Dow Corning Americas

Technical Manual

DOW CORNING

Dow Corning Americas Technical Manual
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Dow Corning 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 DOW CORNING® brand 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.

SITE ADHESION TESTING MUST BE VERIFIED ACCORDING TO THE CRITERIA ON PAGE 72 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 phone, e-mail, "contact us" forms, fax, and Live Help.

Telephone 1-800-248-2481 (press #1 on menu) or email:

product.inquiry@dowcorning.com

Product Offering

Structural Glazing Sealants

Dow Corning has a full line of high performance silicone structural sealants. Following is a brief summary of each Dow Corning 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 www.dowcorning.com.

DOW CORNING® 983 Silicone Glazing and Curtainwall Adhesive/Sealant

Description

DOW CORNING® 983 Silicone Glazing and Curtainwall Adhesive/Sealant is a two-component, fast cure, neutral-curing silicone sealant intended for structural bonding of glass, metal and other building components. DOW CORNING 983 Silicone Glazing and Curtainwall Adhesive/Sealant cures to a high modulus adhesive sealant with excellent adhesion to a wide range of substrates. Available in black and gray.

DOW CORNING® 995 Silicone Structural Sealant

Description

DOW CORNING® 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.

DOW CORNING® 795 Silicone Building Sealant

Description

DOW CORNING® 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.

DOW CORNING® 993 Silicone Glazing Sealant

Description

DOW CORNING® 993 Silicone Glazing Sealant is a two-component, fast cure, neutral-curing silicone sealant intended for structural bonding of glass, metal and other building components and can be used as a ±25% weather seal. DOW CORNING 993 Silicone Glazing Sealant cures to a high modulus adhesive sealant with excellent adhesion to a wide range of substrates. Available in black and gray.

Weatherproofing Sealants

Dow Corning has a full line of high performance weatherproofing sealants. Following is a brief summary of each Dow Corning 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 www.dowcorning.com.

DOW CORNING® 795 Silicone Building Sealant

Description

DOW CORNING® 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.

DOW CORNING® 791 Silicone Weatherproofing Sealant

Description

DOW CORNING® 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.

DOW CORNING® 790 Silicone Building Sealant

Description

DOW CORNING® 790 Silicone Building Sealant is a one-part, low modulus, neutral-curing silicone sealant for use in high-movement weathersealing applications. DOW CORNING 790 Silicone Building Sealant has excellent primerless adhesion to concrete and most porous substrates. Available in a wide variety of colors.

DOW CORNING® Contractors Weatherproofing Sealant

Description

DOW CORNING® Contractors Weatherproofing Sealant is a one-part, medium modulus, neutral-curing silicone sealant for use in non-specified general weathersealing applications. Available in 20 colors.

DOW CORNING® Contractors Concrete Sealant

Description

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

DOW CORNING® 123 Silicone Seal and 123 HC

Description

DOW CORNING®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. DOW CORNING® 123 HC is a custom extrusion or mold made of higher durometer silicone rubber used in custom applications.

DOW CORNING 795 Silicone Building Sealant, DOW CORNING 791 Silicone Weatherproofing Sealant or DOW CORNING 995 Silicone Structural Sealant is used as an adhesive. Widths from 1" (25 mm) to 12" (300 mm) and custom shapes are available in a wide variety of colors.

For more information, see the EIFS Restoration Guide reference 62-510.

DOW CORNING® Parking Structure Sealants

Description

DOW CORNING® Parking Structure Sealants NS, SL and FC are low modulus, neutral-curing silicone sealants for use in vertical and horizontal joints in parking structures and stadiums. NS is a one-part, non-sag sealant for vertical or horizontal joints. SL is a one-part, self-leveling sealant for horizontal joints. FC 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 reference 62-481.

High Performance Weatherproofing Sealants

DOW CORNING® 756 SMS Building Sealant

Description

DOW CORNING® 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.

Primers

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

DOW CORNING® 1200 Prime Coat

Description

DOW CORNING® 1200 Prime Coat is a one-part, solvent-based, silane primer for use with DOW CORNING sealants in many applications. Available in clear and red.

DOW CORNING® 1205 Prime Coat

Description

DOW CORNING® 1205 Prime Coat is a one-part, solvent-based, film-forming primer for use with DOW CORNING sealant on plastics and other substrates.

DOW CORNING® Primer C

Description

DOW CORNING® Primer C is a one-part, film-forming primer for use with DOW CORNING sealants on painted and plastic surfaces to promote fast adhesion.

DOW CORNING® Construction Primer P

Description

DOW CORNING® Construction Primer P is a one-part, film-forming primer for use with DOW CORNING sealants on porous and cementitious surfaces to promote adhesion. DOW CORNING Construction Primer P should not be used with DOW CORNING 790 Silicone Building Sealant, DOW CORNING Contractors Concrete Sealant or DOW CORNING Parking Structure Sealants.

DOW CORNING® P5200 Adhesion Promoter

Description

DOW CORNING® P5200 Adhesion Promoter is a one-part, VOC-compliant, silane primer for use with DOW CORNING sealants in many applications. Available in clear and red.

VOC (Volatile Organic Compounds) information on above products can be found on their respective datasheets and is based on South Coast Air Quality Management District of California. For a VOC data sheet for a specific sealant color, please send your request to product.inquiry@dowcorning.com.

Surface Preparation Guide for Non-Structural Applications

(ALL STRUCTURAL APPLICATIONS MUST BE TESTED BY DOW CORNING TEST LAB.)

	***Dow Corning*® brand Sealant**					
	756 SMS Building Sealant	**790 Silicone Building Sealant[1]**	**791 Silicone Weatherproofing Sealant**	**795 Silicone Building Sealant**	**983 Silicone Glazing and Curtainwall Adhesive/Sealant**	**995 Silicone Structural Sealant**
Substrate	Surface Prep					
Concrete & Masonry						
Brick	Abrade/Dust	Abrade/Dust	Abrade/Dust/PP	Abrade/Dust/PP	NA	NA
Concrete Block	Abrade/Dust/PP	Abrade/Dust	Abrade/Dust/PP	Abrade/Dust/PP	NA	NA
Poured Concrete	Abrade/Dust/PP	Abrade/Dust	Abrade/Dust/PP	Abrade/Dust/PP	NA	NA
Precast Concrete	Abrade/Dust/PP	Abrade/Dust	Abrade/Dust/PP	Abrade/Dust/PP	NA	NA
Tilt-Up Concrete	Abrade/Dust/PP	Abrade/Dust	Abrade/Dust/PP	Abrade/Dust/PP	NA	NA
Mortar	No Data/Field Test	Abrade/Dust	Abrade/Dust/PP	Abrade/Dust/PP	NA	NA
Grout	No Data/Field Test	Abrade/Dust	Abrade/Dust/PP	Abrade/Dust/PP	NA	NA
Plaster	No Data/Field Test	Abrade/Dust	Abrade/Dust/PP	Abrade/Dust/PP	NA	NA
Ceramic Tile	No Data/Field Test	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe
EIFS[2]						
Dryvit	No Data/Field Test	1200/P5200[3]	1200/P5200[3]	1200/P5200[3,4]	NA	NA
Parex	No Data/Field Test	1200/P5200[3,4]	1200/P5200[3]	No Primer[3]	NA	NA
Pleko	No Data/Field Test	1200/P5200[3]	1200/P5200[3]	No Primer[3]	NA	NA
Senergy	No Data/Field Test	1200/P5200[3]	1200/P5200[3]	No Primer[3]	NA	NA
Simplex, Finestone	No Data/Field Test	1200/P5200[3]	1200/P5200[3]	No Primer[3]	NA	NA
STO	No Data/Field Test	1200/P5200[3]	No Primer[2,5]	No Primer[3,5]	NA	NA
Tec	No Data/Field Test	1200/P5200[3]	1200/P5200[3]	No Primer[3]	NA	NA
Thoro	No Data/Field Test	1200/P5200[3]	1200/P5200[3]	No Primer[3]	NA	NA
USG	No Data/Field Test	1200/P5200[3]	1200/P5200[3]	No Primer[3]	NA	NA
Stone						
Granite	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe	NA	Solvent Wipe
Travertine	No Data/Field Test	Solvent Wipe/1200/P5200	Solvent Wipe/ 1200/PP/P5200	Solvent Wipe/ 1200/PP/P5200	NA	NA
Marble[6]	Solvent Wipe/ 1200/PP/P5200	Solvent Wipe/1200/P5200	Solvent Wipe/ 1200/PP/P5200	Solvent Wipe/ 1200/PP/P5200	NA	NA
Limestone	Solvent Wipe/ 1200/PP/P5200	Abrade/Solvent Wipe/ 1200/P5200	Solvent Wipe/ 1200/PP/P5200	Solvent Wipe/ 1200/PP/P5200	NA	NA
Sandstone	No Data/Field Test	Solvent Wipe/1200/P5200	Solvent Wipe/ 1200/PP/P5200	Solvent Wipe/ 1200/PP/P5200	NA	NA
Glass						
Insulating	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe
Float	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe
Laminated[7]	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe
Plate	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe
Tinted	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe
Porcelain-Coated	No Data/Field Test	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe
Ceramic Frit Coating	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe
Reflective Glass[8]	No Data/Field Test	Solvent Wipe/1200/P5200	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe
Low E High (T) Glass[8]	No Data/Field Test	Solvent Wipe/1200/P5200	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe
Paints						
Acrylic Latex	No Data/Field Test	Solvent Wipe/1200/P5200	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe
Acrylic Thermoset	Solvent Wipe	Solvent Wipe/1200/P5200	Solvent Wipe	Solvent Wipe	Solvent Wipe/ 1200/P5200/PC	Solvent Wipe
Duracron	Solvent Wipe	Solvent Wipe/1200/P5200	Solvent Wipe	Solvent Wipe	Solvent Wipe/ 1200/P5200/PC	Solvent Wipe
Alkyd	No Data/Field Test	Solvent Wipe/1200/P5200	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe
Silicone Polyester	No Data/Field Test	Solvent Wipe/1200/P5200	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe
Polyester Powder Coating[9]	No Data/Field Test	Solvent Wipe/1200/P5200	Solvent Wipe	Solvent Wipe	Solvent Wipe/ 1200/P5200/PC	Solvent Wipe
Polyurethane	No Data/Field Test	Solvent Wipe/1200/P5200	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe
Polyvinyl Chloride (PVC)	No Data/Field Test	Solvent Wipe/1200/P5200	Solvent Wipe	Solvent Wipe	No Data/Field Test	No Data/Field Test

	Dow Corning® brand Sealant					
	756 SMS Building Sealant	**790 Silicone Building Sealant[1]**	**791 Silicone Weatherproofing Sealant**	**795 Silicone Building Sealant**	**983 Silicone Glazing and Curtainwall Adhesive/Sealant**	**995 Silicone Structural Sealant**
Substrate	Surface Prep					
Fluoropolymer						
Kynar	Solvent Wipe	Solvent Wipe/1200/P5200	Solvent Wipe	Solvent Wipe/ 1200/P5200/PC	Solvent Wipe/ 1200/P5200/PC	Solvent Wipe
Duranar	Solvent Wipe	Solvent Wipe/1200/P5200	Solvent Wipe	Solvent Wipe/ 1200/P5200/PC	Solvent Wipe/ 1200/P5200/PC	Solvent Wipe
Fluoropon	Solvent Wipe	Solvent Wipe/1200/P5200	Solvent Wipe	Solvent Wipe/ 1200/P5200/PC	Solvent Wipe/ 1200/P5200/PC	Solvent Wipe
Duranar XL	Solvent Wipe	Solvent Wipe/1200/P5200	Solvent Wipe	Solvent Wipe/ 1200/P5200/PC	Solvent Wipe/ 1200/P5200/PC	Solvent Wipe
Acroflur	Solvent Wipe	Solvent Wipe/1200/P5200	Solvent Wipe	Solvent Wipe/ 1200/P5200/PC	Solvent Wipe/ 1200/P5200/PC	Solvent Wipe
Metals						
Aluminum – Alodine	Solvent Wipe	Solvent Wipe/1200/P5200	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe
Aluminum – Mill Finish	No Data/Field Test	Solvent Wipe/1200/P5200 or Scotch Brite Abrade	Solvent Wipe/1200/P5200 or Scotch Brite Abrade	Solvent Wipe/1200/P5200 or Scotch Brite Abrade	1200/P5200/PC	1200/P5200
Aluminum – Anodized	No Data/Field Test	Test/1200/P5200	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe
Copper	No Data/Field Test	Do Not Use	Solvent Wipe	Solvent Wipe	Solvent Wipe	Solvent Wipe
Lead	No Data/Field Test	Solvent Wipe	Solvent Wipe/1200/P5200	Solvent Wipe/1200/P5200	Solvent Wipe	Solvent Wipe
Steel						
Red Lead Primer	No Data/Field Test	Solvent Wipe/1200/P5200	Solvent Wipe	Solvent Wipe	NA	No Data/Field Test
Weathered	No Data/Field Test	Solvent Wipe/1200/P5200	Abrade/Solvent Wipe	Abrade/Solvent Wipe	NA	No Data/Field Test
Stainless	Solvent Wipe	Solvent Wipe/1200/P5200	Solvent Wipe/1200/P5200	Solvent Wipe/1200/P5200	1200/P5200/PC	Solvent Wipe
Galvanized	No Data/Field Test	Solvent Wipe/1200/P5200	Solvent Wipe	Solvent Wipe/1200/P5200	1200/P5200/PC	Solvent Wipe
Cold Rolled	No Data/Field Test	Solvent Wipe/1200/P5200	Solvent Wipe	Solvent Wipe	NA	No Data/Field Test
Plastics						
PVC	No Data/Field Test	Solvent Wipe/1200/P5200	Solvent Wipe	Solvent Wipe	1200/P5200	Solvent Wipe
Acrylic	No Data/Field Test	Do Not Use	Solvent Wipe	Solvent Wipe	1200/P5200	Solvent Wipe
Polycarbonate	No Data/Field Test	Do Not Use	Solvent Wipe	Solvent Wipe	Do Not Use	Solvent Wipe

Dow Corning 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 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 per the Dow Corning Americas Technical Manual
[4]Rigid vinyl edge component requires 1200 Prime Coat.
[5]1200 Prime Coat is required on STO System II (BTS-B, no finish).
[6]The extremely porous nature of some marble, particularly white marble, can contribute to the potential for fluid migration into this substrate. Contact a Dow Corning Specialist when working with marble.
[7]Laminated Glass with polyvinyl buyvol (PVB) interlayer may delaminate up to 1/4" at the edges when in contact with a sealant.
[8]Do not use 790 Silicone Building Sealant on copper sputter coated glass.
[9]See Organic Solvent Usage in Americas Technical Manual for comment.

Key: 1200: *Dow Corning*® 1200 Prime Coat; 1205: *Dow Corning*® 1205 Prime Coat; P5200: *Dow Corning*® P5200 Adhesion Promoter; PC: *Dow Corning*® Primer C; PP: *Dow Corning*® Primer P; NA: Not applicable.

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 Corning's requirements. The suggestions in this guide are not blanket-approval recommendations; Dow Corning 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 Corning 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 (p 63)
"Two Cloth" Cleaning Method (p 64)
Primer Application Procedure (p 65)
Field Adhesion Testing Procedure (p 73)
Field Adhesion Hand Pull Test Criteria (p 74)
Field/Shop Adhesion Log and Sealant Quality Control Logs (p 77-79)

Structural Silicone Glazing

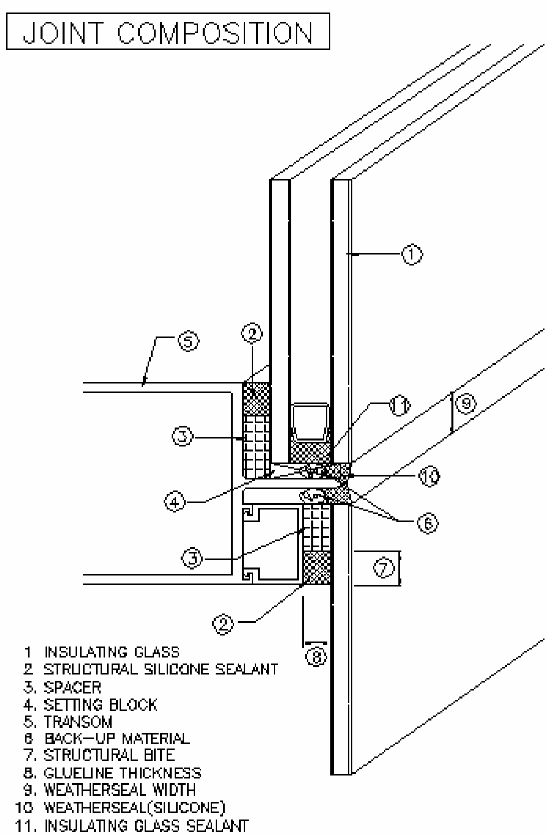
Introduction

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 application. 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 Corning Structural Warranty.

Structural Joint 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/m^2).

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.

$$\text{Bite (mm)} = \frac{0.5 \times \text{short span length (mm)} \times \text{windload (kg/m}^2\text{)}}{\text{Sealant design strength (14,000 kg/m}^2\text{)}}$$

For example, a 1219 mm x 2438 mm lite of glass, exposed to a 290 kg/m^2 windload, requires a silicone bite of 13 mm. Always round up to the nearest millimeter and never round down.

$$\text{Bite (mm)} = \frac{0.5 \times \text{short span length (mm)} \times \text{windload (kPa)}}{\text{Sealant Design Strength 138 kPa}}$$

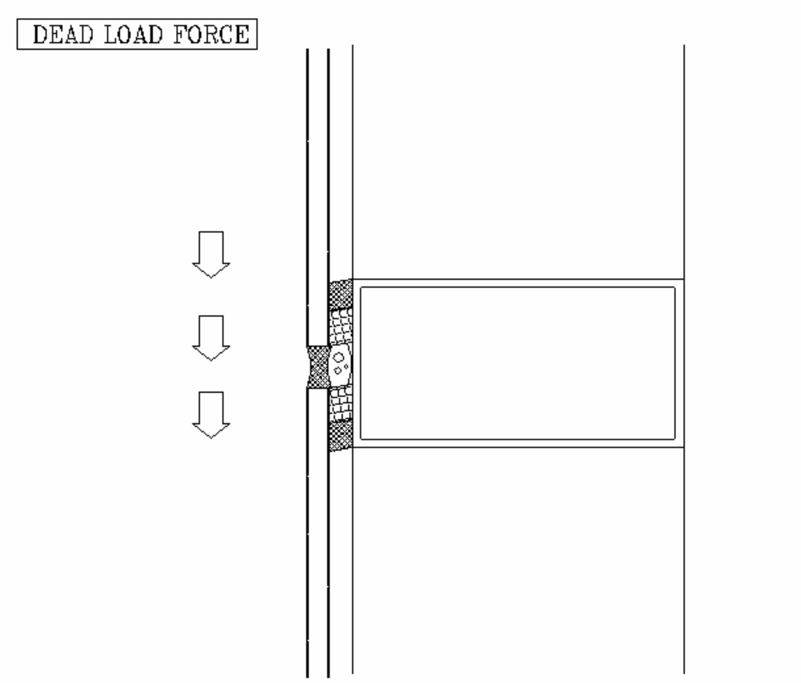
For example, a 1219 mm x 2438 mm lite of glass, exposed to a 3.5 kPa windload, requires a silicone bite of 16 mm. Always round up to the nearest millimeter and never round down.

Deadload

In unsupported deadload designs, the weight of the panel places constant load upon the sealant. DOW CORNING® brand structural sealants can support the weight of the panel or glass when used within the following guidelines:

- For DOW CORNING® 795 Silicone Building Sealant, DOW CORNING® 983 Silicone Glazing and Curtainwall Adhesive/Sealant and DOW CORNING® 995 Silicone Structural Sealant, the allowable deadload design strength is 1 psi or 700 kg/m^2.

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:

$$\text{Bite} = \frac{\text{weight of glass in lb}}{\text{Sealant contact length in inches x sealant deadload design strength (1 psi)}}$$

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.

$$\text{Bite} = \frac{\text{weight of glass in kg}}{\text{Sealant contact length in mm x sealant deadload design strength } (7 \times 10^{-4}\ \text{kg/mm}^2)}$$

$$\text{SDS } (700\ \text{kg/m}^2) = \frac{\text{weight of glass in kg}}{\text{Sealant contact length in meters x bite}}$$

For example, a 1219 mm by 2438 mm lite of monolithic glass at a weight of 14.8 kg/m^2 will have a weight of 43.97 kg and a glass perimeter of 7.314 meters. Based on 700 kg/m^2 deadload design strength, a bite of 9 mm is required.

Glueline Thickness

Proper glueline thickness facilitates the installation of sealant and allows reduced stress on the structural joint resulting from differential thermal movement. A minimum glueline of 1/4" (6.4 mm) is required, but as the structural bite increases, the glueline should be increased to allow the sealant to be applied easily and the panel to expand and contract when subjected to thermal movement. If structural bite requirements exceed 3/4" (19 mm), the glueline thickness should be increased to a dimension greater than 1/4" (6.4 mm). To facilitate filling of the structural joint, the bite-to-glueline thickness ratio should be maintained at 3 to 1 or less.

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) is known.

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

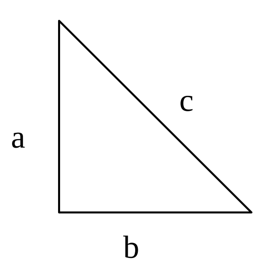
Movement (inches) = panel length (inches) x CTE (inches/inches/ºF) x temperature change (ºF)

For example, for a 4' by 8' high lite of glass fixed at the sill and a temperature change of 180ºF, glass with a CTE of 5.1×10^{-6} will show movement of 0.088". Aluminum with a CTE of 13.2×10^{-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) x CTE (mm/mm/ºC) x temperature change (ºC)

For example, for a 1219 mm by 2438 mm high lite of glass fixed at the sill and a temperature change of 82ºC, glass with a CTE of 9.2×10^{-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 (b) 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.



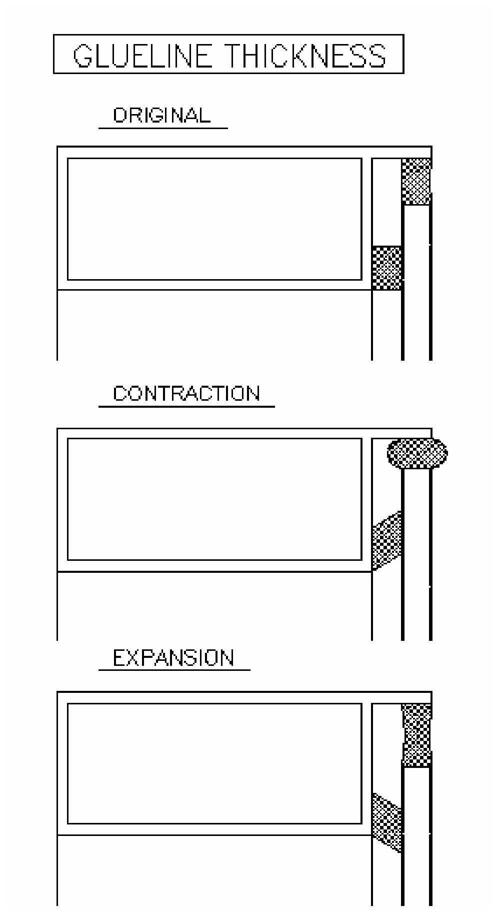
$\mathbf{a^2+b^2 = c^2}$ where a = original glueline
b = joint movement
c = new glueline after joint movement

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 DOW CORNING 995 Silicone Structural Adhesive and DOW CORNING 795 Silicone Building Sealant, maximum extension from thermal expansion is 15% in any structural silicone joint. For DOW CORNING 983 Silicone Glazing and Curtainwall Adhesive/Sealant, maximum extension from thermal expansion is 10% 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. This is the reverse situation to weatherseals, which have higher movement capability.

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 liveload applications at the same design strength (20 psi, 138 kPa, 14000 kg/m^2) 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.

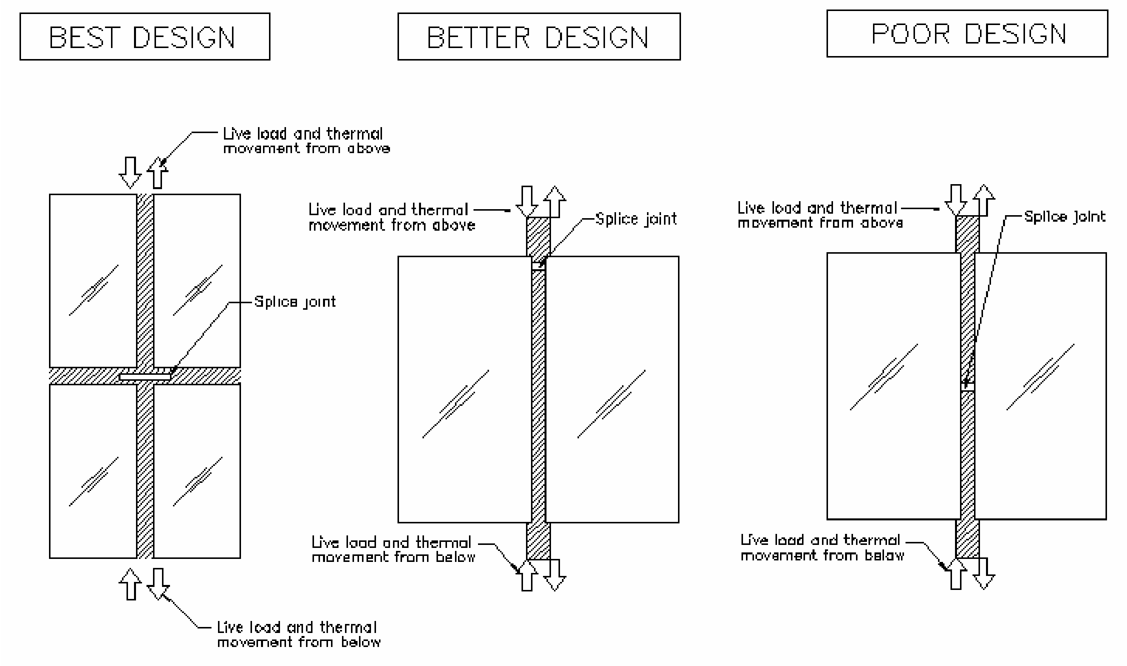
The modulus of the structural silicone in shear is lower than in tension (consider the calculations through the Pythagorean Theorem from the section on glueline thickness). Therefore, combinations of shear and tension loading cannot be added without understanding the stress-strain relationship of each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

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.



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 Corning 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.
- 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.
- The structural sealant joint must be fully cured and adhered prior to removing temporary fasteners in the field or moving curtainwall units in the shop.

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 Corning Technical Service Representative.

Substrate Suitability

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 alodine 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.

Where substrates with non-typical surface finishes are specified, the customer should contact Dow Corning for specific advice. Discussion will need to take place on the durability of any substrate finish prior to its acceptance and use in structural applications. Independent confirmation of the substrate’s stability/durability may be required.

Masonry and cementitious substrates have not been embraced by the Façade/Curtainwall Industry (ASTM C-24) as suitable substrates 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 then be bonded to the metal. The metal must be compatible with masonry and have a high-performance finish.

Dow Corning's adhesion testing procedures, which confirm the adhesion characteristics of the sealant to the substrate, do not in any way verify the durability of that substrate. Contact your Dow Corning Application Sales Engineer for further information.

In addition to suitability of substrates for adhesion, gasket and accessory materials must be compatible with DOW CORNING sealants. The spacer material and setting blocks used in structural glazing must be fully compatible with the structural silicone. Dow Corning 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 Dow Corning's 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. Other materials such as EPDM, neoprene, *Santoprene*®, *Kraton*®, SCR (Silicone Compatible Rubber – an EPDM-based material) and other similar organic materials may cause discoloration of light-colored silicone sealants. In these cases, gray DOW CORNING 983 Silicone Glazing & Curtainwall Adhesive/Sealant and gray DOW CORNING® 982 Silicone Insulating Glass Sealant are not recommended. For weatherseal and structural glazing 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.

For horizontal and 4-sided structural silicone applications, only silicone setting blocks composed of 100% silicone should be specified and submitted for compatibility testing. When using insulating glass, the IG manufacturer should be contacted for their 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 11.

Project Review Services

Dow Corning professionals are available to assist you in selecting the best sealant for your specific application. All Silicone Structural Glazing applications using DOW CORNING adhesive or 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 Corning will issue a warranty. A project submission form is included with this manual for your use. Additional forms are available from any Dow Corning Representative. The following services are offered by Dow Corning.

Product Recommendations

After reviewing project drawings and specifications and having performed laboratory testing, Dow Corning will assist in the selection of the correct DOW CORNING sealant/primer and/or surface preparation for the specific application.

Print Review

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

Dow Corning 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 Corning has found that a few underlying principles are critical to consider in virtually all joint designs using silicone sealants.

Dow Corning 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 Corning’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 Corning 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 Corning 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 Corning tests the compatibility of job site representative accessory materials with its silicone sealants using ASTM Cl087. 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 will 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.

Some studies have shown that the addition of 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 Corning 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 Corning can accommodate special, non-standard testing requirements. Please consult your local Dow Corning Representative at the beginning of the project to determine whether Dow Corning is capable of such testing services. Dow Corning may charge a service fee for non-standard testing.

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 (DOW CORNING 795 Silicone Building Sealant or DOW CORNING 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. A 12" “mini mock-up” sample can be made and destructively tested for complete cure and adhesion.

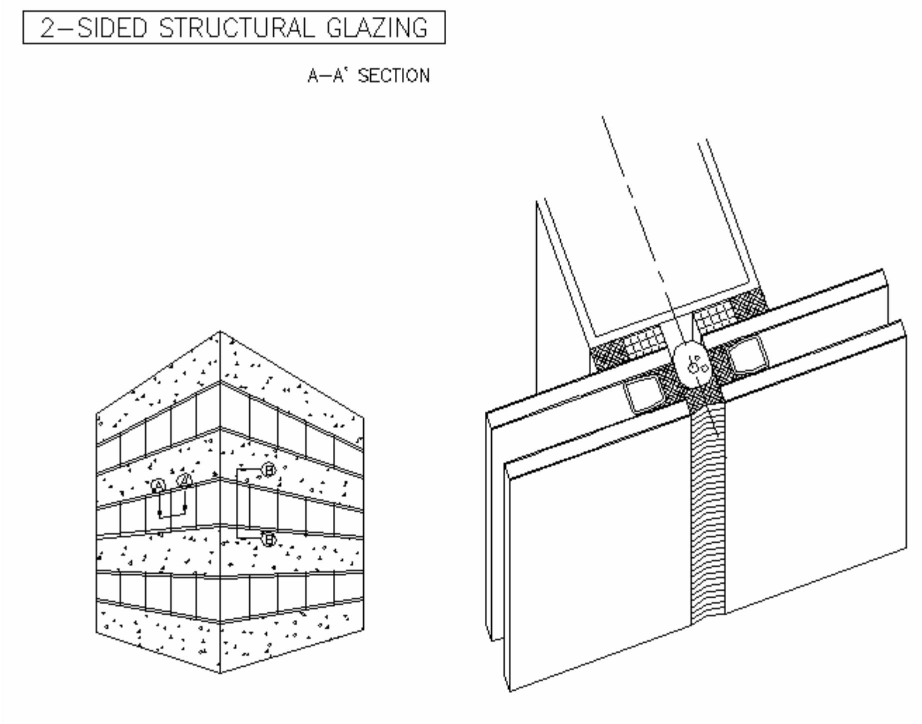
Any review, recommendation or statement made on behalf of Dow Corning relating to an engineering design, architectural drawing, product formulation, end-use specification or similar document is limited to the knowledge of product properties as determined by laboratory testing of material produced by Dow Corning. 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.

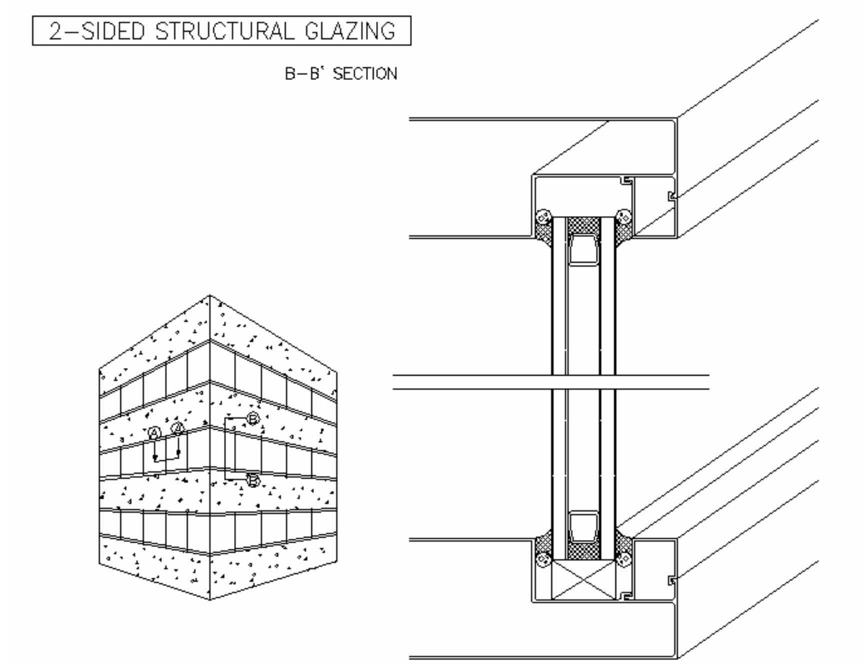
Dow Corning assumes no responsibility for the comments or suggestions relative to subjects other than such product properties, and expressly disclaims any warranty or responsibilities for them.

Classification of Silicone Structural Glazing

2-Sided Structural Glazing

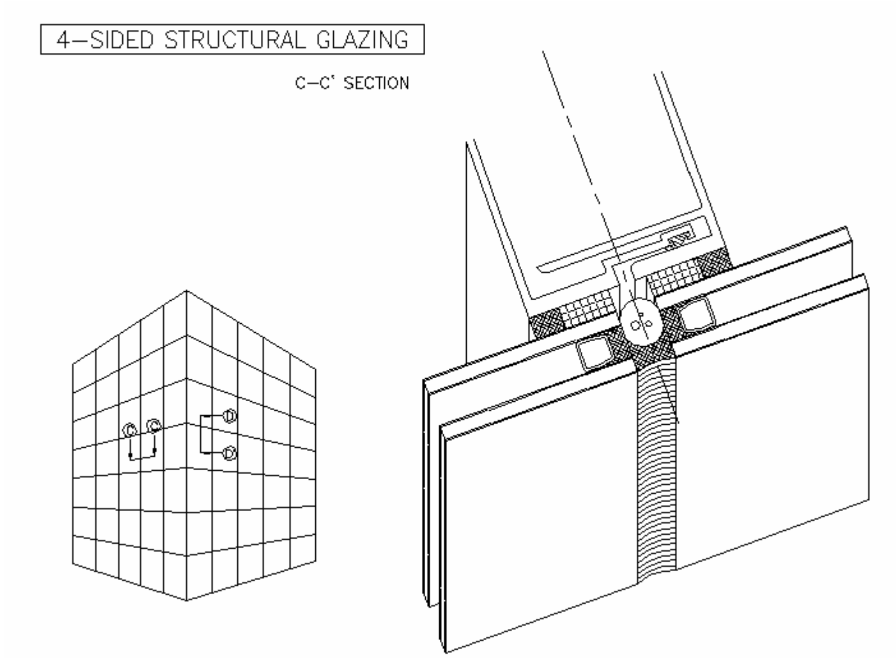
This method uses structural silicone sealant to support the glass on two sides (either vertical or horizontal edges) and utilizing mechanical support on the other two sides. Two-sided structural glazing can be fabricated in the factory or on-site.

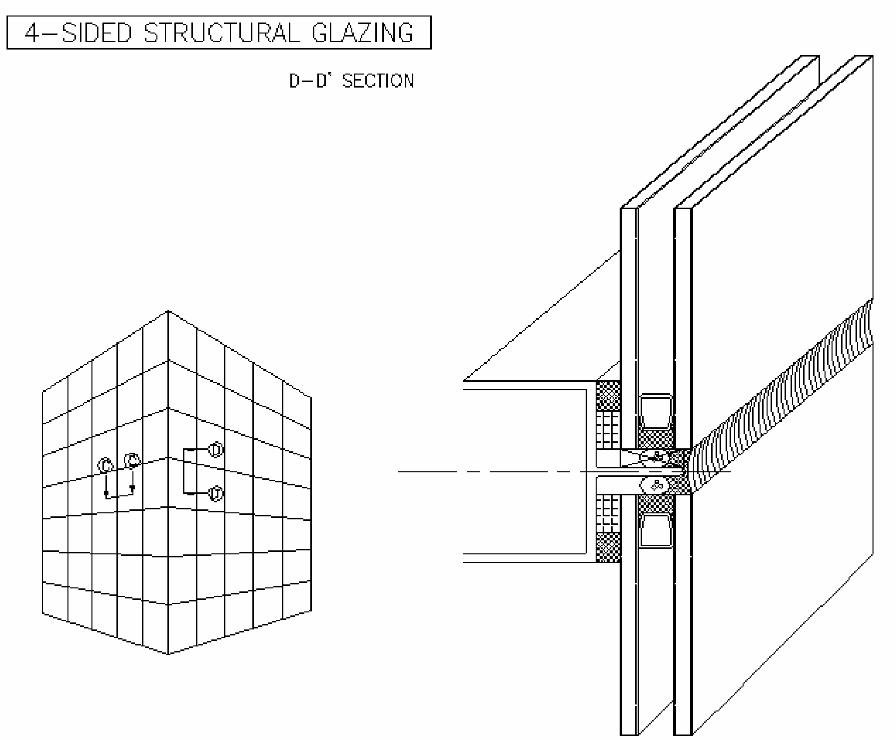




4-Sided Structural Glazing

Glass is supported on all four sides with structural silicone. Structural silicone is used for bonding all four 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 four-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 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.

As a result of recent developments in silicone sealant technology, insulating glass units can also be installed using bolted glass technology. In this system a high-performance silicone insulating glass sealant is used to produce the hermetic edge seal of the insulating glass units. Silicones are used due to their excellent resistance to ultraviolet, which would attack organic-based sealants. Furthermore, high-performance, structurally capable silicone insulating glass sealants used as the hermetic edge seal can dispense with the need to drill the external glass element of the insulating glass unit. 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 Corning'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.

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 facade. 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 DOW CORNING structural silicone sealants. The structure is then made watertight using DOW CORNING weathersealing sealants. This technique is widely used for lobbies, showrooms and racetracks where the unobstructed visibility is an advantage.

Polyvinyl Butyrol (PVB) Compatibility

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 into the sealant 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. Two sources include www.saflex.com and http://www.dupont.com/safetyglass/en/productServices/glasplus/index.html.

DOW CORNING 790 Silicone Building Sealant can cause a discoloration of certain laminate glass interlayers from a few manufacturers. Compatibility should be checked on a job-by-job basis with the actual sheet-form laminate.

Structural Attachment of Non-Glass Materials

Materials besides 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 Corning 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. Special attention should be given to high-performance paints applied to glass before architectural selection.

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 Corning must review all designs whether glass or non-glass materials where its sealants are used as structural adhesives.

For aluminum composite materials that are mechanically attached around the perimeter and the sealant is used to attach an aluminum stiffener, Dow Corning 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.

See also “Substrate Suitability” above.

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 slope glazing with few modifications. 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.

Local codes typically require the use of laminated glass to protect individuals within the structure. Edge delamination of laminated glass with polyvinyl butyrol (PVB) may delaminate up to 1/4" (6 mm) from contact with any sealant. Please contact the laminated glass manufacturer for more information on this matter. See “Polyvinyl Butyrol Compatibility” above.

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 Corning permits the use of its sealants in this manner provided that the joint maintains an aspect ratio of 1 to 1 where the depth of the sealant is equal 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, such as is common in airport control towers, imposes a dead load upon the glazing that must be added to the windload when there is intimate contact with setting blocks. If the outward slope is greater then 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 dead load must be determined and the bite dimension sized appropriately. For these designs, contact your Dow Corning construction professional for further information.

Protective Glazing Systems

Dow Corning 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 Corning 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 Corning can provide the consultant with either ASTM D412 Tensile or ASTM C1135 Tensile sealant strength data for analysis.

Both DOW CORNING 983 Silicone Glazing and Curtainwall Adhesive/Sealant and DOW CORNING 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.

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 DOW CORNING silicone IG sealants should be used. These sealants provide a hermetic seal that is resistant to attack from ultra violet light while at the same time providing a structural seal that structurally 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. Dow Corning products have a proven track record in this application.

Surface Preparation and Sealant Application

Introduction

The Dow Corning application procedures outlined in this manual describe the general requirements for installing DOW CORNING Silicone Building Sealants. By following these procedures closely, you will help ensure good sealant performance. To be eligible to receive a Dow Corning warranty, these procedures must be followed. Since DOW CORNING Silicone Building Sealants are applied in many different environments and situations, these procedures are not intended to be a complete and comprehensive quality assurance program.

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 Corning will test with the specific solvents selected, and cleaning and priming recommendations will be based on the use of this solvent. Dow Corning 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 will trap 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

DOW CORNING 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. 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. Do not pour more than a 10-minute supply into the container at a time to ensure that primer does not get contaminated.
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 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 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).

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).

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.

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

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. DOW CORNING 995 Silicone Structural Sealant and DOW CORNING 795 Silicone Building Sealant typically require 7-14 days but up to 28 days or more in cold, dry conditions, depending on joint size, temperature, and relative humidity.

Factory (Shop) Glazing – One-Component Silicone

If DOW CORNING 995 Silicone Structural Sealant or DOW CORNING 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 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

DOW CORNING 983 Silicone Glazing and Curtainwall Adhesive/Sealant cures in deep section within 3 hours and generally achieves full adhesion within 24 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 DOW CORNING® Primer C. 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 Corning 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 DOW CORNING 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 Corning Representative, who may need to determine whether Dow Corning 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 Corning 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 Corning 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 Corning 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 Corning performs extensive quality assurance testing in our manufacturing facilities in accordance with rigid ISO 9000 standards. This section is intended to provide the end-user with simple screening tests to verify that the material, as received 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 DOW CORNING 995 Silicone Structural Sealant or DOW CORNING 795 Silicone Building Sealant is adequate for structural sealant applications.

Shelf Life and Storage Conditions

DOW CORNING 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.

DOW CORNING 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:

a) Spread a bead of sealant into a 0.04" (1 mm) film on a sheet of polyethylene.
b) Every few minutes, touch the sealant film lightly with a tool.

c) 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 and contact your Dow Corning Representative.
d) 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 Corning Project Manager.
e) 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

Shelf Life and Storage Conditions

DOW CORNING 983 Silicone Glazing and Curtainwall Adhesive/Sealant must be stored at temperatures below 32°C (90°F). A "use by" date is clearly displayed on both the base and catalyst packaging.

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.

DOW CORNING 983 Silicone Glazing and Curtainwall Adhesive/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.

DOW CORNING 983 Silicone Glazing and Curtainwall Adhesive/Sealant Base, 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: DOW CORNING 983 Silicone Glazing and Curtainwall Adhesive/Sealant

DOW CORNING 983 Silicone Glazing and Curtainwall Adhesive/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 DOW CORNING 983 Silicone Glazing and Curtainwall Adhesive/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 DOW CORNING 983 Silicone Glazing and Curtainwall Adhesive/Sealant

The recommended mix ratio for DOW CORNING 983 Silicone Glazing and Curtainwall Adhesive/Sealant is between 9:1 and 10.5:1 by volume (standard ratios typically set by pump manufacturers). Based on these volumetric ratios, the weight ratio for 983 Black sealant corresponds to 12:1 and 14:1 (base to catalyst). For 983 Gray, using the same volumes, the weight ratio should be 10:1 to 12:1 due to a difference in the specific gravity of the Black versus Gray catalyst. This difference is outlined on the DOW CORNING 983 Silicone Glazing and Curtainwall Adhesive/Sealant product datasheet.

Dispensing Equipment for DOW CORNING 983 Silicone Glazing and Curtainwall Adhesive/Sealant

DOW CORNING 983 Silicone Glazing and Curtainwall Adhesive/Sealant requires a plural component meter-mixing device. This two-part sealant pump is available from Graco, H&G Industries, Reinhardt Technik and Lisec. 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 Corning as a sealant supplier to provide pump maintenance, spare parts and troubleshooting. The quality control program recommended by Dow Corning, including snap time, butterfly test, shop adhesion testing and deglazing will show pump problems. Sporadic cure rate, non-uniform color 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. Shore 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.

DOW CORNING 983 Silicone Glazing and Curtainwall Adhesive/Sealant will work only when it is metered and mixed without incorporation of air. This requires a properly maintained pump with qualified, trained operators.

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 DOW CORNING 983 Silicone Glazing and Curtainwall Adhesive/Sealant. The specific operation and maintenance of the pump are beyond the scope of this document. The applicator must have a start-up, shutdown 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.

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:

a) Fold a piece of plain white paper.
b) Apply a minimum 6" (150 mm) bead of DOW CORNING 983 Silicone Glazing and Curtainwall Adhesive/Sealant to the crease or fold in the paper.
c) Press the paper together, smearing the sealant bead to a thin film.
d) Pull the paper apart and visually inspect the sealant smear formed.
e) 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.
f) 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. Under no circumstances should streaked material be used for production.

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:

a) Fill a small container with DOW CORNING 983 Silicone Glazing and Curtainwall Adhesive/Sealant.
b) Place a stick, pencil or spatula into the sealant. (Wooden chopsticks or paint stirring sticks work well). Note the time.
c) Every 5 to 10 minutes, pull on the stick. Do not stir the sealant or incorporate air into the mixed sealant.
d) 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.
e) The snap time will vary depending on atmospheric conditions, temperature, humidity and the individual doing the test. A snap time varying more than 45 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 Corning 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 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.

a) 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.
b) Let the sealant cure for 2 hours.
c) 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.

Movement of 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 has been achieved to the substrates. 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 4 hours after installing DOW CORNING 983 Silicone Glazing and Curtainwall Adhesive/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 seals. It is inappropriate to lift the unit via suction cups on the glass during this initial period.

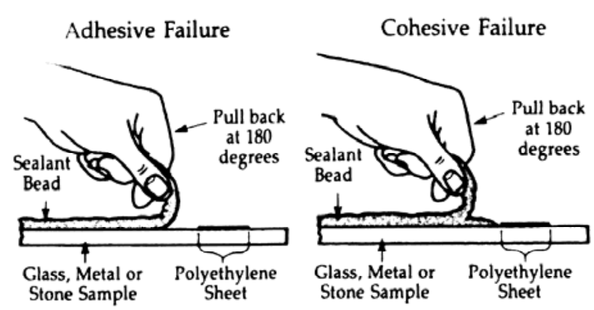
While it is general industry practice to wait 24 hours before transporting units to a job site, units may be transported after 4 hours if adhesion testing has documented full sealant cure. Whatever time frame for transport is chosen, adhesion testing should be completed and documented at that time to illustrate the sealant is cured and adhering.

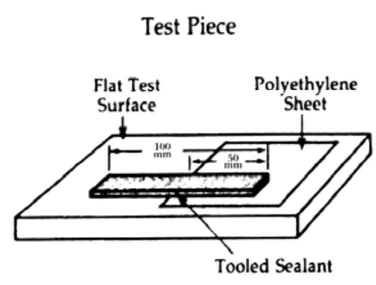
Shop/Site Adhesion Testing

Dow Corning 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 till failure. Record the mode of failure of the test sealant.

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 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 Corning should be consulted for recommendations in determining the appropriate handling of structurally glazed curtainwall units.

Note: Obtaining Adhesion on Painted Aluminum with DOW CORNING 983 Silicone Glazing and Curtainwall Adhesive/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 one, two, seven, or more days for adhesion to develop between 983 Adhesive/Sealant and painted aluminum when either no primer or DOW CORNING 1200 Prime Coat is used. As an alternative, most curtainwall customers choose to use DOW CORNING Primer C to ensure fast adhesion development on painted substrates, even though other surface preparation recommendations (no primer or 1200 Prime Coat) may still be warrantable.

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):

a) Measured size of structural bite (minimum measurement if underfilled)
b) Size of structural glueline
c) Adhesion of silicone sealant with panel and frame
d) Joint type/condition of sealant applied
e) 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 Corning project print review letter and Dow Corning 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 should be performed according to the following schedule:

a) First Deglaze – 1 unit out of the first 10 units manufactured (1/10)

b) Second Deglaze – 1 unit out of next 40 units manufactured (2/50)

c) Third Deglaze – 1 unit out of next 50 units manufactured (3/100)

d) From the fourth deglaze, 1 unit out of every 100 units manufactured thereafter

In other words, deglazing should occur at a rate of 3% for the first 100, and 1% thereafter. Deglazing frequency can be changed under mutual agreement, on a case-by-case basis. The terms and conditions of warranty are not affected by any mutually agreed upon change in deglazing frequency.

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 Corning Technical Service Representative, these tests are not required by Dow Corning.

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

Warranty – Structural Applications

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

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

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

Dow Corning 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 Corning 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 Corning Adhesion Letter(s) generated for each substrate that contacts the approved Dow Corning Structural Sealant (795, 995, or 983).
2. Confirmation of Compatibility:
   Dow Corning Compatibility Letter(s) generated for each spacer that is used in direct contact with the Dow Corning Structural Sealant (795, 995, or 983).
3. Dow Corning Print Review Approval Letter, which confirms that the documented joints meet Dow Corning 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 their Dow Corning-issued warranty.

Structural Glazing – Shop Applied:

1. Confirmation of adhesion:
   Dow Corning Adhesion Letter(s) generated for each substrate that contacts the approved Dow Corning Structural Sealant (795, 995, or 983).
2. Confirmation of compatibility:
   Dow Corning Compatibility Letter(s) generated for each spacer that is used in direct contact with the Dow Corning Structural Sealant (795, 995, or 983).
3. Dow Corning Print Review Approval Letter, which confirms that the documented joints meet Dow Corning 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 their Dow Corning-issued warranty.

Dow Corning Project Checklist

The following items must be completed for silicone structural glazing projects. Check mark 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 Corning for review
_______ Include windload and maximum glass size
_______ Date(s) of Dow Corning print review
_______ Mock-up drawings/Final shop drawings

Adhesion Testing (testing time: 4 weeks)

_______ Submit jobsite representative metal (mullion and/or panel)
_______ Date of Dow Corning adhesion recommendation report
_______ Submit jobsite representative glass
_______ Date of Dow Corning adhesion recommendation report
_______ Submit jobsite representative stone
_______ Date of Dow Corning adhesion recommendation report

Compatibility Testing (testing time: 4 weeks)

_______ Submit jobsite representative structural spacer
_______ Date of Dow Corning compatibility recommendation report
_______ Submit jobsite representative setting block
_______ Date of Dow Corning compatibility recommendation report
_______ Submit jobsite representative setting gaskets that will contact structural silicone
_______ Date of Dow Corning 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

Project						
Location/Elevation/Unit ID						
Sealant Color						
Date	**Time**	**Tester Initials**	**Sealant Lot Number**	**Tack-Free Time (Minutes)**	**Cured After 24 Hours (Y/N)**	**Elastomeric (Y/N)**

Product Quality Control Log – Two-Part Silicone Sealant

Project Name & Location: **Est. Snap Time:**

Location/Elevation/Unit IDs: **Ratio by Weight:**

Date	Time	Tester Initials	Temp & Humidity	Base Lot Number	Catalyst Lot No.	Butterfly Test (P/F)	Snap Time (Minutes)	Adhesion (% Cohesive Failure)						
								Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7

Field/Shop Adhesion Testing Log

Project						
Sealant						
Sealant Lot #/Color						
Primer (if applicable)						
Date Applied	**Applied by (initials)**	**Test Date**	**Test Location (Elevation, Unit Number, etc.)**	**Primed (Y/N)**	**Acceptable Adhesion (Y/N) and %Elongation**	**Acceptable Joint Fill (Y/N) (Measured)**

Dow Corning Deglaze Inspection Form

Project Number: ______________________________________ **Deglaze Date:** ________________________

Project Name: ____ **Sealant Applicator:** ____________________

Frame ID		Panel Size	Dow Corning Product	Lot Number	Sealant Application Date	Measured Structural Bite (Frame)	Measured Structural Bite (Glass)	Glueline
1.								
2.								
3.								

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 guide addresses 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:

Movement (Mt) = CTE x Temp. Change x Length of Material

Examples are below

Max. Temp (Deg °F)	Min. Temp (Deg °F)	Material Length (inches)	Material	Thermal Coefficient inch/inch/°F	Movement (inches)
160	-20	96	Glass	0.0000051	0.088
100	50	180	Aluminum	0.0000132	0.119

Max. Temp (Deg °C)	Min. Temp (Deg °C)	Material Length (mm)	Material	Thermal Coefficient mm/mm/°C	Movement (mm)
60	-20	4000	Glass	0.0000101	3.232
70	-20	3500	Aluminum	0.0000238	7.497

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)

Material	mm/mm/°C x 10^{-6}	inch/inch/°F x 10^{-6}
Glass	9.0	5.0
Aluminum	23.2-23.8	12.9-13.2
Granite	5.0-11.0	2.8-6.1
Marble	6.7-22.1	3.7-12.3
Concrete	9.0-12.6	5.0-6.0
Stainless Steel	10.4-17.3	5.8-9.6
Acrylic	74.0	41.0
Polycarbonate	68.4	38.0

NOTE: The coefficient of expansion for natural materials (brick, stone, wood, etc.) or fabrications of natural materials can be highly variable. If a specific material is contemplated, then the coefficient for that material should be established and used rather than an average value. Moisture-induced movement of brick masonry will cause the brick to swell and reduce joint sizes over the life of the project.

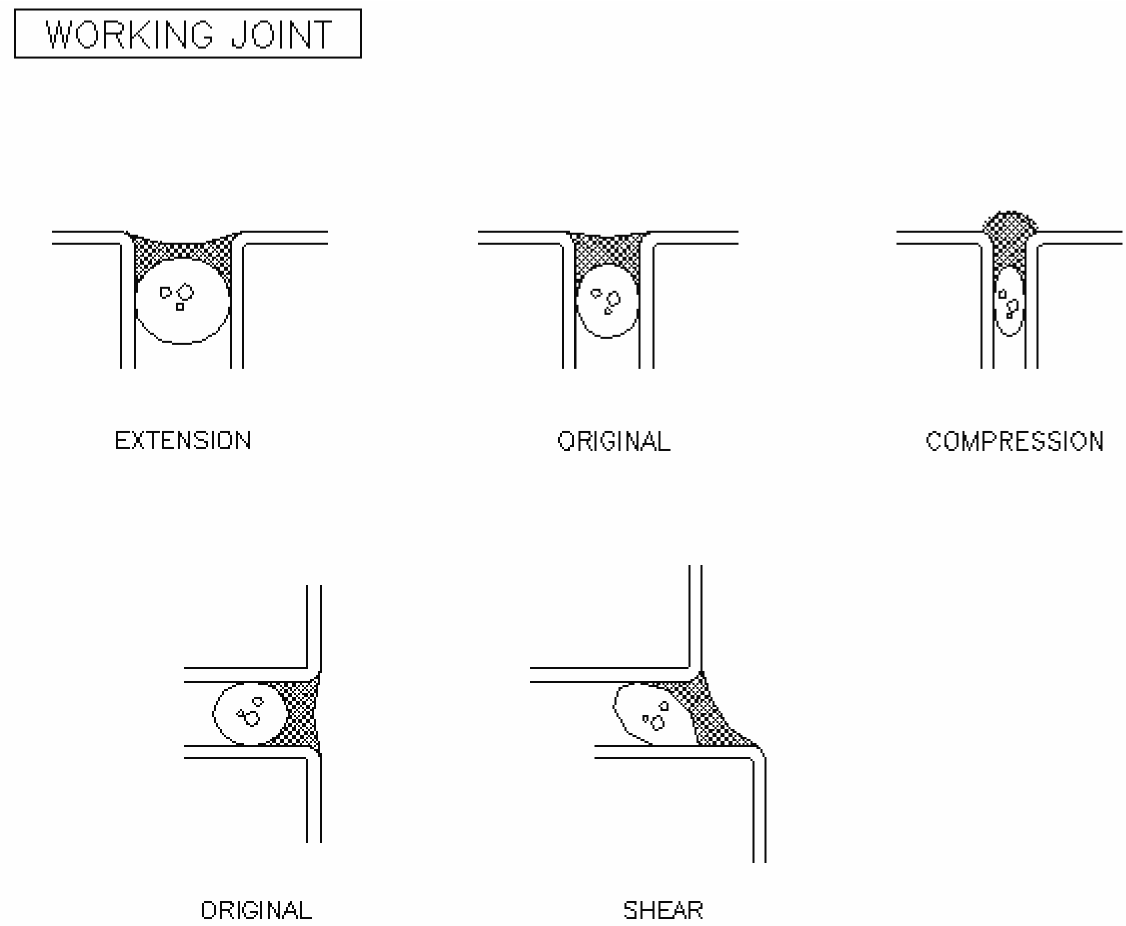
Joint Types

From a functional point of view, joints for construction can be put into two classes depending on the degree of movement.

Working Joint

Working 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 abut 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

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 curtainwalls.

Joint Design

DOW CORNING® 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 Corning 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" (6.4 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 a practical matter, 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.
- 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 DOW CORNING 123 Silicone Seal.
- For further information, see "Construction Calculators" under the "Product Resources" section of the Dow Corning Construction Website.

Minimum Joint Width = 100/X (Mt+Ml)+T X = Sealant movement capacity (%) Mt = Movement due to thermal expansion Ml = Movement due to live loading T = Construction tolerance

.

For example:

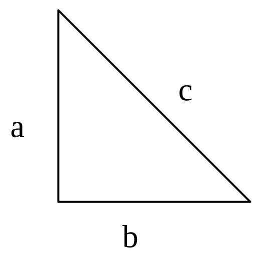
A horizontal joint between an aluminum curtainwall and a concrete panel with a thermal movement of 5/16" (8 mm), a live load movement of 1/4" (6 mm), a construction tolerance of 1/4" (6 mm) and 25% movement capacity sealant would be:

Width = 100/25* (5/16 + 1/4) + 1/4
Width = 2 1/2"

Width = 100/25* (8+6)+6
Width = 62 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:



$$\mathbf{a^2+b^2=c^2}$$

where a = original glueline
b = joint movement
c = new glueline after joint movement

Original Joint Width (inches)	Sealant Movement Capability Expansion	Max. Shear Joint Movement (inches)
0.25	50	0.280

Original Joint Width (mm)	Sealant Movement Capability Expansion	Max. Shear Joint Movement (mm)
10	50	11.18

Movement During Cure

One-part DOW CORNING sealants cure by reacting with atmospheric moisture. Joint movement during cure can cause unsightly aesthetics due to joint deformation, e.g., wrinkling. Premature adhesion loss can also occur because the adhesive characteristics of the sealant are obtained after the sealant has cured. Adhesion loss due to movement during cure can be minimized by the use of a primer. Primers can decrease the adhesion cure time lag. Wrinkling can be minimized 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.

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 DOW CORNING sealants:

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

Each backer rod type has demonstrated successful performance with DOW CORNING 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 Corning 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 DOW CORNING® 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 DOW CORNING® 791 Silicone Weatherproofing Sealant or DOW CORNING® 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 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 phenomena 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 phenomena will never occur with a specific porous substrate.

However, there are steps that can be taken to minimize the potential for this phenomena from occurring.

Minimizing Hydrophobing

- When priming, use a resin-based primer, such as DOW CORNING Primer P, as opposed to a silane primer, such as DOW CORNING P5200 Adhesion Promoter.
- Avoid over-application of any primer, silane or resin, onto the visible surface of the façade.
- 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 ¼" of sealant applied over the midsection of the backer rod. This will minimize the volume of sealant containing excess crosslinker in the joint.

EIFS Consideration

Exterior Insulation and Finish Systems (EIFS) is a new and growing segment of the exterior cladding market. EIFS offers unique challenges due to its composition. DOW CORNING silicone sealants have a demonstrated history of success when used with Exterior Insulation and Finish Systems. Silicone sealants offer unique benefits over organic sealants when used with EIFS.

Consider the following benefits offered by DOW CORNING sealants:

- DOW CORNING one-component silicone sealants require no special mixing, unlike multi-component polyurethane sealants.
- DOW CORNING sealants have been tested and recommended by most major EIFS manufacturers for use with their systems.
- DOW CORNING 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.
- DOW CORNING 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.

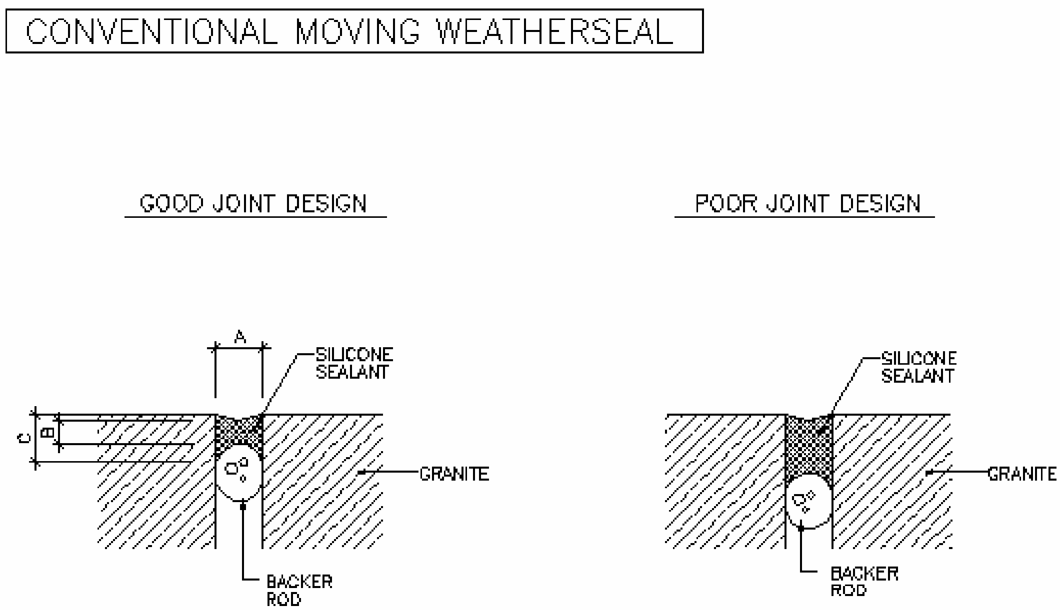
DOW CORNING sealants are tested and approved for use by the major EIFS manufacturers. Refer to the *Building Sealant Recommendation and Surface Preparation Guide* for current recommendations.

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

Key Points:

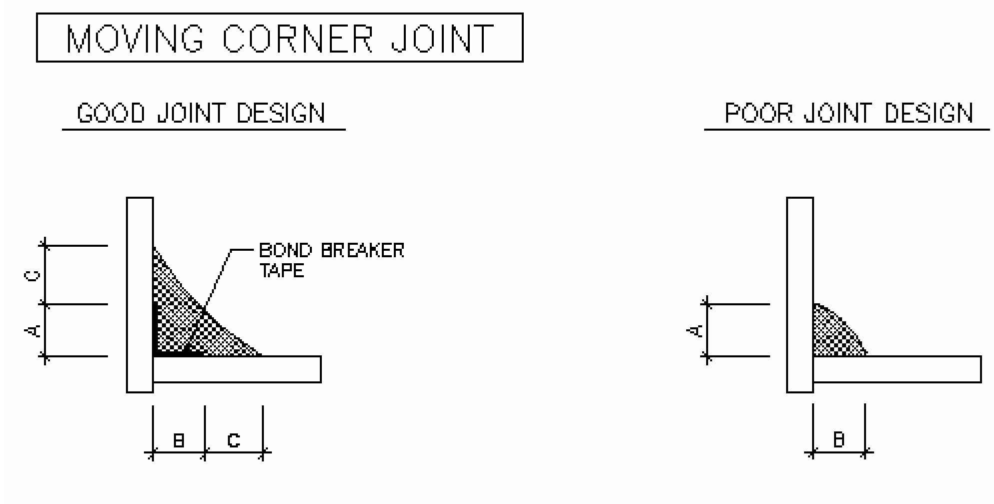
1. Dimension A must be at least 1/4" (6 mm).
2. Dimension B must be at least 1/8" (3 mm).
3. Dimension C must be at least 1/4" (6 mm).
4. Ratio of A:B should be 2:1 minimum.
5. Joint surface tooled.
6. Dimension B suggested Maximum = 1/2" (12.7 mm).
7. Dimension A Maximum = 4" (100 mm). Joints wider 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

Key Points:

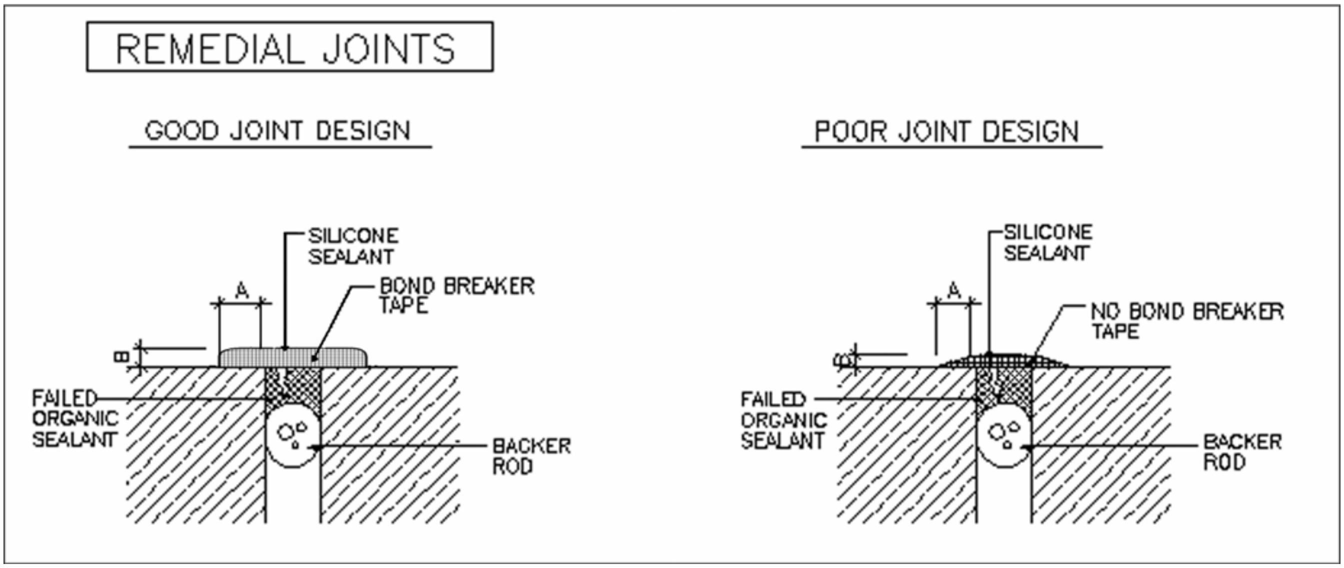
1. Dimension A and B must be at least 1/4" (6 mm).
2. A bond breaker tape or backer rod must be present if joint movement is anticipated.
3. Joint must be tooled flat or slightly concave.
4. Dimension C must be at least 1/4" (6 mm).

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:

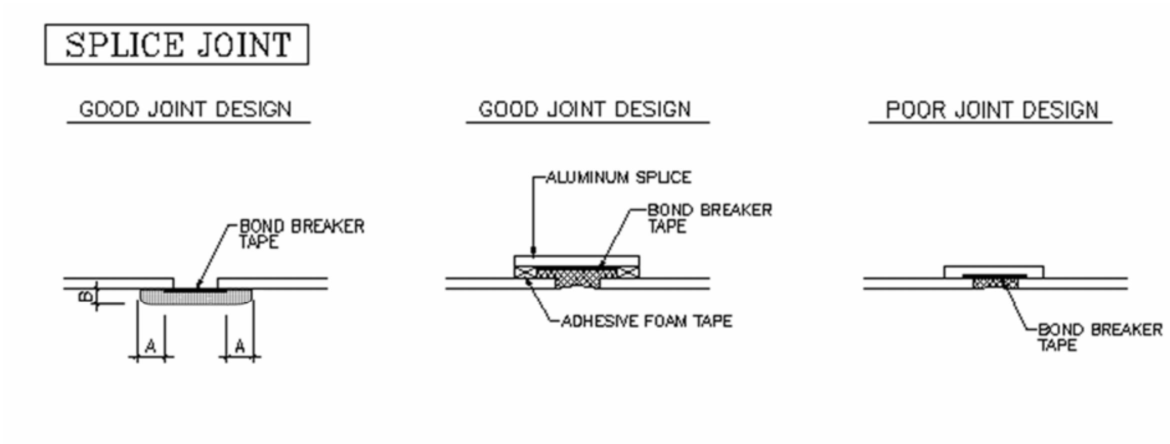
1. Dimension A must be at least 1/4" (6 mm).
2. Dimension B must be at least 1/8" (3 mm).
3. Bond breaker tape must be used to isolate fresh sealant from failed organic weatherseal and to allow joint movement.

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

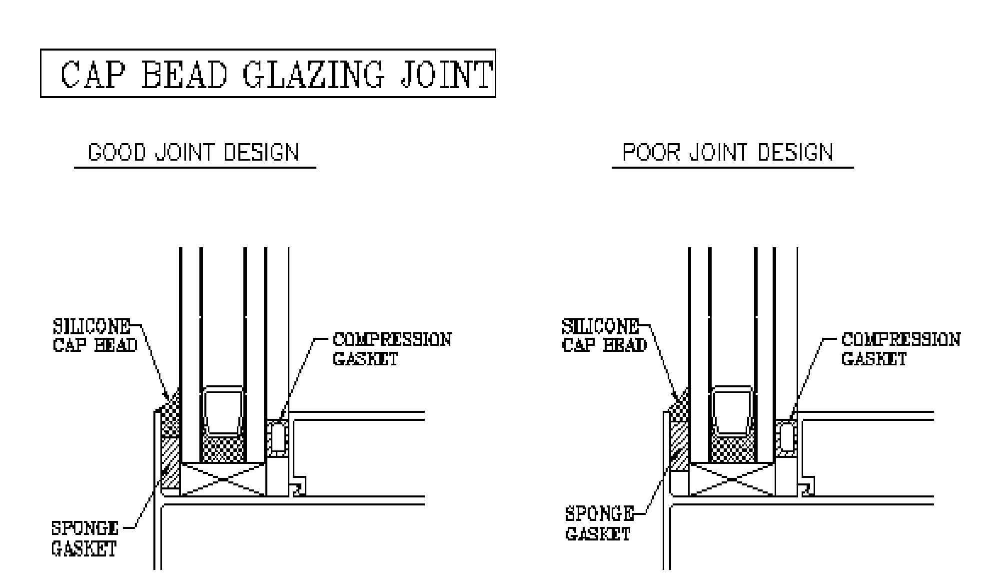


Good Joint Design

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



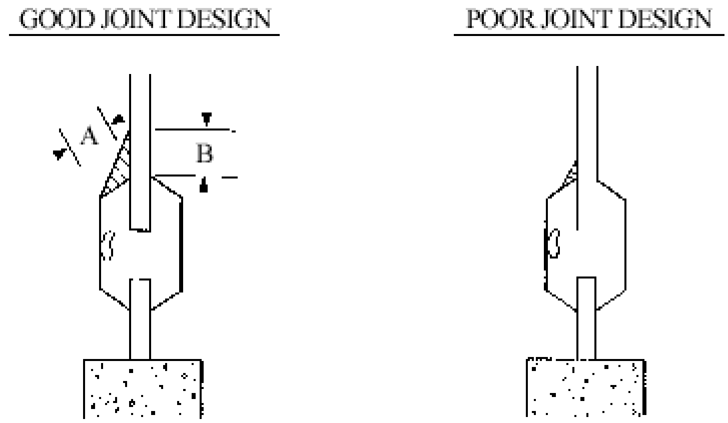
Good Joint Design

Key Points:
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.

Lock-Strip Wet Seal Joint



Good Joint Design

Key Points:
1. Both dimensions A and B are1/4" or greater.
2. DOW CORNING 791 or DOW CORNING 795 (dark color) Sealant is used with DOW CORNING 1200 Prime Coat on glass and lock-strip gasket.

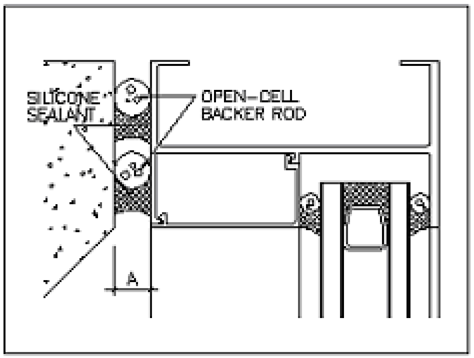
Poor Joint Design

Concerns:
1. Insufficient sealant to accommodate movement.

See Appendix B for more information.

Dual-Seal Moving Weatherseal

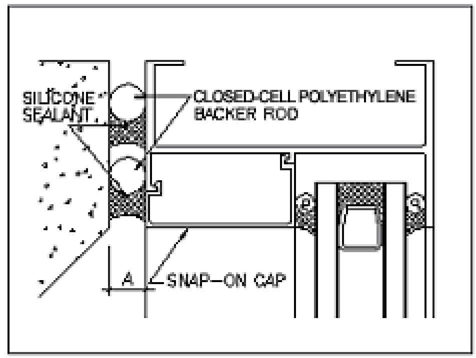
Good Joint Design



Key Points :

1. Both weatherseals comply with the requirements for conventional moving weathseals (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.

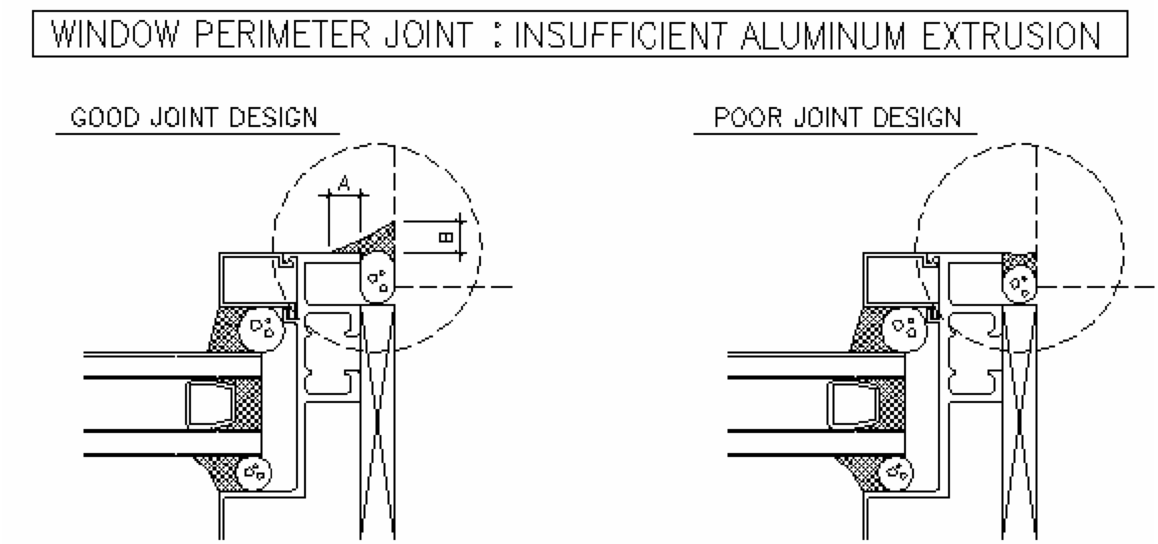
Poor Joint Design



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 this seal will not cure.
2. Dimension A less than 3/4", marking application of rear joint difficult
3. Exterior joint seal to aesthetic snap-on cap.

Window Perimeter Joints: Insufficient Aluminum Extrusion



Good Joint Design

Key Points:

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 DOW CORNING® Silicone Building Sealants. By following these procedures closely, you will help ensure good sealant performance. To be eligible to receive a Dow Corning warranty, these procedures must be followed. Since DOW CORNING Silicone Building Sealants are applied in many different environments and situations, these procedures are not intended to be a complete and comprehensive quality assurance program.

Field adhesion tests are required to ensure good sealant performance and to verify any sealant recommendation (see *Quality Assurance*).

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

Every solvent effectively removes not every contaminant, and certain solvents can seriously damage some substrates. Please follow the solvent manufacturer's safe handling recommendations and local, state and national regulations regarding solvent usage.

Non-Porous Substrate

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.

Porous Substrates

Building materials such as cement board panels, concrete, granite, limestone and other stones or cementitious materials that absorb liquid are considered porous substrates. Dusting alone may be sufficient cleaning for new porous substrates. Depending on the condition of the surface, porous substrates may require abrasion cleaning, solvent cleaning or both. Laitance and surface dirt must be completely removed. Concrete form-release agents, water repellents and other types of surface treatments, protective coatings, and old sealant all affect sealant adhesion. Removal of these treatments, coatings or sealants by abrasion cleaning may be required to obtain acceptable adhesion.

Abrasion cleaning involves grinding, saw cutting, sand or water blasting, mechanical abrading or a combination of these methods. Remaining dust and loose particles should be removed by dusting the surface with a stiff brush, vacuuming or blowing the joints with 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 Corning’s recommendations for removal of existing sealants, substrate leaning, joint preparation and installation of DOW CORNING sealants are not intended and may not be appropriate for remedial work involving existing sealants and/or joints containing PCBs or other potentially hazardous substances. If you know or suspect that the existing sealants and/or joints contain PCBs or other hazardous substances, contact a knowledgeable authority on appropriate removal, handling and disposal procedures.

“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 backer rod and sealant.

Winter/Summer Solvent Considerations

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

Cure Inhibition

DOW CORNING 790 Silicone Building Sealant and DOW CORNING Contractors Concrete Sealant are sensitive to generic alcohols. Therefore, do not use alcohols as cleaners or tooling aids with these products as cure inhibition will result. Furthermore, application of these products to other uncured sealants or wet primers can result in cure inhibition.

For more information on this topic, see Appendix A.

Primer Application Procedure

DOW CORNING 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, and be sure to replace and tighten the cap on the primer can. To prevent deterioration of the primer, do not pour more than a 10-minute supply into the container.
3) Depending on the substrate and job conditions, two different methods can be used to apply the primer. The preferred application is to dip a clean, dry, lint-free cloth into the primer and gently wipe a thin film onto the surface. For “hard-to-get-to” areas and rough surfaces, apply the primer in a thin film with a clean brush. **Caution:** 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. 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.

Do Not Apply Primer Over Backer Rod

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

Backer Rod Installation

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 thin sealant joint (depth) will absorb more movement than a thick joint. Sealants are designed to deliver optimum performance when the joints are shaped like an hourglass.
- As the sealant joint width becomes larger than 1" (25 mm), the depth should be held at approximately 1/2" (12 mm). There is no need to increase the depth beyond 1/2" (12 mm).

Movement During Cure

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

- 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.

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

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. DOW CORNING 795 Silicone Building Sealant, DOW CORNING 995 Silicone Structural Sealant, DOW CORNING 756 SMS Building Sealant, DOW CORNING 791 Silicone Weatherproofing Sealant and DOW CORNING 790 Silicone Building Sealant have wider installation temperature ranges and are more suitable for use in cold temperatures than organic sealant technologies. All of these DOW CORNING sealants can be applied to substrates within a temperature range of -29 to 49°C (-20 to 120°F)[1]. If lower or higher application temperatures are needed, please contact Dow Corning 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. (DO NOT USE ALCOHOL-TYPE CLEANERS WITH DOW CORNING 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 Corning 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.

EIFS Application Procedures

1) Allow the EIFS coating to dry a minimum of 24 hours prior to application of the DOW CORNING sealant. Do not apply sealant to EIFS finish coat unless approved by the EIFS

[1] DOW CORNING 995 Silicone Structural Sealant can be applied at temperatures up to 140°F. Refer to the product data sheet for more information.

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 DOW CORNING 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 their system. Allow sufficient time for the solvent to evaporate prior to priming or installing sealant.
3) Lightly apply DOW CORNING® 1200 Prime Coat 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 DOW CORNING Silicone Building Sealant (Remedial Applications)

As buildings age, weatherseals must be repaired or removed and repaired. 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 Corning's recommendations for removal of existing sealants, substrate cleaning, joint preparation and installation of DOW CORNING sealants are not intended and may not be appropriate for remedial work involving existing sealants and/or joints containing PCBs or other potentially hazardous substances. If you know or suspect that the existing sealants and/or joints contain PCBs or hazardous substances, contact a knowledgeable authority on appropriate removal, handling and disposal procedures.

Follow this procedure to repair failed organic sealant with DOW CORNING 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 DOW CORNING 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/cm^2 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 DOW CORNING primer to the cleaned surfaces before installing the DOW CORNING Silicone Building Sealant.
7) Install back-up material in joints to proper design depth.
8) Apply the appropriate DOW CORNING 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 mechanical damage or otherwise and replacement is required, follow the procedures below.

Assess problem with the joint.

1. If sealant is cured properly and performing application but its appearance is poor (i.e., 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 (i.e., 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 commonly 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 and thus the reliability of long-term bond of the sealant is unpredictable. The best option that can be offered is the use of DOW CORNING 790 Silicone Building Sealant in conjunction with DOW CORNING 1200 Prime Coat. While this combination puts the minimum amount of stress on the membrane during joint movement, it cannot be relied upon for 20 years of +100-50% joint movement.

The tested membrane substrates show areas of failure at various points, but it is unknown if this is related to the stress applied to the substrate from the sealant or if it is related to irregularities in the strength of the membrane substrate. For example, at 50% joint movement, DOW CORNING 995 Silicone Structural Glazing Sealant will provide 75 psi maximum stress on the substrate (or less for some products). It is a prudent, good business practice to contact the membrane supplier to ensure their material is capable of withstanding these repeated stresses for a 20-year period. DOW CORNING 790 Silicone Building Sealant is Dow Corning's lowest modulus product and will put the least amount of stress on the substrate.

Another consideration with bitumen-based materials is the discoloration of silicone materials when in direct contact. Though often masked with black sealant, light-colored silicone materials will show changes. Refer to the additional comments in the *Compatibility Testing* section.

Resealing Cortens Steel

Dow Corning weathersealants have been known to have limited weathersealing life when applied to Cortens 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 Cortens steel-clad buildings.

This dilemma has existed for many years. Recently, Dow Corning contacted the Tnemec company to find a coating that can be applied to steel to act as a corrosion inhibitor and primer for silicone sealants. They suggested a product that they recommend for steel and sent cured samples for testing.
Dow Corning has completed a test of that material.

The material suggested by the Tnemec company was Chembuild 135-32. Dow Corning performed adhesion testing with DOW CORNING 795, 791 and 790 Sealants on Chembuild 135-32 GR that had been applied to metal panels by Tnemec. Because this is a two-part epoxy coating material, DOW CORNING 790 Sealant did not adhere to this coating; however, DOW CORNING 795 and 791 Sealant adhered excellently.

If there is an opportunity to reseal an existing Cortens steel panel-clad building, there is a probable solution using DOW CORNING 791 or 795 Sealant.

First, make contact with a Tnemec representative (www.Tnemec.com) or distributor representative to secure a sample of Chembuild 135 or another suggested product, depending on the specific situation. The coating material must be applied into joints using the Tnemec-recommended surface preparation procedure and allowed to cure for the specified amount of time. Then apply a sample of DOW CORNING 795 or 791 Sealant to the joint and check the adhesion in 7-14 days. Note: The use of DOW CORNING 790 Sealant will result in failure due to adhesion loss or cure inhibition at the bond line.

Quality Assurance – General

Product Quality

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

Skin-Over Time/Elastomeric Test

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

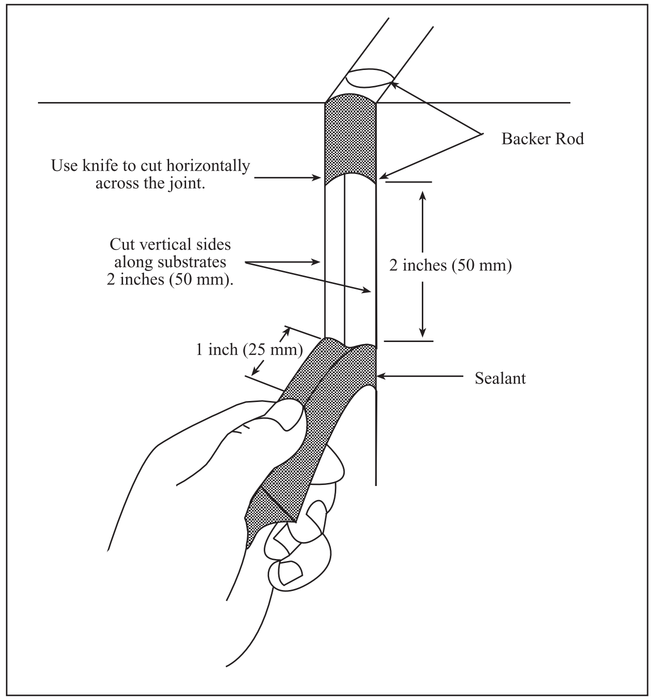
This test is performed as follows:

a. Spread a 0.04" (1 mm) film of sealant on a sheet of polyethylene or wax paper.
b. Every few minutes, touch the sealant film lightly with a tool.
c. When the sealant does not adhere to the tool, the sealant has skinned over. Note the time required to reach this point. If a skin has not formed within 3 hours, do not use this material; contact your Dow Corning Construction Field Specialist or distributor representative.
d. Allow the sealant to cure for 24 hours. After 24 hours, peel the sealant away from the polyethylene sheet. Stretch the sealant slowly to see that it has cured. If the sealant has not cured, contact your Dow Corning Project Manager or distributor representative.
e. 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 one test per 1000' (300 meters) thereafter be submitted or one test per floor per elevation. The hand pull test procedure is as follows:

Field Adhesion Test – Weatherseal Joint



a. Make a knife cut horizontally from one side of the joint to the other.
b. Make two vertical cuts (from the horizontal cut) approximately 3" (75 mm) long, at both sides of the joint.
c. Place a 1" (25 mm) mark on the sealant tab as shown in the illustration.
d. Grasp a 2" (50 mm) piece of sealant firmly just beyond the 1" (25 mm) mark and pull at a 90° angle.
e. 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.
f. 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 Corning Project Manager or Distributor Representative.
g. 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 Corning Project Manager can assist in determining when corrective action is required.
h. 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 Corning'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 e.)

Field Adhesion Hand Pull Test Criteria

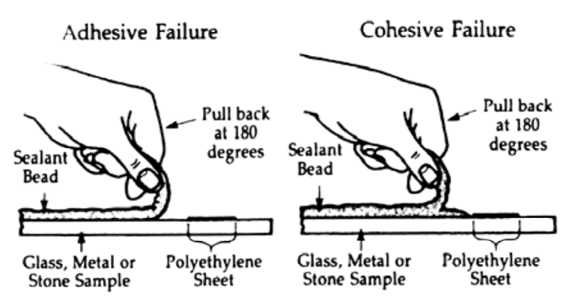
Dow Corning Building Sealant	Adhesion Requirements
DOW CORNING 790 Silicone Building Sealant	Pull tab 3" or 75 mm (300% extension) without bond loss
DOW CORNING 791 Silicone Weatherproofing Sealant	Pull tab 1½” or 38 mm (150% extension) without bond loss
DOW CORNING 795 Silicone Building Sealant	Cohesive failure: no adhesion loss
DOW CORNING 995 Silicone Structural Sealant	Cohesive failure: no adhesion loss
DOW CORNING 123 Silicone Seal	Cohesive failure of adhesive sealant: no adhesion loss
DOW CORNING 756 SMS Building Sealant	Pull tab 1½” or 38 mm (150% extension) without bond loss

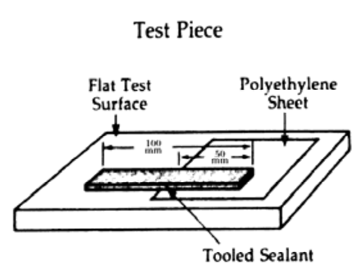
Sealant Repair in Adhesion Test Area

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 above 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 till failure. Record the mode of failure and elongation of the test sealant.

Documentation – Quality Assurance & 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 Corning and/or the local building official.

Therefore, it is suggested that this Quality Assurance logs be kept together with the project files. A hard cover logbook may be preferential to copies of the logs suggested here. A quality assurance engineer should be responsible for documenting these 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 Corning will be happy to assist you during the implementation of this quality control program. If you have any questions, contact your local Dow Corning Field Specialist or authorized building sealant distributor.

Warranty – Weatherproofing applications

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

a) the sealant product(s) are applied within stated shelf life;
b) the sealant product(s) are applied in strict compliance with Dow Corning's published or electronic application procedures, and where applicable, any project-specific written recommendations from Dow Corning;
c) 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, which is available in published or electronic form);
d) field adhesion tests are made, documented, retained and submitted to Dow Corning upon written request, as outlined in our Field Adhesion Test Procedure, in order to confirm adhesion under site conditions.

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

Dow Corning 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.

For details on how to obtain the applicable project-specific performance warranty, please consult your local Dow Corning 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 DOW CORNING Weatherproofing sealant. Reference the *Surface Preparation Guide* within this manual.
2. Field Testing documentation log book(s) show that 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 1000 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 their Dow Corning-issued warranty.

Field/Shop Adhesion Testing Log

Project								
Sealant								
Sealant: Lot #/Color/Use-By Date								
Primer (if applicable)								
Date Applied	**Applied by (initials)**	**Test Date**	**Test Location (Elevation, Unit Number, etc.)**	**Primed (Y/N) Primer Lot #**	**Sealant Color and Lot #**	**Acceptable Joint Fill (Y/N)**	**Acceptable Adhesion (Y/N) and %Elongation**	**Comments Tester Initials**

Product Quality Control Log – One-Part Silicone Sealants

Project						
Location/Elevation/Unit ID						
Sealant Color						
Date	**Time**	**Tester Initials**	**Sealant Lot Number Color**	**Tack-Free Time (Minutes)**	**Cured After 24 Hours (Y/N)**	**Elastomeric (Y/N)**

Product Quality Control Log – Two-Part Silicone Sealants

Project							
Location							
Sealant Color							
Date	**Temperature Humidity**	**Time**	**Tester Initials**	**Sealant Lot Number Base Lot Number Catalyst Color**	**Snap Time (Minutes)**	**Butterfly Test**	**Comments**

Appendix A: Cure Inhibition of DOW CORNING® 790 Silicone Building Sealant

This issue of **TECHtalk** covers the subject of the potential for DOW CORNING® 790 Silicone Building Sealant to be cure inhibited. More than any other Dow Corning Sealant cure inhibition can be a real cause for concern with DOW CORNING 790 Silicone Building Sealant. We'll talk about why, but first *let's* take a few moments to talk about this unique sealant.

DOW CORNING 790 Silicone Building Sealant

First brought to the market in 1972, DOW CORNING 790 Silicone Building Sealant was one of the first "non-acid" curing silicone sealants, thus enabling it to be used with porous substrates - something previous acetic acid curing technologies had great difficulty with. Not only does DOW CORNING 790 Silicone Building Sealant get along with porous substrates, it **LOVES** them. Part of this is its unique chemistry (more later), and part of this is that the sealant is so easily stretched that it applies very little stress on the sealant substrate bondline when the joint experiences movement.

A unique "dual" cure mechanism is what sets DOW CORNING 790 Silicone Building Sealant apart from all other sealant chemistries, including other silicone sealant chemistries. In order to create a low modulus (low resistance to being stretched) sealant, one must minimize the number of crosslinking sites along the sealant polymer chain. You can do this two ways - start with a very big, long polymer that maximizes the distance between crosslinking sites ***OR*** design a product like DOW CORNING 790 Silicone Building Sealant.

The trouble with a big, long polymer is that when it is formulated (fillers added, etc.) into a sealant it is very thick and very difficult to extrude out of a cartridge. Some manufactures get around this by adding diluting agents (sometimes called Plasticizers) to "thin out" this mixture - these diluting agents do not react into the final sealant and are free to "float" around, causing substrate staining and fluid streaking.

The DOW CORNING 790 Silicone Building Sealant approach is to start with a "regular" size polymer that will extrude from a cartridge normally, but during the process of cure the polymer "chain extends" just prior to being crosslinked. Chain extension means that one of the "curing agents" in DOW CORNING 790 Silicone Building Sealant creates a chemical bond between two or more of the polymer chains making them longer. Another agent, a different chemical, crosslinks these "elongated" polymer chains together. If this sounds complex, it is (!!) - and this is the primary reason why no other manufacture has brought a similar product chemistry to market. The absence of these "diluting agents" means DOW CORNING 790 Silicone Building Sealant will not stain most common construction substrates.

This unique curing mechanism does tend to cause DOW CORNING 790 Silicone Building 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 (except, of course, with EIFS) particularly when used against non-porous surfaces.

CURE INHIBITION

It is this unique chemistry that makes DOW CORNING 790 Silicone Building Sealant especially susceptible to cure inhibition. The complex reactions occurring in the cure process can be interfered with. A partial list of inhibiting items include:

Any alcohol – Isopropyl Alcohol (IPA), Ethyl Alcohol, Butyl Alcohol, etc.

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 DOW CORNING 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 be tested by The Americas Construction Test Lab*)* since they can inhibit the cure.

In conclusion, there is no product available in the market today that can compare to DOW CORNING 790 Silicone Building Sealant, in the short term, and most especially in the long term. It is a very unique product, when properly handled and installed it will provide its remarkable properties for a very long time.

Appendix B: Use of DOW CORNING Sealants with Weathered Lock-Strip Gasket Systems

Dow Corning 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. Dow Corning sealants were tested for adhesion in simulated fillet bead wet seal joint for several thousand hours of UV exposure and accelerated QUV weatherometer exposure. After this exposure, both DOW CORNING® 791 Silicone Weatherproofing Sealant and DOW CORNING® 795 Silicone Building Sealant have demonstrated excellent adhesion characteristics to the weathered gasket and glass.

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

- Use either DOW CORNING 791 Silicone Weatherproofing Sealant or DOW CORNING 795 Silicone Building Sealant. To minimize sealant discoloration from the gasket, use a dark-colored sealant.

- The glass and metal is to be solvent cleaned by the two-cloth wipe method in accordance with the *Dow Corning Sealant Application Guide*.

- Both the glass and gasket surface to receive sealant should be primed with DOW CORNING® 1200 Prime Coat.

- A field adhesion test should be performed prior to job start-up and/or after application to verify proper sealant adhesion in job-site conditions.

- Sealant must be installed in a fillet bead with a minimum of ¼" contact on both the glass and lock-strip gasket.

For More Information

Please visit **www.dowcorning.com/construction** for additional information.

Limited Warranty Information – Please Read Carefully

The information contained herein is offered in good faith and is believed to be accurate. However, because conditions and methods of use of our products are beyond our control, this information should not be used in substitution for customer's tests to ensure that Dow Corning's products are safe, effective, and fully satisfactory for the intended end use. Suggestions of use shall not be taken as inducements to infringe any patent.

Dow Corning's sole warranty is that the product will meet the Dow Corning sales specifications in effect at the time of shipment.

Your exclusive remedy for breach of such warranty is limited to refund of purchase price or replacement of any product shown to be other than as warranted.

DOW CORNING SPECIFICALLY DISCLAIMS ANY OTHER EXPRESS OR IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY.

DOW CORNING DISCLAIMS LIABILITY FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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DOW CORNING

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