curtainwall units after their manufacture. Within the first four hours after installing DOWSIL™ 983 Structural Glazing Sealant, curtainwall units can be moved from a glazing table to a bunking area to release floor space in a manufacturing facility. Units moved within this first 4-hour period must be kept horizontal and be moved carefully to ensure that no stress is placed on the sealant joint. It is inappropriate to lift the unit via suction cups on the glass during this initial period.

Units glazed with DOWSIL™ 121 Structural Glazing Sealant that are moved within the first 24-hour period after installing DOWSIL™ 121 Structural Glazing Sealant must be kept horizontal and be moved carefully to ensure that no stress is placed on the sealant. It is inappropriate to lift the unit via suction cups on the glass during this initial period.

While it is general industry practice to wait 24 hours before transporting units to a job site, units glazed using DOWSIL™ 983 Structural Glazing Sealant may be transported after 4 hours if adhesion testing has documented sufficient sealant cure and adhesion. When using DOWSIL™ 121 Structural Glazing Sealant, the units should be allowed to cure for at least 24 hours before being transported. Whatever time frame for transport is chosen, adhesion testing should be completed and documented at that time to illustrate the sealant is sufficiently cured and adhering. If units are transported or crated prior to 100% cure of the sealant (typically 24 hours), banding should be evaluated for proper tension to ensure the sealant does not take a compression set.

Shop/Site Adhesion Testing

Dow requires that adhesion tests be performed on representative production substrates in the shop as a means to verify adhesion of actual production units. Quality control adhesion tests are not a substitute for unit deglazing but only provide an ongoing means to continuously monitor adhesion in a non-destructive manner.
Peel-in-Adhesion Test Procedure

Peel-in-adhesion tests are required as a means to verify sealant adhesion on production materials. Peel-in-adhesion testing should be performed as follows:

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 7.8" (200 mm) long, 1" (25 mm) wide and 1/8" (3 mm) thick. At least 2" (50 mm) of the sealant should be applied over the polyethylene sheet or bond breaker tape.
4. After cure of the sealant, pull the sealant perpendicular to the substrate until failure. Record the mode of failure of the test sealant.

Adhesive Failure

Cohesive Failure

The sealant should be applied to each representative substrate. Sealant samples should be peeled back at the time increment that the units are to be moved. Units may be moved in as little as 4 hours for DOWSIL™ 983 Structural Glazing Sealant or 24 hours for DOWSIL™ 121 Structural Glazing Sealant, but typically cure times are from 1 to 7 days. At the time that curtainwall units may be subjected to stress on the structural silicone, either during transit in the shop or to the jobsite, the sealant must have achieved 100% cohesive failure to each of the substrates that adhesion is required. Only after the sealant has achieved 100% cohesive failure can significant stress be applied to the structural joint. Peel-in-adhesion test results should be correlated with results from deglazing of actual production units.

The tests described above must be performed to verify that adhesion of structural silicone is obtained before curtainwall units are transported to a jobsite and erected on the building. These are daily tests and are intended to verify that all surfaces that require structural adhesion have obtained adhesion before units leave the factory. Adhesion time of two-component structural sealants can vary with conditions of lower temperature and humidity, and units that do not have full adhesion can lose adhesion during transportation if adhesion is not verified prior to shipment. Curtainwall units should not be subjected to stress unless the sealant has developed full adhesion. Dow should be consulted for recommendations in determining the appropriate handling of structurally glazed curtainwall units.
NOTE: Obtaining Adhesion on Painted Aluminum with DOWSIL™ 983 Structural Glazing Sealant and DOWSIL™ 121 Structural Glazing Sealant – Adhesion development is a key requirement that must be confirmed at each glazing location before subjecting units to considerable movements such as tilting, crating or shipping units. However, it may take 1, 2, 7 or more days for adhesion to develop between DOWSIL™ 983 Structural Glazing Sealant or DOWSIL™ 121 Structural Glazing Sealant and painted aluminum when either no primer or DOWSIL™ 1200 OS Primer is used. As an alternative, the use of DOWSIL™ Primer-C OS to may provide quicker adhesion development on painted substrates compared to no primer or DOWSIL™ 1200 OS Primer.

Deglazing
Deglazing is carried out on glass or panel and frame, which use structural silicone attachment. Deglazing is a method of quality inspection used to confirm good adhesion and proper fill of the structural joint. Deglazing on silicone structural glazing projects is an excellent quality control procedure. Deglazing involves completely detaching the panel from the frame. The structural silicone sealant should be tested for adhesion to both the panel and the frame. The surface of the panel and/or frame must not be damaged to obtain the best inspection.

The inspection should include the following (Deglaze Inspection Form):

1. Measured size of structural bite (minimum measurement if underfilled)
2. Size of structural glueline
3. Adhesion of silicone sealant with panel and frame
4. Joint type/condition of sealant applied
5. Appearance of the sealant/uniformity of color/bubbles/etc.

NOTE: When measuring the size of the structural bite during deglazing, if any voids or underfilling occurs, then the measured bite may not meet the minimum bite requirements outlined in the Dow project print review letter and DOWSIL™ Structural Glazing Warranty requirements. The minimum measured bite at any point (on the frame or panel) governs the measured bite reported on the Deglaze Inspection Form – reporting measured average bites is not acceptable. Always follow proper application techniques to ensure complete fill is attained to avoid these issues and the need to reapply the sealant.

Deglazing Frequency
Deglazing may not be required as part of a comprehensive quality control program for structural glazing. Simple processes, such as glazing 1-2 lites in a storefront application make no practical sense to deglaze unless the design is complicated. For glazing projects with numerous lites, variable geometries or complex design requirements, deglaze operations should be considered part of a comprehensive quality control program and should be agreed upon prior to fabrication between contract glazer, designer, consultant and/or other interested parties. Project documents/specifications should prevail in defining frequency.

Deglaze operations should be conducted to capture the initial start of fabrication to ensure quality workmanship with periodic inspection to confirm continued quality. Dow recommends deglazing according to the following schedule:

1. First deglaze – 1 unit out of the first 10 units manufactured (1/10)
2. Second deglaze – 1 unit out of next 40 units manufactured (2/50)
3. Third deglaze – 1 unit out of next 50 units manufactured (3/100)
4. From the fourth deglaze – 1 unit out of every 100 units manufactured thereafter
NOTE: Current practices in design and fabrication of structurally glazed curtain wall assemblies include the potential for multiple lites or panels to be individually glazed onto one frame. Based on the above description, it is reasonable to expect that “unit” as stated in the manual should be considered one frame consisting of one or more glass lites or panel or combination of. It is at the discretion of the fabricator or as a result of contractual obligations to determine the number of lites or panels to be removed during the deglaze process. It is reasonable to expect that if only one lite or panel is removed from a multi lite frame (“unit”), that lite should be representative of the quality of installation for the remainder of the unit. If there are deficiencies found, then further investigation or deglaze operations should be pursued.

Alternate Quality Control Tests
Quality control tests not identified above may be required or accepted as alternatives to these tests on a job-specific basis. Alternate quality control tests such as tensile adhesion joints have been used successfully to monitor adhesion and cure development of two-component sealants. Water immersion of peel adhesion or tensile adhesion joints may be recommended for a specific project. Unless specifically approved or recommended by the Dow Technical Service Representative, these tests are not required by Dow.
**Documentation – Quality Assurance and Warranty**

Suggested logs referred to in this manual are provided on the following pages. In the event of a warranty claim or inspection, these must be available from the contractor, subcontractor or owner for review by Dow, the curtainwall consultant and/or the local building official.

Therefore, it is suggested that these quality assurance logs be kept together with the project file. A hardcover logbook may be preferential to copies of the logs suggested here. A quality assurance engineer should be responsible for documenting this data on a job-to-job basis. All curtainwall units must be numbered so the sealant installation dates, sealant lot numbers and quality assurance testing can be obtained from the project log. The position of each panel on the building should be marked on an elevation drawing so that it can be easily traced if required.

Dow will be happy to assist you during the implementation of this quality control program. If you have any questions, contact your local Dow Field Specialist.

**Warranty – Structural Applications**

All warranties are dependent on the successful completion of Dow requirements. These requirements include, but are not limited to:

1. The sealant is applied within its stated shelf life;
2. The sealant is applied in strict compliance with Dow’s published or electronic application procedures and, where applicable, with any written requirements indicated on the Evaluation Review Summary Letters;
3. The sealant is used with materials that have been evaluated and approved by Dow for compatibility and adhesion, and that the samples of the submitted materials are representative of the materials actually used on the project;
4. The application of the sealant and the joint configuration are completed in accordance with the project prints/specifications; and
5. Adhesion tests are made, documented, retained and submitted to Dow upon written request, in order to confirm adhesion under site conditions.

At the time of shipment, the DOWSIL™ sealant is warranted that the sealant will meet the Dow sales specification. For further details on the requirements and limitations of this limited warranty, consult the DOWSIL™ product data sheet for the sealant in use.

Dow also offers a project-specific 20-year performance warranty for sealants used in structural applications. Specific requirements must be met to qualify for this performance warranty.

For details on how to obtain the applicable warranty, please consult your local Dow Field Specialist or authorized building sealant distributor.
Quality assurance requirements for a project-specific performance (structural) warranty include, but are not limited to:

Structural Glazing – Field Applied:

1. Confirmation of Adhesion: Dow Adhesion Letter(s) generated for each substrate that contacts the approved DOWSIL™ Structural Sealant (DOWSIL™ 795 Silicone Building Sealant, DOWSIL™ 995 Silicone Structural Sealant, DOWSIL™ 121 Structural Glazing Sealant or DOWSIL™ 983 Structural Glazing Sealant).
2. Confirmation of Compatibility: Dow Compatibility Letter(s) generated for each spacer that is used in direct contact with the DOWSIL™ Structural Sealant (DOWSIL™ 795 Silicone Building Sealant, DOWSIL™ 995 Silicone Structural Sealant, DOWSIL™ 121 Structural Glazing Sealant or DOWSIL™ 983 Structural Glazing Sealant).
3. Dow Print Review Approval Letter, which confirms that the documented joints meet Dow performance standards for structural glazing.
4. Field testing documentation log book(s) that show sufficient testing was done. The minimum should be one test per elevation per floor. The contractor should determine other job-specific needs. The contractor should complete and fill out the log to demonstrate that acceptable adhesion was obtained in actual use. This is in addition to the Adhesion Letter noted in #1.
5. The contractor documents and retains all required quality assurance documentation and, upon completion of the project, provides a copy to the owner. This documentation must be retained for this warranty to be valid and will be required should any claims arise in the future. The owner should retain the quality assurance documentation along with the Dow-issued warranty.

Structural Glazing – Shop Applied:

1. Confirmation of Adhesion: Dow Adhesion Letter(s) generated for each substrate that contacts the approved DOWSIL™ Structural Sealant (DOWSIL™ 795 Silicone Building Sealant, DOWSIL™ 995 Silicone Structural Sealant, DOWSIL™ 121 Structural Glazing Sealant or DOWSIL™ 983 Structural Glazing Sealant).
2. Confirmation of Compatibility: Dow Compatibility Letter(s) generated for each spacer that is used in direct contact with the DOWSIL™ Structural Sealant (DOWSIL™ 795 Silicone Building Sealant, DOWSIL™ 995 Silicone Structural Sealant, DOWSIL™ 121 Structural Glazing Sealant or DOWSIL™ 983 Structural Glazing Sealant).
3. Dow Print Review Approval Letter, which confirms that the documented joints meet Dow performance standards for structural glazing.
4. In-shop logs:
   a. Daily adhesion testing and quality control logs must be completed by the contractor to verify that the units were sufficiently cured and adhered before transported to the site.
   b. Deglazing documentation log must be completed and filled out by the contractor to demonstrate that acceptable adhesion, void-free fill and sealant bite were obtained on production units per requirements in the log.
5. The contractor documents and retains all required quality assurance documentation and, upon completion of the project, provides a copy to the owner. This documentation must be retained for this warranty to be valid and will be required should any claims arise in the future. The owner must retain the quality assurance documentation along with the Dow-issued warranty.
Dow Project Checklist

The following items must be completed for silicone structural glazing projects. Check off and/or date these items as they are completed. Some items may not apply to all projects. In that case, simply note “NA” (not applicable).

Design Details
_______ Submit prints to Dow for review
_______ Include windload and maximum glass size
_______ Date(s) of Dow print review
_______ Mock-up drawings/final shop drawings

Adhesion Testing (testing time: 4 weeks)
_______ Submit job site representative metal (mullion and/or panel)
_______ Date of Dow adhesion recommendation report
_______ Submit job site representative glass
_______ Date of Dow adhesion recommendation report
_______ Submit job site representative stone
_______ Date of Dow adhesion recommendation report

Compatibility Testing (testing time: 4 weeks)
_______ Submit job site representative structural spacer
_______ Date of Dow compatibility recommendation report
_______ Submit job site representative setting block
_______ Date of Dow compatibility recommendation report
_______ Submit job site representative setting gaskets that will contact structural silicone
_______ Date of Dow compatibility recommendation report

Quality Assurance
_______ Perform daily product quality testing and document on log sheet(s)
_______ Perform daily field/shop adhesion testing and document on log sheet(s)
_______ Perform deglaze on mock-up and document on log sheet(s)
_______ Perform deglaze on frame according to schedule
## Product Quality Control Log – One-Part Silicone Sealants

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<th>Tester Initials</th>
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<th>Elastomeric (Y/N)</th>
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Product Quality Control Log – Two-Part Silicone Sealant

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<th>Base Lot Number</th>
<th>Catalyst Lot No.</th>
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<th>Snap Time (Minutes)</th>
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</table>
### Product Quality Control Log - DOWSIL™ 121 Structural Glazing Sealant

<table>
<thead>
<tr>
<th>Time</th>
<th>Lot Number</th>
<th>Façade</th>
<th>Location/ Specific Lite</th>
<th>Primer Y/N</th>
<th>Static Mixer Check for Mix Y/N</th>
<th>Initial Material Runout Cured Y/N</th>
<th>Initials</th>
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</table>

**Project Name and Location:**

**Date:**

**Temperature:**
# Field/Shop Adhesion Testing Log

<table>
<thead>
<tr>
<th>Project:</th>
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</thead>
<tbody>
<tr>
<td>Sealant:</td>
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</tr>
<tr>
<td>Sealant Lot Number/Color:</td>
<td></td>
</tr>
<tr>
<td>Primer (if applicable):</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Date Applied</th>
<th>Applied by (Initials)</th>
<th>Test Date</th>
<th>Test Location (Elevation, Unit Number, etc.)</th>
<th>Primed (Y/N)</th>
<th>Acceptable Adhesion (Y/N) and % Elongation</th>
<th>Acceptable Joint Fill (Y/N) (Measured)</th>
</tr>
</thead>
<tbody>
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</table>
Dow Deglaze Inspection Form

Project Number: ____________________________________________________________

Deglaze Date: _____________________________________________________________________________________________________

Project Name: _______________________________________________________________________________________________________

Sealant Applicator: ____________________________________________________________

<table>
<thead>
<tr>
<th>Frame ID</th>
<th>Panel Size</th>
<th>DOWSIL™ Product</th>
<th>Lot Number</th>
<th>Sealant Application Date</th>
<th>Measured Structural Bite (Frame)</th>
<th>Measured Structural Bite (Glass)</th>
<th>Glueline</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
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<td>2.</td>
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</tbody>
</table>

Frame Description: _______________________________________________________________________________________________________

Glass Description: _______________________________________________________________________________________________________

Comments on Adhesion, Joint Fill and Appearance:

1. __________________________________________________________________________________________________________________________________________________________
2. __________________________________________________________________________________________________________________________________________________________
3. _________________________________________________________________________________________________________________________________________________________
Weatherproofing

Introduction
The successful performance of a building exterior is frequently defined by its ability to keep rain and the elements outside, away from the building’s occupants. One of the critical links to ensuring a weatherproof building is the joint sealant. Building joints can be sealed effectively by following a few simple guidelines for designing workable joints, selecting the correct sealant, performing appropriate surface preparation and performing quality checks to ensure proper performance. This section of the manual contains design, sealant selection, surface preparation, job site adhesion testing and remedial procedures.

Joint Movement
Regardless of the size and height of structures, joint movement inevitably occurs by various factors such as: changes in temperature, seismic movement, elastic frame shortening, creep, live loads, concrete shrinkage, moisture-induced movements and design errors. Therefore, each joint should be designed to absorb these movements, using the correct sealant.

When movement is caused by temperature change, the degree of joint movement for each material should be considered since all materials have their own coefficient of linear thermal expansion (CTE). Joint movement caused by thermal expansion can be calculated by the following equation:

$$\text{Movement (Mt)} = \text{CTE} \times \text{Temp. Change} \times \text{Length of Material}$$

Examples are below:

<table>
<thead>
<tr>
<th>Max. Temp. (°F)</th>
<th>Min. Temp. (°F)</th>
<th>Material Length (inches)</th>
<th>Material</th>
<th>Thermal Coefficient inch/inch/°F</th>
<th>Movement (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>160</td>
<td>-20</td>
<td>96</td>
<td>Glass</td>
<td>0.0000051</td>
<td>0.088</td>
</tr>
<tr>
<td>100</td>
<td>50</td>
<td>180</td>
<td>Aluminum</td>
<td>0.000132</td>
<td>0.119</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Max. Temp. (°C)</th>
<th>Min. Temp. (°C)</th>
<th>Material Length (mm)</th>
<th>Material</th>
<th>Thermal Coefficient mm/mm/°C</th>
<th>Movement (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>-20</td>
<td>4000</td>
<td>Glass</td>
<td>0.000009</td>
<td>2.88</td>
</tr>
<tr>
<td>70</td>
<td>-20</td>
<td>3500</td>
<td>Aluminum</td>
<td>0.000235</td>
<td>7.40</td>
</tr>
</tbody>
</table>
### Average Coefficients of Linear Thermal Expansion for Building Materials - Reference ASTM C1472-06 (Standard Guide for Calculating Movement and Other Effects When Establishing Sealant Joint Width)

<table>
<thead>
<tr>
<th>Material</th>
<th>mm/mm/°C x 10⁻⁶</th>
<th>inch/inch/°F x 10⁻⁶</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>9.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Aluminum</td>
<td>23.2-23.8</td>
<td>12.9-13.2</td>
</tr>
<tr>
<td>Granite</td>
<td>5.0-11.0</td>
<td>2.8-6.1</td>
</tr>
<tr>
<td>Marble</td>
<td>6.7-22.1</td>
<td>3.7-12.3</td>
</tr>
<tr>
<td>Concrete</td>
<td>9.0-12.6</td>
<td>5.0-6.0</td>
</tr>
<tr>
<td>Stainless Steel</td>
<td>10.4-17.3</td>
<td>5.8-9.6</td>
</tr>
<tr>
<td>Acrylic</td>
<td>74.0</td>
<td>41.0</td>
</tr>
<tr>
<td>Polycarbonate</td>
<td>68.4</td>
<td>38.0</td>
</tr>
</tbody>
</table>

**NOTE:** The coefficient of expansion for natural materials (brick, stone, etc.) or fabrications of natural materials can be highly variable. If a specific material is specified, then the coefficient for that material should be established and used rather than an average value.

**NOTE:** Moisture-induced movement of brick masonry will cause the brick to swell and reduce joint sizes over the life of the project.
Joint Types
From a functional point of view, joints for construction can be put into two classes depending on the degree of movement.

Working Joint (Moving Joint)
Working joints (moving joints) are joints in which the shape and size of the sealant joint changes dramatically when movement occurs. Usually, a working joint occurs on the building envelope when different materials about each other or joints are designed to allow thermal expansion of materials. Typical examples of working joints include:

- Control Joint
- Expansion Joint
- Lap Joint
- Butt Joint
- Stack Joint

Fixed Joint (Non-moving Joint)
Fixed joints are mechanically fixed to prohibit movement. Movements are generally less than 15% of joint width. These joints are typically designed as air and/or water seals in window systems.
Joint Design
DOWSIL™ sealants have been designed to perform when installed in compliance with accepted weathersealing procedures. Industry guides documenting in detail the procedures for designing weatherseal joints are available. Some good examples are found later in this document.

Dow has found that a few underlying principles are critical to consider in virtually all joint designs using silicone sealants. This section is intended as a review of these underlying design principles. When considering the design of weatherproof joints, the following basic points must be addressed:

- In all cases, a minimum depth of 1/4" (6 mm) sealant/substrate bond is necessary to ensure adequate adhesion.
- In most cases, a minimum width of 1/4" (6 mm) opening is necessary to ensure that sealant applied from a caulking gun will flow into the sealant joints. **NOTE:** In some cases where the sealant is used simply as a non-moving bedding compound and is applied to one substrate before both substrates are pressed together, thinner joint dimensions are acceptable.
- One-part silicone sealants require atmospheric moisture to fully cure. Therefore, the sealant joint must be designed to ensure that the sealant is not isolated from the air.

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

- A minimum 1/4" (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% movement can be accommodated.
- A properly designed moving joint with a 2:1 width to depth ratio will accommodate more movement than a thick joint (i.e., 1.5:1 or 1:1 ratio). Sealants are designed to deliver optimum performance when the joints are shaped like an hourglass and use the 2:1 ratio.
- As the sealant joint width becomes larger than 1" (25 mm), the depth should be held at approximately 3/8" to 1/2" (9 mm to 12 mm). There is no need for greater sealant depth with a silicone sealant. This may mean that the width to depth ratio will be greater than 2:1 (i.e. 3:1).
- Joint widths up to 4" (100 mm) can be accommodated with silicone sealants. Wide joints may require additional care and attention to detail to provide an aesthetically pleasing finish. Wider joints may be better accommodated by DOWSIL™ 123 Silicone Seal. For large joints that will be hidden by cladding such as the perimeter of curtainwall systems, DOWSIL™ Silicone Transition Strip may be an option.
- For further information, see Construction Calculators under the Tools and Resources section of the Dow Construction Website at consumer.dow.com/construction.

Minimum Joint Width = \[
\frac{100}{X} \times (M_t + M_l) + T
\]

X = Sealant movement capacity (%)
M_t = Movement due to thermal expansion
M_l = Movement due to live loading
T = Construction tolerance
For example:

A horizontal joint between an aluminum curtainwall and a concrete panel with a combined thermal movement of 5/16" (8 mm), a live load movement of 1/4" (6 mm), a construction tolerance of 1/4" (6 mm) and 25% movement capacity sealant would be:

\[
\text{Width} = \frac{100}{25} \times (5/16" + 1/4") + 1/4"
\]

\[
\text{Width} = 2-1/2"
\]

\[
\text{Width} = \frac{100}{25} \times (8 + 6) + 6
\]

\[
\text{Width} = 62 \text{ mm}
\]

**Joint Movement in Shear**

When joints move in shear, greater joint movement can be accommodated since actual movement on the sealant is less. The joint width required \((a)\) for joint movement \((b)\), as calculated below, or the allowable movement \((b)\) for a particular joint width dimension \((a)\), can be calculated using the Pythagorean Theorem. The new joint width after movement \((c)\) is limited by the movement capability of the sealant in shear in a weatherseal joint configuration. The calculation is as follows:

**Weatherseal in Shear**

\[
a^2 + b^2 = c^2
\]

where

- \(a\) = original glueline
- \(b\) = joint movement
- \(c\) = new glueline after joint movement

<table>
<thead>
<tr>
<th>Original Joint Width (inches)</th>
<th>Sealant Movement Capability Expansion</th>
<th>Max. Shear Joint Movement (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25</td>
<td>50</td>
<td>0.280</td>
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</table>

<table>
<thead>
<tr>
<th>Original Joint Width (mm)</th>
<th>Sealant Movement Capability Expansion</th>
<th>Max. Shear Joint Movement (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>50</td>
<td>11.18</td>
</tr>
</tbody>
</table>
For Example:

\[ c = a + a \times (\text{movement capability in expansion}) \]
\[ c = 0.25" + 0.25" \times (50\%) \]
\[ c = 0.375" \]

\[ a^2 + b^2 = c^2 \]
\[ (0.25")^2 + b^2 = (0.375")^2 \]
\[ b^2 = 0.078 \text{ in}^2 \]
\[ b = 0.280" \]

\[ c = a + a \times (\text{movement capability in expansion}) \]
\[ c = 10 \text{ mm} + 10 \text{ mm} \times (50\%) \]
\[ c = 15 \text{ mm} \]

\[ a^2 + b^2 = c^2 \]
\[ (10 \text{ mm})^2 + b^2 = (15 \text{ mm})^2 \]
\[ b^2 = 125 \text{ mm}^2 \]
\[ b = 11.18 \text{ mm} \]

**Movement During Cure**

One-part DOWSIL™ sealants cure by reacting with atmospheric moisture. Sealants will initially form a tack free skin within several minutes or hours. Full depth of cure can take several weeks as part of the cure cycle depending on size of joint and environmental conditions with adhesion fully forming towards the end. Joint movement during cure can cause unsightly aesthetics due to joint deformation, e.g., wrinkling. Full adhesive characteristics of the sealant are obtained after the sealant has cured. If the joint sees excessive movement before the sealant has fully cured, premature adhesion loss may occur. Adhesion loss due to movement during cure can be minimized by the use of a primer. Primers can shorten the time to achieve full adhesion. Wrinkling can be minimized by following these suggestions:

- Use open-cell polyurethane backer rod
- Seal when the joint surface is cool and will experience minimum temperature changes, typically in the late afternoon or early evening.
- Place no more than 1/4" (6 mm) 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. This issue is not known to affect the long term performance of the joint and will not void any DOWSIL™ weatherseal warranty.
Backer Materials
A backer rod is the typical backer material for most weatherseal joints. The role of a backer rod is to allow a sealant to be installed and tooled to a proper joint profile. Once the sealant cures, the backer material must not restrict the movement of the sealant or cause 3-sided adhesion. To provide sufficient backpressure during sealant installation, the backer rod should be sized ~25% larger than the joint opening. Sizing differs among backer rod types; refer to the manufacturer’s recommendations. Generally, three common backer rod types can be used with DOWSIL™ sealants:

- Open-cell polyurethane
- Closed-cell polyethylene
- Non-gassing polyolefin

Each backer rod type has demonstrated successful performance with DOWSIL™ sealants.

When selecting a backer rod, consider the following:

- Open-cell polyurethane backer rod allows the sealant to cure through the backer rod, which is beneficial when fast sealant cure is desired. Open-cell polyurethane backer rod can absorb water, which may have a detrimental effect in certain joint types.
- Closed-cell polyethylene backer rod may outgas if punctured during installation, requiring it to be left for 20 minutes before application of the sealant.
- Other back-up materials such as expanding foam tapes or glazing gaskets should be reviewed or tested for compatibility prior to use.
- When a backer rod cannot be positioned in a joint opening, a Teflon or polyethylene tape should be used to prevent three-sided adhesion.

Dow makes the following exceptions when selecting backer rod types:

- For double weatherseal joints, open-cell polyurethane backer rod must be used unless the interior seal is allowed 7 days’ cure before installing the exterior seal.
- Open-cell polyurethane backer rod is recommended for use with DOWSIL™ 790 Silicone Building Sealant against painted or metal surfaces to promote cure from both sides of the joint.
- Because EIFS manufacturers do not permit the use of open-cell polyurethane backer rod with their systems, use either DOWSIL™ 791 Silicone Weatherproofing Sealant or DOWSIL™ 795 Silicone Building Sealant when EIFS is adjacent to non-porous or metal surfaces. Open-cell polyurethane backer rod should not be used adjacent to EIFS.
- In some horizontal joints where water can collect, open-cell polyurethane backer rod should not be used.

Hydrophobic Effects
Silicone sealants cure with moisture in the atmosphere by reacting with a functional silane in the presence of a catalyst and functional silicone polymers. The silane crosslinkers are of the same chemical structure as the materials used to waterproof concrete structures such as parking garages and bridge decks. Silane crosslinkers are used in all silicone sealants and the silicon-modified organic materials (polyethers and acrylics) that are used as sealants in the construction industry.

As a silicone sealant is applied into a joint, there is the potential for the excess crosslinkers (added to ensure adequate shelf life) to migrate into the porous material and crosslink into a hydrophobic resin.
beneath the surface. On occasion, this hydrophobic resin will not allow water to penetrate into the stone adjacent to the joint and may cause a dry area to appear adjacent to the joint in a rainstorm. While this phenomenon does not always occur, when it does, it can be attributed to the inherent nature of the necessary silane crosslinkers. Therefore, it cannot be guaranteed that this phenomenon will never occur with a specific porous substrate.

However, there are steps that can be taken to minimize the potential for this phenomenon to occur.

**Minimizing Hydrophobing**

- When priming, use a resin-based primer, such as DOWSIL™ Construction Primer P, as opposed to a silane primer, such as DOWSIL™ 1200 OS Primer.
- Avoid over-application of any primer, silane or resin, onto the visible surface of the facade.
- Use an open-cell polyurethane backer rod as opposed to a polyethylene or polyolefin backer rod. This will allow a curing of the excess crosslinker to occur along the backside and minimize a catalyst/crosslinker mixture from migrating into the stone.
- Make sure there is no more than 1/4" of sealant applied over the midsection of the backer rod. This will minimize the volume of sealant containing excess crosslinker in the joint.

**EIFS Considerations for Design and Specification**

Exterior Insulation and Finish Systems (EIFS) offer unique challenges due to its composition. DOWSIL™ silicone sealants have a demonstrated history of success when used with EIFS and offer unique benefits over organic sealants when used with EIFS.

Consider the following benefits offered by DOWSIL™ sealants:

- DOWSIL™ one-component silicone sealants require no special mixing, unlike multi-component polyurethane sealants.
- DOWSIL™ sealants have been tested and recommended by most major EIFS manufacturers for use with their systems.
- DOWSIL™ silicone sealants are UV stable and are virtually unaffected by outdoor weathering. Silicone sealants have a life expectancy of greater than 20 years, compared to 5 to 10 years of life expectancy for many organic polyurethane sealants.
- DOWSIL™ 790 Silicone Building Sealant, the preferred sealant for EIFS expansion joints, has unparalleled ultra-low modulus properties, movement capability of +100/-50% and a proven 20+ year performance on buildings.
- An inorganic silicone sealant maintains its low modulus when cold, whereas an organic polyurethane sealant can get 2 to 3 times stiffer in cold temperatures. Low modulus silicone sealants put less stress on softer EIFS coatings when a joint opens up during cold temperatures.

DOWSIL™ sealants are tested and approved for use by the major EIFS manufacturers. Refer to the Building Sealant Recommendation and Surface Preparation Guide, Form No. 63-1184, for current recommendations.

Refer to EIFS Application Procedures on page 73.

For EIFS restoration, please refer to the EIFS Restoration Guide, Form No. 62-510.
Weatherseal Design Examples
Examples of a variety of weatherseal joints follow with a review of joint type for key points and concerns.

Conventional Moving Weatherseal

**Good Joint Design**

1. Dimension A must be at least 1/4" (6 mm).
2. Dimension B must be at least 1/8" (3 mm).
3. Dimension C must be at least 1/4" (6 mm).
4. Ratio of A:B should be 2:1 minimum.
5. Joint surface tooled.
6. Dimension B suggested Maximum = 1/2" (12.7 mm).
7. Dimension A Maximum = 4" (100 mm). Joints wider than 2" (50 mm) may slump slightly; therefore, double application techniques of the sealant may be required.

**Poor Joint Design – Concerns:**

1. A deep sealant joint will not have the same movement capability as a properly designed joint.
2. Slow cure due to excessive sealant depth.
Moving Corner Joints

Good Joint Design

1. Dimension A and B must be at least 1/4" (6 mm).
2. A bond breaker tape or backer rod must be present if joint movement is anticipated.
3. Joint must be tooled flat or slightly concave.
4. Dimension C must be at least 1/4" (6 mm).

Poor Joint Design – Concerns:

1. Dimension A or B less than 1/4" (6 mm).
2. Joint not properly tooled.
3. No bond breaker material; therefore, the joint will not accept movement.
Remedial Joints

Good Joint Design – Key Points:

1. Dimension A must be at least 1/4" (6 mm).
2. Dimension B must be at least 1/8" (3 mm).
3. Bond breaker tape must be used to isolate fresh sealant from failed organic weatherseal and to allow joint movement.
4. If existing sealant has not lost adhesion to the substrate, disengage it before applying silicone sealant.

Poor Joint Design – Concerns:

1. Dimension A less than 1/4" (6 mm) increases difficulty in obtaining adhesion and increases the likelihood for voids.
2. Dimension B less than 1/8" (3 mm) increases the likelihood of pinholes or voids in tooling; poor cohesive integrity.
3. No bond breaker material; therefore, the joint will not accept movement.
Splice Joints

Good Joint Design                      Good Joint Design                      Poor Joint Design

Key Points:

1. Joint is very difficult to clean.
2. Bond breaker hard to position/size correctly.
3. Movement during cure can cause joint failure.
Cap Bead Glazing Joints

Good Joint Design

1. Adhesion contact on glass and metal is at least 1/4" (6 mm).
2. Silicone is compatible with gasket.
3. Dark-colored sealant masks possible discoloration from the gasket.

Poor Joint Design – Concerns:

1. Inadequate contact between sealant and external metal.
2. Gray sealant is prone to discoloration.
Dual-Seal Moving Weatherseal

Good Joint Design

1. Both weatherseals comply with the requirements for conventional moving weatherseals (addressed previously).
2. Open-cell backer rod is used to ensure full cure of the back weatherseal.
3. If closed-cell backer rod is used, the back weatherseal must be fully cured prior to the installation of the exterior seal.
4. Dimension A is at least 3/4" wide to assist application of the rear sealant joint.

Poor Joint Design – Concerns:

1. If both joints are sealed at or near the same time, the closed-cell backer rod will prevent moisture from reaching the rear sealant joint, and the sealant will not cure.
2. Dimension A is less than 3/4", making application of rear joint difficult.
3. Exterior joint seal to aesthetic snap-on cap.
Window Perimeter Joints: Insufficient Aluminum Extrusion

Good Joint Design

1. Dimensions A and B are each 1/4" (6 mm) or larger.

Poor Joint Design – Concerns:

1. Attempting to apply sealant onto the edge (or behind) thin gauge metal results in inadequate sealant/substrate contact and water leakage.
Weatherproofing Joints: Surface Preparation and Sealant Application

Introduction
This application procedure outlines general requirements for installing DOWSIL™ Silicone Building Sealants. By following these procedures closely, you will help ensure good sealant performance. To be eligible to receive a Dow warranty, these procedures must be followed. Since DOWSIL™ 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 the Quality Assurance section on page 75).

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 is applied as required.
4. Seal – Sealant is applied into the joint cavity.
5. Tool – Dry tooling techniques are used to create a flush joint and to 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 Procedure
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.

Organic Solvent Usage
Not every solvent effectively removes every contaminant, and certain solvents can damage some substrates. Please follow the solvent manufacturer’s safe handling recommendations and local, state and national regulations regarding solvent usage.

Non-Porous Substrates and Solvent Choice
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% 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. White spirit will need to be a minimum of 98% pure to prevent leaving an oily film on the substrate surface. MEK and toluene are also acceptable solvents. We do not recommend using denatured alcohol as a cleaning solvent.
**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. When choosing an abrasion cleaning method, it is important to choose one that will not leave a residue on the substrate. For example, some metal wire brushes can leave a varnish on precast panels. Remaining dust and loose particles should be removed by dusting the surface with a stiff brush, vacuuming, or blowing the joints with water- and 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’s recommendations for removal of existing sealants, substrate cleaning, joint preparation and installation of DOWSIL™ 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.

**“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.

1. Thoroughly clean all surfaces of loose debris.
2. 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.
3. Wipe vigorously to remove contaminants. Check the cloth to see if it has picked up contaminants. Rotate the cloth to a clean area and re-wipe until no additional dirt is picked up.
4. 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 porous surfaces will allow a small amount of residual organic solvent to remain in the top surface layer. If this is the case, the surface must be allowed to dry before installing primer (if needed), backer rod and sealant.
Cleaning Procedures for Flashing Substrates

Peel-and-stick and spunbonded polyolefin substrates are unique surfaces to adhere to, but they must be clean in order to achieve sealant adhesion. However, adhesion to these substrates may be negatively affected if they are “overcleaned,” burnished or polished. Dow thereby recommends a light two-rag wipe method using isopropanol alcohol (IPA) for cleaning these surfaces. Utilize clean, soft, absorbent, lint-free cloths for the cleaning. The “two-cloth” cleaning method consists of a solvent wipe followed by a dry cloth wipe.

1. If there is significant dirt or debris visible on the membrane surface, lightly brush this off using a soft brush.
2. 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.
3. Lightly wipe the membrane surface to remove contaminants. Check the cloth to see if it has picked up contaminants. Rotate the cloth to a clean area and re-wipe until no additional dirt is picked up.
4. Immediately wipe the cleaned area with a separate clean, dry cloth.

The IPA must be removed with the dry cloth before the solvent evaporates, or the cleaning will be less effective. If any solvent remains on the substrate after the dry cloth wipe, allow the IPA to completely “flash” or dry prior to applying primer or sealant. Drying time depends on environmental conditions, but on a membrane substrate, allowing 5–10 minutes for the IPA to flash off is typically sufficient.

Winter/Summer Solvent Considerations

IPA and MEK are water soluble and may be more appropriate for winter cleaning, as they help in removing condensation and frost. Xylene and toluene are not water soluble and may be better suited for warm-weather cleaning.

Cure Inhibition

DOWSIL™ 790 Silicone Building Sealant and DOWSIL™ Contractors Concrete Sealant are sensitive to alcohols. Therefore, when cleaning, Dow recommends using a non-alcohol based solvent and allowing the solvent to fully dry/flash prior to sealant installation. Primers must also be fully dry prior to sealant installation. Further, do not use alcohols or solvents as tooling aids with these sealants, as cure inhibition will result. Any application or contact of DOWSIL™ 790 Silicone Building Sealant and DOWSIL™ Contractors Concrete Sealant with alcohol, solvents or other uncured sealants may result in cure inhibition.

For more information on this topic, see Appendix A.

Primer Application Procedure

DOWSIL™ primers 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; 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: Over-priming 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. DO NOT APPLY PRIMER OVER BACKER ROD.

7. 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 sealant.

**Primer Storage**

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

**Sealant Application Procedure**

It is critical that the sealant fills the entire joint or cavity and firmly contacts 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 (40°F). To assist in the drying of a frost-containing joint, a water-soluble solvent such as IPA should be used.

Sealant should be applied as follows:

1. To ensure an aesthetically pleasing job, masking tape should be used to keep excess sealant from contacting adjacent areas where it is not intended.
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.
3. 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. **NOTE:** 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.
4. Remove the masking tape before the sealant skins over (within about 15 minutes of tooling).
EIFS Application Procedures

1. Allow the EIFS coating to dry a minimum of 24 hours prior to application of the DOWSIL™ sealant. The sealant joint should be applied to the base coat of the EIFS system. Do not apply sealant to EIFS finish coat unless approved by the EIFS manufacturer. Drying time may be greater, depending on temperature and humidity. Consult the EIFS manufacturer for recommended drying time.

2. The joints must be clean and dry prior to installation of the DOWSIL™ sealant. If sealant is to be applied immediately following the drying time of the EIFS coating, simply brush or wipe the joint surfaces to ensure that there is no dust or debris in the joint. If the fully dried coating is exposed for greater than one day, joint surfaces must either be wire brushed or blown with oil-free compressed air or cleaned with a suitable solvent such as Isopropyl Alcohol (IPA) using the “two cloth” cleaning method. Consult the EIFS manufacturer to determine if a specific solvent is compatible with its system. Allow sufficient time for the solvent to evaporate prior to priming or installing sealant.

3. Lightly apply DOWSIL™ 1200 OS Primer or other recommended primer with a soft bristle brush to the inside of the joint. One brush wipe of the substrate should be sufficient. Allow the primer to dry a minimum of one hour prior to backer rod installation.

4. Install either closed-cell polyethylene or non-gassing polyolefin backer rod with EIFS. Open-cell polyurethane backer rod should not be used adjacent to EIFS surfaces.

Removal and Replacement of Existing Weatherseals

Introduction
In some cases when an existing building is to be repaired or resealed, the existing weatherseal must be removed before a new weatherseal can be installed. When a failed organic sealant is to be cut out and replaced, the old sealant must be completely removed as described in the following paragraphs. When a silicone weatherseal is to be replaced with a new silicone sealant, complete removal of the existing functional joint may not be necessary. Follow the directions for removal and replacement of cured silicone sealant.

Repairing Failed Organic Sealant with DOWSIL™ Silicone Building Sealant (Remedial Applications)
As buildings age, weatherseals must be repaired or removed and replaced. The replacement may be necessary due to the aging and deterioration of an organic weatherseal. If a sealant has failed, it is good practice to understand why it failed and replace it with a sealant offering higher-performance properties.
Please note that Dow’s recommendations for removal of existing sealants, substrate cleaning, joint preparation and installation of DOWSIL™ 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 hazardous substances, contact a knowledgeable authority on appropriate removal, handling and disposal procedures.

Before starting a project to replace or repair failed organic sealant, it is recommended to complete a mock-up demonstrating the procedures for removing the existing sealant and cleaning the substrates. In addition, adhesion testing should be completed to determine whether or not a primer is required.

Follow this procedure to repair failed organic sealant with DOWSIL™ Silicone Building Sealant in remedial applications:

1. Cut away the old sealant as close to the joint edges as possible.
2. Clean all joints of contaminants and impurities to the depth at which the new DOWSIL™ Silicone Building Sealant and backer rod are to be installed. This may be accomplished by several methods: abrading with a wire brush (power or hand), grinding, saw cutting or solvent cleaning.
3. Blow out dust, loose particles and other debris with moisture-free and oil-free compressed air; 6.0-kg/cm² air pressure recommended; no moisture or oil allowed in air. (Occasionally, a second pass with a wire brush and air blast is needed to ensure the joint is clean.) Loose pieces of caulk or backer rod that have become lodged in the joint should also be removed.
4. After cleaning, the joints must be thoroughly dry, dust-free and frost-free before resealing.
5. Mask joint edges if possible to facilitate application and clean-up.
6. If priming is recommended, follow directions for applying the desired DOWSIL™ primer to the cleaned surfaces before installing the DOWSIL™ Silicone Building Sealant.
7. Install back-up material in joints to proper design depth.
8. Apply the appropriate DOWSIL™ Silicone Building Sealant in a continuous operation to properly fill and seal the joint width.
9. Using a blunt instrument, dry tool the joint so it is slightly concave. Tooling should be done as soon as possible after sealant application. Remove masking as necessary.
10. Seal a test joint and check adhesion after curing 7 to 21 days.

**Removal and Replacement of Cured Silicone Sealant**
A properly designed and installed silicone joint will typically last 20 years without need of replacement. In instances where the joint has experienced damage – mechanical or otherwise – and replacement is required, follow the procedures below.

Assess problem with the joint.

1. If sealant is cured properly and performing in its application but its appearance is poor (e.g., due to improper tooling), then cleaning the sealant surface with a solvent and recapping the joint should be sufficient.
   a. Clean sealant with a solvent (e.g., xylene, toluene) to remove dirt. Allow solvent to evaporate.
   b. Remask the joint.
   c. Apply a thin bead of fresh sealant over the cured sealant.
d. Dry tool the sealant.
e. Remove the masking material.

2. If the sealant is mechanically damaged and a recapping will not improve the joint appearance, then remove the section of old sealant and replace.
a. Cut away the old sealant. If excellent adhesion to the substrate is still maintained, then leave some sealant at the edges of the joint (up to 0.08”/2 mm thick).
b. If adhesion to the substrate is poor, then remove sealant down to the substrate and clean the substrate and recondition if necessary (i.e., clean with xylene and prime with appropriate primer).
c. Mask the joint.
d. Reapply the sealant. (If resealing does not occur on the same day, the joint will have to be recleaned using a solvent such as xylene or toluene before applying the fresh sealant.)
e. Dry tool the joint.
f. Remove the masking material.
g. Check adhesion after sealant has cured for 7–21 days.

Sealing to Air Barrier Organic Membranes
Polyethylene-backed bitumen-based membranes are occasionally used as air barriers within exterior walls. Sealant materials are expected to adhere to the polyethylene backing to provide a watertight barrier at window and door openings along with various transition points within the wall. Polyethylene is known in the sealant industry as a bondbreaker because it is a low surface energy material that makes achieving adequate adhesion a challenge and thus the reliability of long-term bond of the sealant unpredictable. The best option that can be offered is the use of DOWSIL™ 758 Silicone Weather Barrier Sealant. With project-specific testing, other sealants may be suitable for the application.

Many flashings and fluid-applied membranes will discolor light sealants. Dow is available to test compatibility of flashing and sealant upon request. For any asphaltic or bitumen-based flashing material, Dow recommends a dark-colored sealant be used or the sealant be installed in a final nonvisible location. Typically, sealant performance is not affected by the discoloration on the sealant.

Resealing Corten Steel
DOWSIL™ weathersealants have been known to have limited weathersealing life when applied to Corten steel panels, due to continued corrosion of the steel at the bond line. This disintegration of the underlying substrate is excluded by the limited weatherseal warranty and has caused some hard feelings with contractors and consultants involved in repairing Corten steel-clad buildings.

High-performance coatings that act as corrosion inhibitors and primers may be used in these applications. Dow recommends that coating manufacturers be contacted for recommendations. Dow can complete adhesion testing on cured samples of specified coatings. DOWSIL™ 791 Silicone Weatherproofing Sealant or DOWSIL™ 795 Silicone Building Sealant have been successfully used in these applications.
Sealant Interaction Considerations

Dow Silicone Sealants are specifically formulated to provide durable performance in weatherproofing applications. Based on the highly developed reactive chemistries of our sealants, used in a vastly diverse selection of substrates and potential variability in practices in the construction environment, Dow has found unique situations that should be avoided to prevent interactions of our sealants during the cure cycle. The following are important considerations specific to these unique instances.

**DOWSIL™ 756 SMS Building Sealant**
DOWSIL™ 756 SMS Building Sealant is a unique chemistry of 100% silicone sealant allowing for reduced dirt pickup and a non-staining characteristic. DOWSIL™ 756 SMS Building Sealant still requires stain testing to be completed and is not recommended for use with high iron content substrates.

DOWSIL™ 756 SMS Building Sealant may also display an aesthetic discoloration when NOT exposed to sunlight or when cured in confinement. This discoloration generally dissipates upon exposure to sunlight.

**DOWSIL™ 758 Silicone Weather Barrier Sealant**
DOWSIL™ 758 Silicone Weather Barrier Sealant is generally intended for use against polymeric flashing materials, which should be cleaned according the procedures on page 69. Generally, DOWSIL™ 758 Silicone Weather Barrier Sealant does not require use of a primer. Should a primer be found to be necessary or to enhance adhesion, please follow the primer procedures on page 71.

**DOWSIL™ 790 Silicone Building Sealant**
DOWSIL™ 790 Silicone Building Sealant and DOWSIL™ Contractors Concrete Sealant are sensitive to alcohols. Therefore, when cleaning, Dow recommends using a non-alcohol based solvent and allowing the solvent to fully dry/flash prior to sealant installation. Primers must also be fully dry prior to sealant installation. Further, do not use alcohols or solvents as tooling aids with these sealants, as cure inhibition will result. Any application or contact of DOWSIL™ 790 Silicone Building Sealant and DOWSIL™ Contractors Concrete Sealant with alcohol, solvents or other uncured sealants may result in cure inhibition.

For more information on this topic, see Appendix A.

Quality Assurance – General

**Product Quality**
Dow 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 variation (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 0.04" (1 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 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 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. A sample form is found at the end of this section.
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. It is suggested that 5 tests for the first 1000' (300 meters) and 1 test per 1000' (300 meters) thereafter be submitted or 1 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 2 vertical cuts (from the horizontal cut) approximately 3" (75 mm) long, at both sides of the joint.
3. Place a 1" (25 mm) mark on the sealant tab as shown in the illustration.
4. Grasp a 2" (50 mm) piece of sealant firmly just beyond the 1" (25 mm) mark and pull at a 90° 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. Pass/fail criteria for each sealant are shown in the following table. If the sealant does not pass according to the guidelines provided, consult your local Dow Project Manager or Distributor Representative.
6. 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). Your Dow Project Manager can assist in determining when corrective action is required.
7. Record the test results in a field adhesion test log. An example is provided later in this section. This log will need to be retained as a part of Dow’s warranty procedure. Some building officials may also require it.

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.)

NOTE for DOWSIL™ 758 Silicone Weather Barrier Sealant: When field adhesion testing with DOWSIL™ 758 Silicone Weather Barrier Sealant, please be aware of the unique behavior of this sealant. No sealant should be pulled on at high speed, but in particular, DOWSIL™ 758 Silicone Weather Barrier Sealant should be pulled slowly at 90 degrees in order to avoid a false negative result.
# Field Adhesion Hand Pull Test Criteria

<table>
<thead>
<tr>
<th>DOWSIL™ Building Sealant</th>
<th>Adhesion Requirements</th>
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</thead>
<tbody>
<tr>
<td>DOWSIL™ 790 Silicone Building Sealant</td>
<td>Pull tab 3” or 75 mm (300% extension) without bond loss</td>
</tr>
<tr>
<td>DOWSIL™ 791 Silicone Weatherproofing Sealant</td>
<td>Pull tab 1½” or 38 mm (150% extension) without bond loss</td>
</tr>
<tr>
<td>DOWSIL™ 795 Silicone Building Sealant</td>
<td>Cohesive failure: no adhesion loss</td>
</tr>
<tr>
<td>DOWSIL™ 995 Silicone Structural Sealant</td>
<td>Cohesive failure: no adhesion loss</td>
</tr>
<tr>
<td>DOWSIL™ 123 Silicone Seal</td>
<td>Cohesive failure of adhesive sealant: no adhesion loss</td>
</tr>
<tr>
<td>DOWSIL™ 121 Structural Glazing Sealant</td>
<td>Cohesive failure: no adhesion loss</td>
</tr>
<tr>
<td>DOWSIL™ 756 SMS Building Sealant</td>
<td>Pull tab 1½” or 38 mm (150% extension) without bond loss</td>
</tr>
<tr>
<td>DOWSIL™ 758 Silicone Weather Barrier Sealant</td>
<td>Pull tab 2” or 50 mm (200% extension) without bond loss. <strong>NOTE:</strong> The pull should be completed slowly.</td>
</tr>
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</table>

**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.
Peel-in-Adhesion Test Procedure
Another simple screening test can be done on a flat test surface. A test piece like that shown 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 7.8" (200 mm) long, 1" (25 mm) wide and 1/8" (3 mm) thick. At least 2" (50 mm) of the sealant should be applied over the polyethylene sheet or bond breaker tape.
4. After cure of the sealant, pull the sealant perpendicular to the substrate until failure. Record the mode of failure and elongation of the test sealant.

Adhesive Failure
Cohesive Failure

Documentation – Quality Assurance and Warranty
Suggested logs referred to in this section are provided on the following pages. In the event of a warranty claim or inspection, these must be available from the contractor, subcontractor or owner for review by Dow and/or the local building official.

Therefore, it is suggested that these quality assurance logs be kept together with the project files. A hardcover logbook may be preferential to copies of the logs suggested here. A quality assurance engineer should be responsible for documenting this data on a job-to-job basis. All curtainwall units must be numbered so the sealant installation dates, sealant lot numbers and quality assurance testing can be obtained from the project log.

Dow will be happy to assist you during the implementation of this quality control program. If you have any questions, contact your local Dow Field Specialist or authorized building sealant distributor.
Warranty – Weatherproofing Applications
All warranties are dependent on the successful completion of Dow requirements. These requirements include, but are not limited to:

1. The sealant product(s) are applied within stated shelf life;
2. The sealant product(s) are applied in strict compliance with Dow’s published or electronic application procedures and, where applicable, any project-specific written recommendations from Dow;
3. The sealant product(s) are used with compatible materials and substrates (testing/evaluation is required to obtain warranty if the surface is not recommended in our Surface Preparation Guide [page 7], which is available in published or electronic form);
4. Field adhesion tests are made, documented, retained and submitted to Dow upon written request, as outlined in our Field Adhesion Test Procedure, in order to confirm adhesion under site conditions.

At time of shipment, the DOWSIL™ sealant product(s) are warranted that the sealant product(s) will meet the Dow sales specification. For further details on requirements and limitations of this limited warranty, consult the DOWSIL™ product data sheet for the sealant product(s) in use.

Dow also offers project-specific performance warranties for sealant products used in weatherproofing applications. These project-specific performance warranties carry various warranty terms (up to 20 years) and remedies. Specific requirements must be met to qualify for a performance warranty. Dow does not offer project-specific warranties on projects where wood is a primary substrate.

For details on how to obtain the applicable project-specific performance warranty, please consult your local Dow Field Specialist or authorized building sealant distributor.

Quality assurance requirements for a performance (weatherproofing) warranty include, but are not limited to:

1. Confirmation of adhesion is required for each substrate that contacts the approved DOWSIL™ weatherproofing sealant. Reference the Surface Preparation Guide within this manual (page 7).
2. Field Testing documentation log book(s) show that a sufficient amount of testing was done. The minimum testing is per ASTM C1521-02, section 7.3.3, which states, “For each area to be inspected, perform procedure every 100 linear ft in the first 1,000 linear ft of joint. If no test failure is observed in the first 1,000 ft of joint, perform procedure every 1,000 linear ft thereafter or approximately once per floor per elevation.” The contractor should determine other job-specific needs. The contractor should complete and fill out the log to demonstrate that acceptable adhesion and joint design were obtained in actual use. This is in addition to the adhesion documentation noted in #1.
3. The contractor documents and retains all required quality assurance documentation and, upon completion of the project, provides a copy to the owner. This documentation must be retained for this warranty to be valid and will be required should any claims arise in the future. The owner must retain the quality assurance documentation along with the Dow-issued warranty.

Dow does not warrant aesthetics.
Field/Shop Adhesion Testing Log

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<th>Applied by (Initials)</th>
<th>Test Date</th>
<th>Test Location (Elevation, Unit Number, etc.)</th>
<th>Primed (Y/N) Primer Lot #</th>
<th>Sealant Color and Lot #</th>
<th>Acceptable Joint Fill (Y/N)</th>
<th>Acceptable Adhesion (Y/N) and % Elongation</th>
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Product Quality Control Log – One-Part Silicone Sealants

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<th>Project:</th>
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<th>Time</th>
<th>Tester Initials</th>
<th>Sealant Lot Number/Color</th>
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<th>Cured After 24 Hours (Y/N)</th>
<th>Elastomeric (Y/N)</th>
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# Product Quality Control Log – Two-Part Silicone Sealants

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Appendix A: Cure Inhibition of DOWSIL™ 790 Silicone Building Sealant

This appendix covers the subject of the potential for DOWSIL™ 790 Silicone Building Sealant to be cure inhibited. More than any other DOWSIL™ sealant, cure inhibition can be a real cause for concern with DOWSIL™ 790 Silicone Building Sealant. We’ll talk about why, but first let’s take a few moments to talk about this unique sealant.

DOWSIL™ 790 Silicone Building Sealant
DOWSIL™ 790 Silicone Building Sealant has a unique chemistry that allows it to have unparalleled primerless adhesion to porous substrates. It is also a low modulus, high movement capability (+100/-50%) sealant.

DOWSIL™ 790 Silicone Building Sealant’s unique chemistry also causes this sealant to cure slower than some other sealants, and this contributes to why we strongly suggest using an open-cell backer rod with this product when being installed against non-porous substrates. With the exception of EIFS, open-cell backer rod is preferable for DOWSIL™ 790 Silicone Building Sealant use on porous substrates as well.

Cure Inhibition
It is also this unique chemistry that makes DOWSIL™ 790 Silicone Building Sealant especially susceptible to cure inhibition. A partial list of inhibiting items includes:

- Any alcohol – isopropyl alcohol (IPA), ethyl alcohol, butyl alcohol, etc. Alcohols may be used for cleaning but should be allowed to fully flash or dry prior to sealant installation. Use of alcohols as a cleaner on porous substrates is typically not recommended because it can be difficult to judge when the alcohol is fully flashed or dry.
- Many other solvents – acetone, methyl ethyl ketone (MEK), methyl isobutyl ketone (MIBK), etc.
- Solvent-containing materials – incompletely cured primers, incompletely dried paints, etc.
- Some kinds of release agents – solvent-containing products, materials containing glycols of any kind, etc.
- Many types of substrates – some Synergy EIFS products, some EPOXY substrates (any EPOXY material should be tested), any porous substrate cleaned with a solvent that has not had sufficient “flash-off” time, etc.

Conditions that should be avoided when working with DOWSIL™ 790 Silicone Building Sealant:

- DO NOT “wet tool” with solvents or soaps, as this can inhibit the surface of this sealant. The rest of the sealant bulk may cure normally, but the surface will remain tacky and gummy indefinitely.
- DO NOT apply this sealant to a backer rod that is contaminated with solvent or primer.
- DO NOT apply this sealant to a surface that has been cleaned with a solvent that has not been allowed to completely dry.
- DO NOT apply this sealant to EPOXY-containing surfaces (unless they have been tested by the Dow Americas Construction Test Lab), since they can inhibit the cure.
• **DO NOT** apply this sealant wet to wet with any of the other Dow branded sealants as they can inhibit the cure. Care should be taken to ensure a minimum of 3-5 days of curing of the sealant installed first prior to installing the second sealant.
Appendix B: Use of DOWSIL™ Sealants with Weathered Lock-Strip Gasket Systems

Lock-Strip Wet Seal Joint

Good Joint Design

Poor Joint Design

Good Joint Design – Key Points:

1. Both dimensions A and B are 1/4" or greater.
2. DOWSIL™ 791 Silicone Weatherproofing Sealant or DOWSIL™ 795 Silicone Building Sealant (dark color) is used with DOWSIL™ 1200 OS Primer on glass and lock-strip gasket.

Poor Joint Design – Concerns:

1. Insufficient sealant to accommodate movement.

Dow has evaluated sealants for use as a perimeter weatherseal for weathered and leaking lock-strip or zipper gasket systems. For our evaluation, various weathered gaskets aged 10 years and older were collected. DOWSIL™ sealants were tested for adhesion in simulated fillet bead wet seal joints for several thousand hours of UV exposure and accelerated QUV weatherometer exposure. After this exposure, both DOWSIL™ 791 Silicone Weatherproofing Sealant and DOWSIL™ 795 Silicone Building Sealant have demonstrated excellent adhesion characteristics to the weathered gasket and glass.

As a result of this evaluation, Dow recommends the following steps to properly repair and seal leaking lock-strip or zipper gaskets systems using our silicone sealants:

- Use either DOWSIL™ 791 Silicone Weatherproofing Sealant or DOWSIL™ 795 Silicone Building Sealant. To minimize sealant discoloration from the gasket, use a dark-colored sealant.
- Solvent clean the glass and metal using the two-cloth wipe method described on page 70.
- Prime both the glass and gasket surface to receive sealant with DOWSIL™ 1200 OS Primer.
- Perform a field adhesion test prior to job start-up and/or after application to verify proper sealant adhesion in job-site conditions.
- Install the sealant in a fillet bead with a minimum of 1/4" contact on both the glass and lock-strip gasket.
Appendix C: Winter/Summer Considerations

Silicone sealants can be applied in subfreezing temperatures, provided the substrate is frost- and moisture-free. Although cure will be slower in colder temperatures, adhesion will be acceptable. DOWSIL™ 795 Silicone Building Sealant, DOWSIL™ 995 Silicone Structural Sealant, DOWSIL™ 756 SMS Building Sealant, DOWSIL™ 791 Silicone Weatherproofing Sealant, DOWSIL™ 790 Silicone Building Sealant and DOWSIL™ 758 Silicone Weather Barrier Sealant have wider installation temperature ranges and are more suitable for use in cold temperatures than organic sealant technologies. All of these DOWSIL™ sealants can be applied to substrates within a temperature range of -29 to 49°C (-20 to 120°F). If lower or higher application temperatures are needed, please contact Dow to discuss appropriate sealants. IPA and MEK are soluble in water and may be more appropriate for winter cleaning because they help in removing condensation and frost. Xylene and toluene are not soluble in water and may be better suited for warm-weather cleaning. All surfaces must be free of moisture, condensation, morning dew and frost conditions prior to installation. (USE CAUTION WITH ALCOHOL-TYPE CLEANERS WITH DOWSIL™ 790 Silicone Building Sealant.)

At colder temperatures (below 4°C/40°F), substrates should be inspected for frost, which must be removed. Daily inspections are strongly recommended to review these cold-weather conditions and correct with proper cleaning. Maintain a log, reviewing and recording low-temperature start-up conditions. Please allow longer curing time prior to performing field adhesion testing. Contact your Dow Application Sales Engineer for assistance.

At warmer temperatures (above 32°C/90°F), the solvent may flash prematurely and result in poor cleaning. Xylene and toluene are slower-drying solvents and may be preferred for cleaning warmer substrates.

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1DOWSIL™ 995 Silicone Structural Sealant can be applied at temperatures up to 140°F. Refer to the product data sheet for more information.
Learn More

Please visit consumer.dow.com/construction for additional information.

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