High Performance Building

Dow Performance Silicones

DOWSIL™ 2400 Silicone Assembly Sealant

Application Guide

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Introduction

This manual is intended to provide technical information and application guidelines for the DOWSIL™ 2400 Silicone Assembly Sealant. This hot-melt adhesive is designed for auto-mated back-bedding (or front-bedding) applications in the assembly of windows, doors and skylights. DOWSIL™ 2400 Silicone Assembly Sealant becomes part of a total manufacturing productivity solution when used with standard hot-melt dispensing equipment and an automated X–Y glazing table.

This manual cannot be considered a comprehensive guide as fenestration products vary in many aspects, including design, customer requirements, manufacturing environments and end-use applications. For the purpose of this manual, any reference to windows can be considered interchangeable with doors and skylights.

Dow Technical Customer Service provides process workflows and resources to manage product and technical information inquiries from customers. These inquiries may include but are not limited to:

- Product Recommendations
- Product Troubleshooting
- Application Assistance
- Environmental, Health, Safety and Sustainability Data

Inquiries are received via e-mail or telephone:

- E-mail: construction@dow.com
- Telephone: +1 800 248 2481

Product Information

DOWSIL™ 2400 Silicone Assembly Sealant (SAS): This product is designed for use as a back-bedding (or front-bedding) sealant on most common window materials for standard and impact-resistant glazing. DOWSIL™ 2400 Silicone Assembly Sealant is compatible with common insulating glass sealants. DOWSIL™ 2400 Silicone Assembly Sealant dispenses into a clear sealant bead. It provides a 15-minute open time, instant green strength, instant primerless adhesion, and ±50% movement capability.

For more information, visit consumer.dow.com/construction for (Material) Safety Data Sheets, product data sheets and additional information on all DOWSIL™ silicone reactive hot-melt adhesive window assembly sealants.

Quality Assurance

Dow conducts quality assurance testing in its sealant manufacturing facilities that are certified in accordance to ISO 9001 and Responsible Care RC14001 requirements.

Industry Certification

DOWSIL™ 2400 Silicone Assembly Sealant is approved as a bonding, back-bedding sealant compound by the American Architectural Manufacturers Association (AAMA), and may be found on the AAMA Verified Components List. The most recent version of this list may be found on the AAMA website:

www.aamanet.org/general/1/111/verified-components

Verified components on this list are tested per AAMA 800-10, *Voluntary Specification and Test Methods for Sealants, Section 1.1, Back-Bedding Glazing Compounds.*

As of the publication date of this manual, DOWSIL™ 2400 Silicone Assembly Sealant is verified as AAMA 805.2-10, Group C back-bedding glazing compounds for certified windows and doors.

The AAMA 805.2 classification is for a pumpable and gunnable compound used to bed glass to the surrounding substrate and is intended to bond the glass to the substrate and prevent air infiltration and water penetration. The 805.2 compounds cure relatively hard and stiff and permit limited movement without loss of bond. The performance requirements for the 805.2 classification include:

- **Hardness**: When tested in accordance to ASTM C661, the Shore A hardness shall not exceed 70 durometer.
- **Thin Film Integrity**: There shall be no presence of voids within the 805.2 compound when tested in accordance to AAMA 800-10, Section 2.3.
- **Peel Strength**: When laboratory tested for peel adhesion (modified ASTM C794), 805.2 compounds shall exhibit peel strengths of at least 12.5 pli (lb per inch of width).
- **Failure Mode**: When laboratory tested for peel adhesion (modified ASTM C794) or, alternatively, lap shear (modified ASTM C961), Group C shall demonstrate predominantly cohesive failure (> 90%). Group A is limited to chemically curing sealants which demonstrate adhesive failure but which have been shown to provide acceptable field performance.
- **Vehicle Migration**: There is no vehicle migration from an 805.2 compound edge when tested in accordance with a modified ASTM D2203 (AAMA 800-10, Section 2.8.1).
- **Low Temperature Flexibility**: 805.2 compounds shall have no cracks and/or loss of adhesion from the test panel when tested in accordance with a modified ASTM C734 (AAMA 800-10, Section 2.9.1).
- **Water Resistance**: 805.2 compounds shall demonstrate no presence of voids, cracks, separation or breakdown when tested in accordance to AAMA 800-10, Section 2.11.1.

Substrate Selection

DOWSIL™ 2400 Silicone Assembly Sealant is suitable for back-bedding applications utilizing, but not limited to, the following substrates:

- Aluminum
    - Anodized
    - Mill Finished
    - Fluoro-based Coatings
    - Polyester-based Coatings
- Fiberglass
- Glass
- Polyvinyl Chloride
- Wood
    - Primed or Unprimed
    - Treated

Adhesion

DOWSIL™ 2400 Silicone Assembly Sealant is designed to exhibit excellent adhesion to common substrates over a wide temperature range and does not require surface priming. Substrates may be subject to further treatment and coating to enhance durability. All substrates should be tested as part of the sealant selection process. Consult a Dow application engineer when substrates change or non-typical finishes are specified.

The Dow test laboratory located in Midland, Michigan offers a variety of capabilities to ensure that a particular sealant will meet a customer's design requirements for the window application. The adhesion of Dow products to a customer-specific substrate is evaluated using a modified version of ASTM C794 *Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.*

Material Compatibility

The Dow test laboratory conducts compatibility testing according to ASTM C1087 Standard Test Method for *Determining Compatibility of Liquid-Applied Sealants with Accessories* used in structural glazing systems. In addition to the suitability of substrates for adhesion, components such as setting blocks, weather stripping, gaskets and other window accessory materials must be compatible with DOWSIL™ brand sealants. Chemical incompatibilities between materials may result in discoloration, loss of adhesion and/or inhibit the cure of the silicone sealant.

Silicone weather seals, silicone insulating glass sealants, butyl tape, and vinyl extrusions are typically found to be compatible with DOWSIL™ 2400 Silicone Assembly Sealant with no discoloration or cure inhibition.

Other materials, such as ethylene propylene diene monomer (EPDM) rubber, neoprene, Santoprene, Kraton and other similar organic materials are typically found to cause slight discoloration of light-colored sealants. These materials are usually approved for incidental contact with glazing-type silicones of all colors; but pigmented sealants may be preferable if the sealant line is visible or if any potential discoloration needs to be masked.

Contact a Dow application engineer for questions regarding compatibility and testing. Standard tests require four weeks from receipt of test samples. Dow can accommodate non-standard tests with sufficient lead times, which may be subject to a service fee. Test reports from Dow should not be interpreted as approvals.

Shelf Life and Storage Conditions

It is important to use any DOWSIL™ product within its recommended shelf life. The expiration date (EXP DATE) is clearly displayed on the packaging label. DOWSIL™ 2400 Silicone Assembly Sealant should be stored in its original, unopened container in a clean and dry environment below 90°F (32°C). It has a shelf life of 12 months from the date of manufacture when stored below 90°F, and is packaged in air-tight containers because of its reactivity to atmospheric moisture.

Sealant Design Considerations

Properly installed and fully cured back-bedding sealants allow the window unit to hold up to a wide range of weather conditions and pass design pressure testing. The sealant serves a primary purpose as a weatherseal to prevent air infiltration and water penetration. The sealant is designed to adhere and absorb stresses between the window sash and the glass as a consequence of movement from thermally induced expansion or contraction and wind loads. The movement capability of a fully-cured sealant helps absorb these stresses, rather than distribute them throughout the window unit to other components, such as the glass.

The glue-line thickness of a cured sealant must be designed to accommodate joint movements due to differences in the thermal expansion of the different materials in the window unit. The joint bite – the minimum width or contact surface of the sealant on both the window sash and glass – must be designed to accommodate both dead loads and dynamic loads such as from thermal fluctuations, wind or impact. In all cases, opposite-side mechanical supports such as glazing beads are required as the products in this manual are not considered structural sealants as defined by ASTM C1184 *Standard Specification for Structural Silicone Sealants.*

Cure Requirements

All DOWSIL™ one-part window sealants cure by reacting with moisture in the atmosphere. The rate of cure depends on the diffusion of atmospheric moisture through the interface of the exposed sealant within the sealant joint. Therefore, one-part sealants cure from the outside surface inward. The rate of moisture diffusion is affected by several factors including:

- **Partial Pressure of Water Vapor**: This depends on temperature and humidity in the immediate surroundings, and is the driving force for diffusion. Increasing temperature without changing the water content in the atmosphere (such that the relative humidity decreases) will not accelerate cure.
- **Dimensions of the Sealant Joint**: The diffusion rate of moisture obeys Fick's law and is proportional to the square root of time. Therefore, the length of time needed for the one-part sealant to fully cure increases significantly with an increasingly deeper sealant joint.
- **Joint Configuration or Joint Design**: Areas such as corner keys and windows with tight clearances may not afford one-part sealants with sufficient exposure to atmospheric moisture, and tight clearances with little access to the atmosphere will slow the cure process. Conversely, porous substrates will interfere less with the cure process and small amounts of absorbed moisture (such as with wood substrates) may accelerate the cure process.
- **Sealant Composition**: Silicones are more permeable than organic materials. Silicone sealants are formulated with inorganic fillers to improve mechanical strength, which decrease the moisture diffusion rate. This decrease will depend on the type and the amount of filler in the sealant.

DOWSIL™ 2400 Silicone Assembly Sealant provides instant green strength. Green strength can be described as the initial shear strength before the sealant starts to exhibit sufficient cure that, in turn, builds mechanical and adhesion strength. The green strength of this hot-melt adhesive will reduce hold times in the window assembly process necessary for sufficient cure to occur.

While sealant green strength does allow for improved manufacturing throughput, care should still be taken to ensure window units are not allowed to rack during the packaging or shipping process. If the sealant is not fully cured, units that become out-of-square can set into this distorted shape due to the racking forces overcoming the green strength of the material.

Determining and Maintaining Sealant Joint Dimensions

***Note:** It is the responsibility of the window manufacturer to determine the appropriate bead size that will deliver the necessary joint dimensions for each product design, joint configuration and application based on the sealant properties provided in the product data sheet. It is incumbent on the window manufacturers to rely on their experience and to validate product design by performing the necessary unitized industry tests.*

Glue-line thickness is defined as the sealant thickness necessary to absorb movement expected between the window sash and the glass due to climatic-induced loads. To determine glue-line thickness, the first step is to identify the direction and magnitude of the movement. The sealant generally undergoes the most movement in the direction of the longest dimension of the window.

As a basis for determining the appropriate glue-line thickness when using DOWSIL™ 2400 Silicone Assembly Sealant, it is recommended to start with a 3/16-inch (5 mm) nominal bead diameter. The initial bead diameter will contract by approximately 6% in volume as it cools down from its recommended dispensing temperature. This bead diameter, assuming no squeeze out, results in a typical bite (contact width) of approximately 1/2 inch (13 mm), and a compressed sealant glue-line thickness of approximately 0.055 inch (1.3 mm). While DOWSIL™ 2400 Silicone Assembly Sealant may in some applications exhibit sufficient stiffness between the window sash and the insulating glass (IG) unit, this behavior cannot be solely relied upon to maintain glue-line thickness. Bumpers, such as those used in aluminum applications, and/or glazing legs, such as those seen in vinyl and wood applications, are required to maintain the appropriate glue-line thickness and to minimize excessive squeeze out. Dow recommends glue-line thickness requirements be assessed by conducting movement capability tests and/or finite element analysis for each window design.

Attention should next be given to the application process to verify that a sufficient, uniform and consistent bead is applied around the entire perimeter of the glazing leg with no skips, thin spots or shallow areas. If the application equipment is not robust enough to ensure a consistently applied minimum glue-line profile (bite and thickness) according to design calculations, a safety factor should be applied to increase the overall bead size so that the design requirements are met in worst-case situations or locations.

Care should also be taken in the dispensing process to ensure the glue-line thickness does not fall below the design requirement. Excessive sealant compression after bedding the glass and installing opposite-side glazing beads may reduce the glue-line thickness such that severe climatic induced movements may exceed the sealant's movement capability. Wood, vinyl and fiberglass sash profiles typically have glazing dams to establish and maintain the design glue-line thickness. It is unacceptable for glass to make contact with aluminum sash profiles such that tapes and bumpers are occasionally used to ensure and maintain the appropriate glue-line thickness. Regardless of the method to maintain glue-line thickness, the main takeaway should be that a definable thickness is required to allow the sealant to perform its designed functions.

Glue-line Thickness and Joint Movement Calculations

A properly designed glue-line thickness will facilitate the assembly process of window units and minimize stresses on the sealant joint and interfaces resulting from movements due to thermal expansion and wind loads. Glazed windows undergo expansion and contraction movements due to diurnal temperature cycles, heat traps, wind loads and proximity to heating and air conditioning vents. The glue-line should be designed to accommodate these movements in order to minimize stress and prevent the glass from breaking.

Thermally-induced movement may be estimated for any window sash profile or IG unit if its length (longest dimension), composition and linear coefficient of thermal expansion (CTE) are known. Linear CTE values for typical window sash materials in the proximity of 77°F (25°C) are listed in Table 1.

The maximum thermal movement (expansion or contraction) for a particular material from a change in temperature ΔT can be calculated as follows:

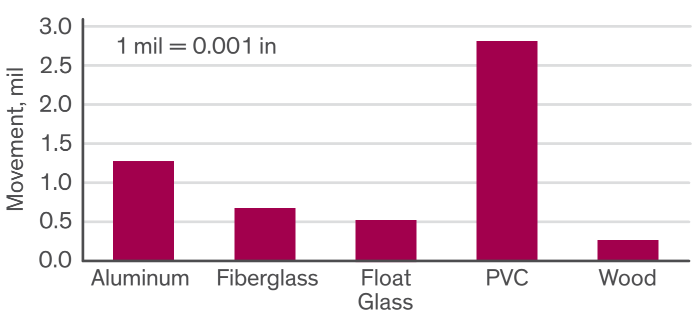
Movement (in) = Length (in) × CTE (in/in·°F) × ΔT (°F)

Figure 1 compares the movement, either contraction or expansion, for every 10 lineal inches of typical window materials resulting from a 10°F (5.6°C) change in temperature using the average linear CTE data from Table 1.

Table 1: Linear coefficient of thermal expansion for typical window sash materials

Material	Linear Thermal Expansion Coefficients	
	10^{-6} in/in·°F	10^{-6} m/m·K
Aluminum	12.3-13.2	22.2-23.8
Fiberglass	6.5	11.7
Float Glass	5.0-5.1	9.0-9.2
PVC	28	50.4
Wood	2.1-3.0	3.8-5.4

Figure 1: Movement for every 10 lineal inches of typical window materials due to a 10°F (5.6°C) change in temperature



Determining Thermally-induced Differential Movement

Glazed windows undergo expansion and contraction movements due to diurnal temperature cycles, heat traps and proximity to heating and air conditioning vents. The glue-line should be designed to accommodate these movements to minimize stress and prevent the glass from breaking. Thermally-induced differential movement may be estimated for any window sash profile and IG unit if its length (longest dimension), composition and CTE are known. CTE values for typical window sash material compositions in the proximity of 77°F (25°C) are listed in Table 1.

The largest magnitude of thermal movement is typically in the vertical direction because IG units are almost always supported on the bottom by setting blocks, and because aspect ratios are such that windows are typically taller than they are wide. The thermally-induced movement in the vertical direction δ_v may be estimated by the following formula where h is the height of the window unit; CTE_{sash} and CTE_{glass} the linear CTE of the window sash and glass lite, respectively; and ΔT_{sash} and ΔT_{glass} the differential temperature of the window sash and glass lite, respectively, relative to when the window unit was assembled during the manufacturing process.

$$\delta_v = h \cdot (CTE_{sash} \cdot \Delta T_{sash} - CTE_{glass} \cdot \Delta T_{glass})$$

Assuming a window is free to expand and contract in both horizontal directions from its centerline, thermally induced movement δ_w experienced by the sealant across the width from the centerline of the window may be estimated by the following formula where w is the width of the window unit.

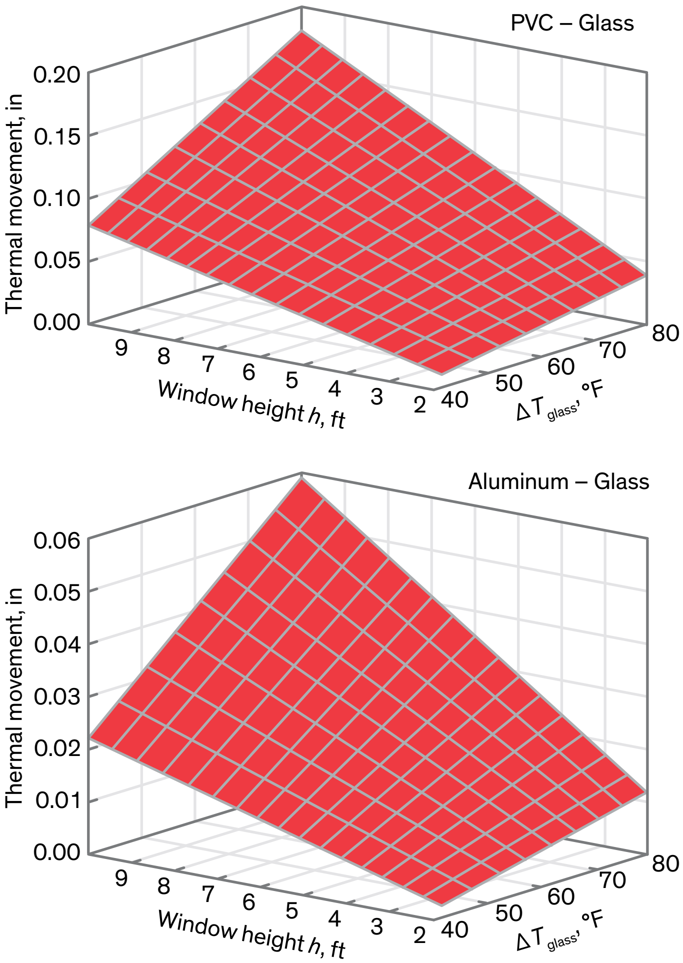
$$\delta_w = (w/2) \cdot (CTE_{sash} \cdot \Delta T_{sash} - CTE_{glass} \cdot \Delta T_{glass})$$

In determining thermally-induced movement in a window unit, the designer seeks the result with the higher magnitude for the purpose of calculating the glue-line thickness. Unless the width of the window unit is more than twice its height, in almost all cases the movement in the vertical direction is going to be the value of higher magnitude.

Sample Calculations

A window manufacturer is assembling a series of windows intended for use in an environment where the expected maximum and minimum temperatures are 140°F (60°C) and –15°F (–26°C), respectively. The factory where the units are manufactured is maintained at 65°F (18°C). Therefore, the temperature differential is greatest during the cold condition, (65°F – (–15°F) = 80°F). Because the IG unit has insulating capability, it is expected to be warmer than the window sash. Figure 2 shows the resulting movement for different window heights when ΔT_{glass} is varied from 40°F to 80°F. The temperature of the window sash, either PVC (top graph) or aluminum (bottom graph), is assumed to be 10°F (5.6°C) cooler.

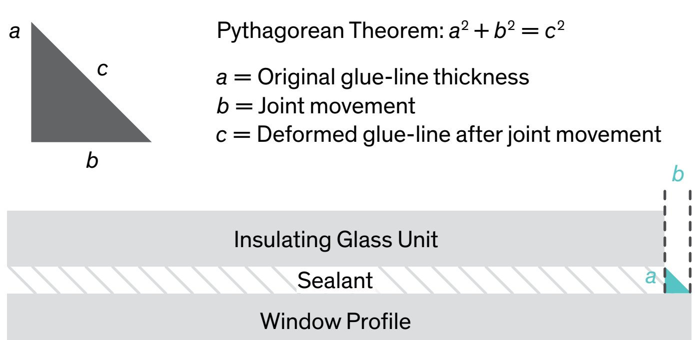
Figure 2: Thermally-induced movement as a function of window height and ΔT_{glass} where ΔT_{sash} is assumed to be 10°F cooler



Determining Sealant Glue-line Thickness

The required glue-line thickness a for a differential movement b can be calculated using the Pythagorean Theorem (Figure 3).

Figure 3: Schematic diagrams for the dimensions used to calculate movement in the joint configuration.



Likewise, the allowable movement b for a particular glue-line thickness a can be calculated. The deformed glue-line dimension c will be limited by the movement capability of the sealant undergoing shear in the joint configuration.

Sample Calculations

Joint movement:

- For a 3 ft × 5 ft glass lite fixed at the sill and a temperature change of 40°F over the course of a 24-hour day, the glass (CTE ~ 5.1×10^{-6}/°F) will exhibit a maximum joint movment b of:

$$5 \text{ ft} \cdot (12 \text{ in/ft}) \cdot 5.1 \times 10^{-6} \text{ in/in} \cdot °\text{F} \cdot 40°\text{F} = 0.012 \text{ in}$$

- A vinyl sash profile (CTE ~ 28×10^{-6}/°F) will expand by 0.067 in from an increase of 40°F
- Differential movement b is 0.067 – 0.012 = 0.055 in

Sealant movement:

- For a differential movement b = 0.055 in, a back-bedding sealant with an initial glue-line thickness of a = 0.05 in will deform to the following dimension:

$$c = \sqrt{(0.050)^2 + (0.055)^2} = 0.074 \text{ in}$$

- The total movement of this glue-line profile due to a 40°F change in temperature is:

$$\frac{0.074 - 0.050}{0.050} \; 100\% = 48\%$$

Consult the product data sheet for the movement capability rating of any back-bedding sealant to determine if the glue-line thickness to be used is suitable for the design of the window unit.

Following ASTM C719 *Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle)* protocol, the movement capability for DOWSIL™ 2400 Silicone Assembly Sealant is ±50%. Using the relationship between a and c as it relates to movement capability M, the maximum value for c can be determined.

$$c = a(1+M/100\%)$$

Therefore, $c = 1.5a$ for a back-bedding sealant rated with ±50% movement capability, and the minimum glue-line thickness that will be able to accommodate a maximum allowable movement b due to a change in temperature is:

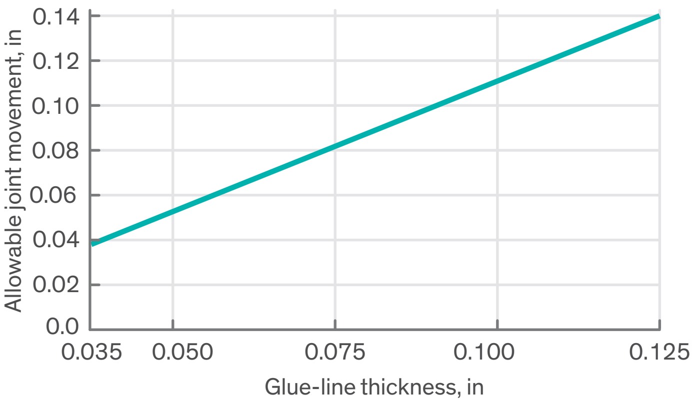
$$a = \sqrt{b^2/1.25}$$

Figure 4 shows the effect of glue-line thickness a on the maximum allowable movement b for a back-bedding sealant rated with ±50% movement capability.

Movement direction should also be taken into consideration. In the worst case scenario, thermally-driven movement will occur in one direction due to setting blocks preventing any downward movement of the IG unit. In a system where the IG unit is not supported by setting blocks, the IG unit may move in both directions.

Some variability in the window sash surface flatness should be anticipated. The process equipment that extrudes the sealant bead can also be expected to demonstrate variability. Hence, a minimum glue-line thickness of 0.035 in (0.9 mm) should be observed regardless of the calculations.

Figure 4: Allowable joint movement as a result of a change in temperature as a function of the glue-line thickness of a back-bedding sealant rated with ±50% movement capability



Bite Calculation for Wind Load

Aside from thermal stresses, the bond should be able to accommodate dynamic loads due to wind, impact from flying objects or normal operation of windows. The following procedures can be applied to calculate the minimum bite (contact width) necessary to simultaneously withstand both the weight of the IG unit and any wind load.

***Note**: The provided bite calculations are guidelines and each window manufacturer should decide if additional structural support is needed to retain the IG unit based on knowledge of the specific finished product and intended application.*

The minimum sealant bite *w* necessary to resist a given wind load can be approximated using the following formula where *w* and the shorter dimension of a rectangular IG unit have the same unit of length (in or mm), and wind load and stress have the same unit of pressure.

$$w = \frac{\text{Shorter dimension of IG unit} \times \text{Wind load}}{2 \times \text{Maximum allowable design stress}}$$

The maximum allowable design stress for DOWSIL™ 2400 Silicone Assembly Sealant is 20 psi (0.14 MPa) under short durations such as normal wind loads. For a 6 ft × 8 ft IG unit with an applied wind load of 40 psf, the sealant bite dimension will be:

$$w = \frac{6\text{ ft} \times 12\text{ in/ft} \times 40\text{lb}_f\text{/ft}^2 \times 1\text{ ft}^2\text{/144 in}^2}{2 \times 20\text{ psi}} = 0.50\text{ in}$$

To anticipate bead size variability during sealant bead extrusion, regardless of the calculation output, a minimum bite of 3/8 in (9.5 mm) should always be observed.

Bite Calculation for Dead Load

The weight of the IG unit acts as a dead load for the sealant bond when a window is opened. The following formula can be used to calculate the minimum bite dimension *w* to accommodate this dead load where the weight of the IG unit is based on a glass density of 0.090 $\text{lb}\cdot\text{in}^3$ (2500 $\text{kg}\cdot\text{m}^3$) and gravitational acceleration is 386 $\text{in}\cdot\text{s}^{-2}$ (9.81 $\text{m}\cdot\text{s}^{-2}$).

$$w = \frac{\text{Weight of IG unit} \times \text{Gravitational acceleration}}{\text{Perimeter of IG unit} \times \text{Max allowable design stress}}$$

For example, the maximum allowable design stress for a constant or long-term load for DOWSIL™ 2400 Silicone Assembly Sealant is 1.0 psi (0.007 MPa). For a 3 ft × 5 ft IG unit (192-in perimeter), the minimum bite dimension for a dead load of 50 lb_f is 0.26 in (6.60 mm).

In almost all applications, the IG unit should be supported on the bottom by appropriately placed setting blocks per industry accepted practices found in the Glass Association of North America (GANA) Glazing manual. Where IG units are supported by setting blocks, the sealant does not experience any dead load and only experiences dynamic stresses such as thermal and wind loading conditions.

Setting Blocks

Setting blocks are almost always required by window industry IG manufacturers. Always ensure setting blocks in contact with DOWSIL™ 2400 Silicone Assembly Sealant have been tested and approved for chemical compatibility. The primary function of setting blocks is the support of both the inboard and outboard lites of glass on the same horizontal plane. This ensures a shearing stress does not occur due to one of the lites being supported only by the IG sealant system. Excessive loading onthe IG sealant system may lead to failure of the IG seal and ultimately IG failure. By supporting the IG unit along the bottom with a minimum of two setting blocks, vertical loads in the IG unit are transmitted entirely to the window sash for support. However, this practice results in the thermally induced movement of both the window sash and glass to be in the vertical direction. Since most windows have aspect ratios where height exceeds width, this movement is usually the greater in the vertical dimension (height).

Typical Yield

The amount of DOWSIL™ 2400 Silicone Assembly Sealant required to meet a target manufacturing number of window units will depend on the bead size of the sealant and the perimeter length of the unit. Once bead size and glue-line thickness are established by the window manufacturer, Table 2 can be used as a guide to estimate the lineal coverage of a gallon of sealant for different bead sizes. The number of identical window units that can be manufactured per gallon of sealant can then be calculated if the perimeter length of the window unit is known.

Table 2: Effect of bead size on lineal coverage per gallon of sealant

Initial Bead Size,[1] inch		Linear Coverage per Gallon[2]	
		inches	feet
1/8	0.125	18,800	1,500
3/16	0.188	8,400	660
1/4	0.250	4,700	380
3/8	0.375	2,100	170

[1] Based on a circular cross-section
[2] Calculated with consideration to waste due to start-up and purging

Application

Safe Handling Instructions

Before handling DOWSIL™ 2400 Silicone Assembly Sealant, review the product and safety data sheets and the container label for safe use, physical and health hazard information. Any exposure of opened containers to air is discouraged because this product will react with moisture in the atmosphere and begin to cure on the material surface. The presence of local exhaust ventilation should be discussed with your safety department. Be aware that air drafts from ventilation systems in the proximity of the dispensing nozzle may affect its temperature, which will in turn impact bead size consistency and sealant wet-out on the window sash.

The product and safety data sheets are available from consumer.dow.com. Copies may also be obtained from your local Dow sales representative or distributor.

Refer to “In-shop Application” under dispensing equipment for recommendations on the safe operation of the bulk melter.

Volatile Organic Content (VOC)

- Non-hazardous formulation
- Low VOC < 24 g/L (exempt from California VOC regulations)

Product Handling Precautions

DOWSIL™ 2400 Silicone Assembly Sealant is generally dispensed around 248°F (120°C). The use of personal protective equipment to prevent contact of hot material or hot equipment surfaces with skin or eyes is recommended.

Safety Instructions

Safety instructions contained in this manual apply to tasks that may be performed with DOWSIL™ 2400 Silicone Assembly Sealant. It is important that these safety instructions are followed to protect employees, operators, and equipment.

- Become familiar with and follow all safety instructions prescribed by your company, general accident prevention regulations and government safety regulations.
- Become familiar with and follow all safety instructions prescribed by the equipment manufacturers.
- Schedule periodic safety inspections to ensure required material and equipment practices are followed.
- Provide appropriate emergency and first-aid equipment in the production workspace.

Recommended Personal Protective Equipment

Product and dispensing system are both hot and pressurized.

- Safety glasses with side shields or goggles
- Cut-resistant gloves when handling scrapers or deglazing tools
- Glass handling jackets and/or sleeves
- Heat-resistant gloves to protect against burns when working with hot materials and equipment
- Steel-toed shoes when handling product containers and window units

Quality Control

Customers should examine the expiration date (EXP DATE) displayed on the packaging label to verify the product is within its shelf life. DOWSIL™ 2400 Silicone Assembly Sealant has a shelf life of 12 months when stored in a properly sealed, air-tight container at temperatures below 90°F (32°C). The product should be inspected for traces of cure upon opening the container for the first time; refer to the section *Determination of Cure State*. Any attempt to pump cured material will impact bead quality and could eventually lead to pump deterioration and malfunction.

Determination of Cure State

Dow packages its products in containers that are properly sealed, but events may occur, such as mishandling of containers, that may compromise the integrity of the seal. A compromised seal may allow air ingress into the container.

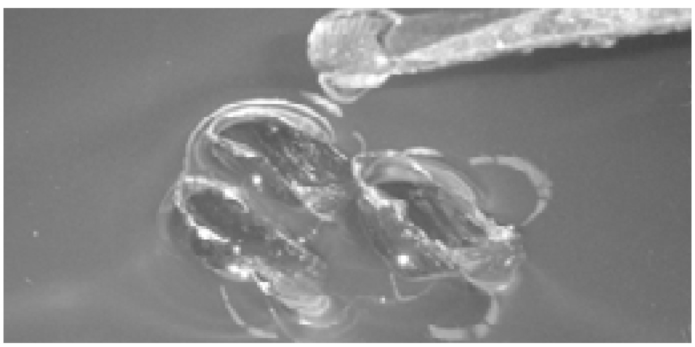
The moisture in the air will produce the detrimental effect of curing the surface of the product before it can even be dispensed by the customer.

DOWSIL™ 2400 Silicone Assembly Sealant does not change in appearance before, during or after it is fully cured. The product undergoes a change from a gum-like consistency in the uncured state at room temperature to a cross-linked rubber-like material when cured.

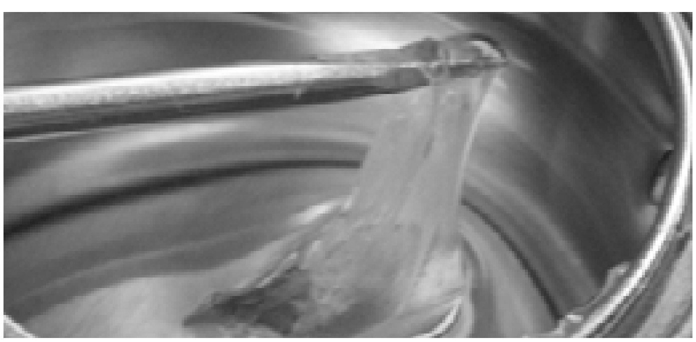
To ensure that DOWSIL™ 2400 Silicone Assembly Sealant can be pumped, a pick test was developed to determine if the surface of the product in its container is cured (Figure 5).

Using a screwdriver or similar tool, stab the surface of the hot-melt product and attempt to 'pick' up (remove) a portion of the material. The top photograph in Figure 5 shows what will happen if the product is uncured: the screwdriver head is able to pick up a small amount of material as the screw-driver is pulled quickly away from the surface. The bottom photograph shows what will happen if the product is cured at the exposed surface: the small amount of material that is picked up by the tool will resist separating from the bulk in the container. Any occurrence of cure in the container will not allow the product to be properly pumped and dispensed.

Figure 5: Determination of the cure state of DOWSIL™ 2400 Silicone Assembly Sealant using a pick test



Good – Acceptable
Uncured product is gummy, separates easily and remains on the tool when pulled away from the surface.



Reject – Unacceptable
Cured product displays rubbery features, stretches and resists separation when pulled away from the surface.

Substrate Preparation

DOWSIL™ 2400 Silicone Assembly Sealant does not require primers to promote adhesion to common fenestration substrates. Special surface preparation procedures, such as solvent wiping, are usually not required when applied to clean, dry substrates. The window manufacturing process should therefore be set up in a manner wherein the window sash and IG are kept clean and free of dust and debris prior to the sealant being applied. It is recommended to clean the substrate when in doubt.

When a cleaning solvent is used, the proper choice of solvent is an important part of the surface preparation requirements for substrates that are to be bonded. Cleaning solvents differ in effectiveness in removing contaminants. Be aware that the use of aggressive solvents like methyl ethyl ketone can adversely affect finishes such as polyester powder-coated aluminum. Milder cleaning solvents such as isopropyl alcohol (IPA) and high-quality (greater than 98% purity) white/mineral spirits can be used without damaging the substrate surface.

Before bedding an IG unit, the glass edge of the outer pane must also be prepared for bonding. This entails ensuring the glass edge is clean and dry. The IG unit should be free of any cutting oils, grease, dirt and other forms of contamination which might otherwise prevent proper adhesion and adversely impact the long-term durability of the bond.

Dow recommends checking with the substrate supplier and IG manufacturer for the compatibility of cleaning solvents. Always follow manufacturer/supplier safe handling recommendations as well as local, state and national regulations.

In-shop Application

Dispensing Equipment

DOWSIL™ 2400 Silicone Assembly Sealant is designed for dispensing from automated, high-volume bulk melters (or hot-melt pumping systems) for 5-gallon/20-liter or 55-gallon/200-liter containers in conjunction with automated robotic or hand-assist equipment. Dow can provide engineering assistance in the design of a delivery system. Equipment suppliers of bulk melters typically provide design, installation, operation and maintenance training.

Hot-melt pumps can be run either under constant flow or constant pressure. Dispensing product under constant pressure usually leads to more consistent flow. However, this can lead to slight variations in flow when changing containers due to batch-to-batch viscosity variations. To maintain constant volumetric flow, the best solution is to run the hot-melt pump at constant pressure and to install a metering (gear) pump just before the nozzle. The volumetric output depends on temperature and can be adjusted with the help of the equipment supplier and Dow technical service personnel during the start-up phase.

The hose is an important component of a pump and gun delivery system. The planning and design of the production area where the sealant will be applied should be first taken into consideration before selecting the appropriate hose length and diameter. Hoses should be designed to be as short in length and as small in diameter as possible, and must not have so much of a pressure drop so as to starve the delivery of material at any point during the dispensing phase. Hoses that are too long and too large in diameter can make maneuvering the gun or dispensing head difficult. Longer hoses require higher pressures to maintain target flow rates, and increase radiant heat loss.

Air flow around the dispensing nozzle will be much cooler than the hot-melt material exiting the nozzle. Variations in ambient temperature may affect bead consistency unless the nozzle is heated or the nozzle has enough bulk to maintain a reasonably consistent temperature.

Glazing Table

An automated X–Y glazing table is the most efficient method for applying glazing sealants to maintain bead consistency, reduce labor and minimize waste. Consult your Dow sales representative for contact information for manufacturers of melter and table equipment. Automated glazing tables apply sealant in the most consistent manner, but problems can occur. Routine operational audits and preventive maintenance schedules can help ensure consistent sealant delivery.

To assist with sealant application filling issues, it is good practice to have a compatible silicone sealant available in cartridge form that can be dispensed using a caulk gun for remedial glazing, or supplement sealant to thinly applied, shallow or skipped areas of the glazed unit prior to bedding the glass. DOWSIL™ 1199 Silicone Glazing Sealant Clear, DOWSIL™ 9-1350 Silicone Glazing Sealant or DOWSIL™ 791 Silicone Weatherproofing Sealant can be used in such situations.

Manufacturing Process Conditions

DOWSIL™ 2400 Silicone Assembly Sealant depends on moisture in the atmosphere to completely cure the sealant bead even though this product provides instant green strength. The atmosphere in the manufacturing and any staging areas should have a minimum relative humidity of 30% and preferably 50-60%. The cure rate of these products will be affected as temperature and relative humidity vary due to normal seasonal fluctuations.

The temperature around the glazing process should be within 65°F (18°C) and 90°F (32°C). Colder temperatures will reduce cure speed and adhesion development. Hotter temperatures will initially reduce green strength and may promote squeeze out; however, cure speed may increase.

The surface temperatures of the glass and window sash must not fall substantially below the recommended manufacturing process temperature. Lower temperatures may lead to condensation or wet substrate surfaces which may influence bead quality or inhibit cure.

The manufacturing environment should be dust free.

Dispensing Temperatures

The dispensing temperature is critical for the proper application of DOWSIL™ 2400 Silicone Assembly Sealant. Figure 6 shows the effect of temperature on the hot-melt viscosity of this product, which should not be exposed to sustained temperatures above 285°F (140°C).

Figure 6: Effect of dispensing temperature on the hot-melt viscosity of DOWSIL™ 2400 Silicone Assembly Sealant (1,000 cP = 1,000 mPa·s = 1 Pa·s)

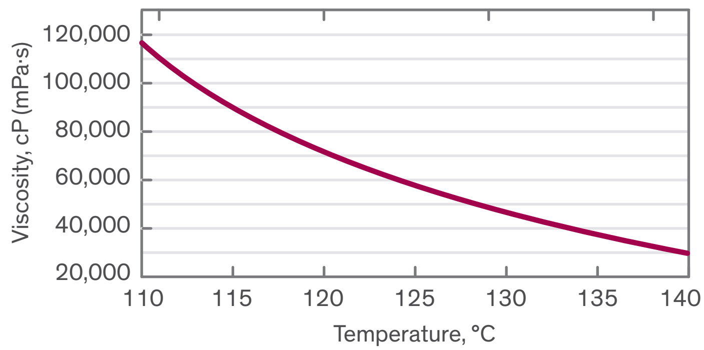


Table 3 lists recommended temperature ranges for different zones in the bulk melter and is between 239°F (115°C) and 266°F (130°C). The smaller volume zones closer to the nozzle may be set at higher temperatures to increase flow at the nozzle but should not exceed 285°F (140°C). The nozzle temperature may need to be set higher than zone temperatures but should not exceed 285°F (140°C) depending on air drafts and heat losses from the uninsulated metal nozzle. This is generally acceptable since the residence time of the hot melt flowing through the nozzle is relatively short. Maintain nozzle temperatures at the lowest possible temperature which produces consistent hot-melt flow and bead dimensions.

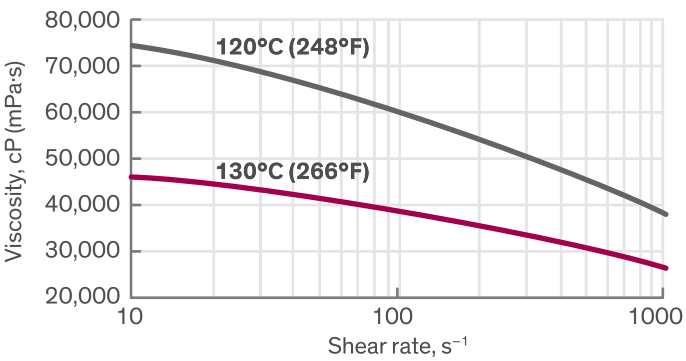
Table 3: Recommended zone temperatures for hot-melt unloader

Zone	Temperature	
	°F	°C
Platen	240 – 266	115 – 130
Hose	240 – 266	115 – 130
Gun body/valve	240 – 266	115 – 130
Metering pump	240 – 266	115 – 130
Nozzle[1]	248 – 285	120 – 140

[1] May exceed 266°F (130°C) depending on drafts, ambient temperature and heat loss through the nozzle.

Take advantage of any equipment operational safety feature that will protect the product from overheating. This will also extend the service life of o-rings and seals used in the dispensing equipment. The hot-melt viscosity of DOWSIL™ 2400 Silicone Assembly Sealant will also depend on shear rate, which is proportional to the volumetric flow-rate coming out of the nozzle. Figure 7 shows how the hot-melt viscosity changes with shear rate at 120°C (248°F) and 130°C (266°F). For the sealant bead sizes listed in Table 2, the shear rate can be expected to vary between 10 and 200 s^{-1} in the hose and between 100 and 1,000 s^{-1} in the nozzle.

Figure 7: Effect of shear rate on the hot-melt viscosity of DOWSIL™ 2400 Silicone Assembly Sealant at 120°C and 130°C. 1,000 cP = 1,000 mPa·s = 1 Pa·s



Dispensing Too Hot

Caution: *Maintaining the material at temperatures over 266°F (130°C) over extended periods of time may have the following detrimental effects:*

- Reduced tackiness
- Bead dragging around the corners
- Bubbles in sealant
- Reduced pot life
- Excessive fluidity

Dispensing Too Cold

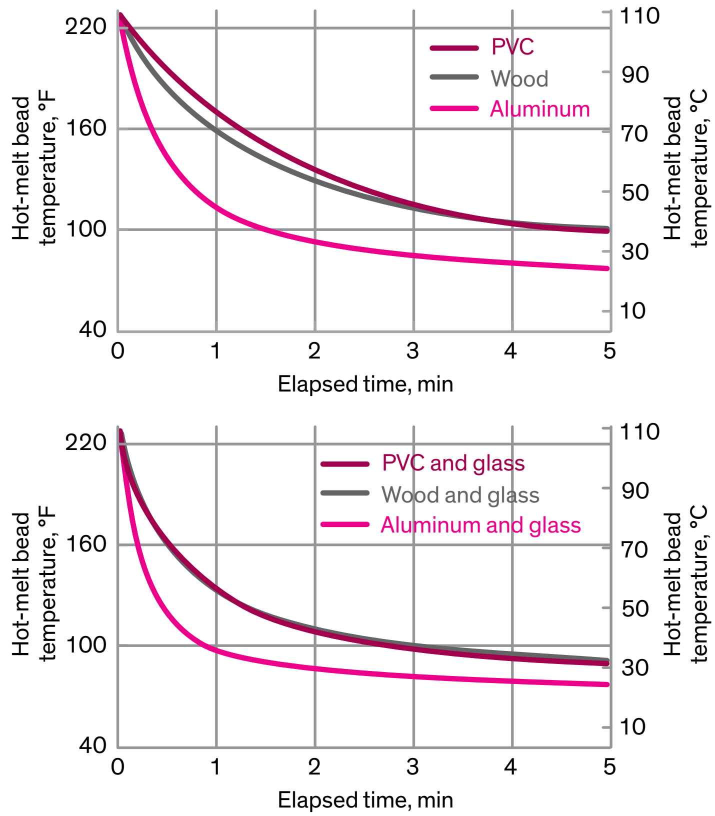
Operating at too low a temperature will increase the viscosity, leading to predictable problems:

- Difficulty pumping
- Uneven flow from nozzle
- Build-up of material on the side of the nozzle causing offset dispensing
- Stringiness behind the nozzle

Drafts or atmospheres lower than typical room temperatures [65°F (18°C)] may contribute to adverse dispensing performance at the nozzle tip.

After DOWSIL™ 2400 Silicone Assembly Sealant has been dispensed at 248°F (120°C), it will take approximately five minutes for the bead to cool down to ambient temperatures. Figure 8 shows typical changes in bead temperature as a function of time elapsed after wetting out typical window sash substrates. The temperature profile depends on the thermal conductivity of the substrate(s); for example, wood and PVC (and silicones) have similar thermal conductivities (~ 0.2 $W \cdot m^{-1} \cdot K^{-1}$) compared to window glass (~ 1 $W \cdot m^{-1} \cdot K^{-1}$) and aluminum (~ 200 $W \cdot m^{-1} K^{-1}$).

Figure 8: Typical changes in bead temperature as a function of time elapsed after wetting out typical window sash substrates (top) and when squeezed between substrate and glass (bottom)



Glazing Process

- Open time is defined as the maximum elapsed time after dispensing the sealant for completing all manufacturing steps on each unit. DOWSIL™ 2400 Silicone Assembly Sealant provides up to 15 minutes open time at room temperature. This allows processing flexibility and robust manufacturing options. The 15-minute open time allows the glass to be realigned or reworked during installation, and allows installation of setting blocks and spacers, as well as opposite-side glazing beads and other components, without adversely affecting the properties of the sealant.

- Once sealant is applied to the window sash, the glass, setting blocks and spacers should be installed and positioned within 15 minutes. If the sealant is left for longer than 15 minutes without the glass being installed, the sealant should be removed from the window sash and a fresh bead should be applied.
- Ensure the glass is bedded directly on the sealant and not bound in direct contact with the window sash.
- Install setting blocks and spacers to control the position of the glass in the window sash. To allow for placement of setting blocks, glass may be shifted slightly if necessary by applying a slow, steady force with a thin, hard plastic spatula. If glass shifting, repositioning or any reworking is required, it should be done within the first five minutes after dispensing the sealant.
- Apply opposite-side glazing beads prior to leaning the window away from the sealant. If production will not allow for this, store the window unit either flat or with the weight of the glass leaning on the sealant.

General Considerations for Applying DOWSIL™ 2400 Silicone Assembly Sealant

Follow the manufacturer recommendations for material dispensing and pump operation.

Initial Start-up Tips

- Disconnect the hose at the glazing table and position into an empty drum to capture purge material and ensure all contaminants (such as assembly lubricants and test fluids) are cleared from the pumps and hoses prior to proceeding with production.
- Reconnect the hose and begin purging material through the nozzle. Collect material into a suitable waste container until all visible contamination, such as oils and/or air bubbles, are no longer present and material is extruding smoothly from the nozzle.
- Run test beads of material to ensure uniform bead application on the substrate.

Container Changeover

- Test a newly opened container for cure. Refer to the section "Determination of Cure State".
- Ensure the follower platen is wiped free of dirt, dust or oils prior to pumping material.
- Grease the gasket on the follower platen with silicone-compatible, high-temperature greases.
- After opening and testing for cure, place the container under the heated platen.
- Open the vent valve on the platen to allow trapped air to purge from the container as the platen is being lowered into the container.
- Start the heat cycle and wait for the platen to reach the target dispensing temperature. Refer to the section *Dispensing Temperatures* for more information.
- Apply down-force pressure (make sure the direction switch for platen is in the down position) and purge any remaining air through the vent valve. It is recommended that any purged material be collected in a suitable waste container for proper disposal.
- Shut the vent once hot-melt material is flowing through the vent valve with no air bubbles.
- Start the pump to begin dispensing the material through the nozzle. Collect material in a suitable waste container until material is running smoothly.
- Run test beads of material to ensure uniform bead application on the substrate.

Time at Temperature Considerations

- In a sealed system, DOWSIL™ 2400 Silicone Assembly Sealant is stable for up to 24 hours at 248°F (120°C). If the glazing process is not to be used for an extended period, up to and including 24 hours, the pumps and heating zones can be shut down or the temperatures lowered without detrimental effects on the sealant.
- For shutdown intervals in excess of 24 hours, powering down the equipment is required. Provided the product remains sealed within its container and equipment, the pump can be restarted normally without affecting material. Approximate heat-up time is 30 to 60 minutes depending on equipment type and manufacturer recommendations.
- Exposure of opened containers to air should be minimized because DOWSIL™ 2400 Silicone Assembly Sealant will react with moisture in the atmosphere.

Shut Down Considerations

- Nozzle tips left exposed to air after shutting down production will cure any hot-melt product left over within the nozzle. At the end of a production campaign, apply silicone-compatible, high-temperature grease to the nozzle tip. Immersion of the nozzle tip in any viscosity grade of silicone oil will also work. Upon start-up, small amounts of cured material from within the nozzle tip can usually be dispensed during the purge cycle.
- For shutdown intervals in excess of 24 hours, powering down the equipment is required. This will save energy, extend the service life of the o-rings and seals in the dispensing equipment and avoid exceeding product pot life. Remove the nozzle while warm and use a pipe plug to cap the application head and the hose.
- Provided the product remains sealed within its container and equipment, the pump can be restarted normally without any adverse effects.

Quality Control and Application Issues

Bead Location

- The sealant bead should be located on the glazing leg, parallel with the glazing leg, and within the dimensions of the glass unit.
- Bead locations not parallel to the glazing leg or outside of the dimensions of the glass unit may not contact the glass at some locations of the glass perimeter.
- Other issues that could cause bead location errors may include the operator not placing the window sash squarely on the table or the table not 'seeing' or sensing the widow sash properly.

Bead Consistency and Uniformity

Bead consistency and uniform bead dimensions are important for good sealant wet-out and consistent bite. The consistency of the bead must be checked on every window sash. If bead inconsistencies occur, determining and correcting the root cause will be necessary. Aside from the nozzle opening, flow rate – pump pressure, and table speed will define bead size. If the bead size is inconsistent, this may indicate a change in pump pressure, temperature variations especially at the nozzle tip, improperly sized hoses, or a problem with the pump.

Below are some examples of bead inconsistencies and suggested remedies.

Skip – An area where the X–Y glazing table does not apply any back-bedding sealant:

- Apply DOWSIL™ 1199 Silicone Glazing Sealant Clear (or other sealants, such as DOWSIL™ 9-1350 Silicone Glazing Sealant or DOWSIL™ 791 Silicone Weatherproofing Sealant) to the skip location.

Thinning – An area along the sealant line where the bead dimension is unusually thin and non-uniform:

- Apply DOWSIL™ 1199 Silicone Glazing Sealant Clear (or other sealants, such as DOWSIL™ 9-1350 Silicone Glazing Sealant or DOWSIL™ 791 Silicone Weatherproofing Sealant).
- Check that the dispensing pump is powered on and maintaining pressure. If thinning occurs at the end of the cycle, this could be an indication that either the system has too much pressure drop for the flow rate required or the melt rate of the bulk melter is not sufficient for the application rate.

Tooling – An area along the sealant where the nozzle was too low (or the window sash too high) and the nozzle dragged on the sealant:

- Scrape off the sealant and apply new sealant.
- Adjust the nozzle to the appropriate height.

Waviness or Unevenness – An inconsistent bead that can occur when the nozzle is too high above the window sash:

- If the waviness results in a bead of varying height causing wet-out to be inconsistent, scrape off the bead and reapply. If the bead is just uneven, but the bead height is consistent, the sealant application is acceptable if the window manufacturer deems the waviness to be visually acceptable.
- Adjust the nozzle to the appropriate height.

Substrate Issues: Uneven Surfaces in Window Sash

Uneven surfaces, such as improper cleaning of welded corners or a warped window sash, can cause either tooling or wavy sealant and can contribute to a unit that may be improperly sealed. It is vital to consistently provide a flat, even window sash on which to apply the DOWSIL™ 2400 Silicone Assembly Sealant.

Equipment Issues

Issues may occur even when following recommended operational and maintenance practices. Some of these issues may adversely affect the quality of the sealant bead being applied on the window unit.

Application Head or Nozzle

- The nozzle on the application head is often uninsulated. Nozzle temperatures are often set higher than hose temperatures, but should not exceed 285°F (140°C) to maintain consistent hot-melt flow and bead dimensions. This is generally acceptable because the residence time of the hot-melt flowing through the nozzle is short.
- A nozzle tip left exposed to air during production down times will cure any hot-melt product left over within the nozzle. At the end of a production run, apply silicone-compatible, high-temperature grease to the nozzle tip. Immersion of the nozzle tip in any viscosity grade of silicone oil will also work. Remove nozzle while warm and use a pipe plug to cap the application head when production downtimes exceed 24 hours.
- Nozzles containing cured material can often be purged out with fresh material. Occasionally, the nozzle may need to be removed and cleaned or replaced if the material cure has progressed too deep. Use of IPA or DOWSIL™ OS-20 Fluid can be used to help soften the material for easier cleaning.

Hose

Plug any open-ended hose when production downtimes exceed 24 hours or material may start to cure and affect flow in subsequent production runs. DOWSIL™ 2400 Silicone Assembly Sealant does not build up on the interior hose wall, and proper care of the outside of the hose, including preventing excessive tight radius bending, should lead to a long hose life as long as the sealant is not allowed to cure on the inside.

Melt Platen Sealing Rings

Avoid buildup of product residue on the melt platen surface and around the sealing rings. Any residue should be considered cured and will reduce the seal's effectiveness. Avoid the use of sharp tools and remove any residue before start-up or when a new container is loaded. Follow all recommendations for lubricating the sealing rings. In some instances, the sealing ring may need to be replaced.

Leakage

When air or sealant leakage occurs, immediately replace the corresponding seal or o-ring.

Compressed Air

Compressed air is used for pneumatic operations including the aeration and deaeration of the container. Compressed air coming into contact with the moisture-reactive product must be clean and dry.

Environmental Issues

Air drafts from ventilation systems in the proximity of the application head may affect its temperature, which will in turn impact bead size consistency and sealant wet-out on the window sash. Reduce and eliminate air flow on nozzles where possible.

Temperature and humidity conditions in the manufacturing area should be controlled year round if possible. Like other one-part RTV sealants, DOWSIL™ 2400 Silicone Assembly Sealant requires moisture in the air to cure.

Deglazing and Reglazing of Window Units

***Note**: It is recommended that the operator wear appropriate Personal Protection Equipment while deglazing any window and handling glass.*

Deglazing can be used to remedy manufacturing issues associated with the back-bedding sealant and/or as a quality assurance method of inspection used to confirm good adhesion and proper fill of the glazing joint.

Units manufactured with DOWSIL™ 2400 Silicone Assembly Sealant as the back-bedding sealant can be deglazed using standard deglazing tools, as shown in Figure 9. First, remove the opposite-side glazing beads if these are present. Deglaze the window by spraying the perimeter of the unit with a mild solvent, such as DOWSIL™ OS-20 Fluid to soften the sealant and provide lubrication during cutting. Insert the cutting tool between the glazing leg on the window sash and the glass. Working the blade between these two surfaces is the most critical step; it is possible to break the glass if excessive pressure is applied. Once the blade is well positioned between the glass and the glazing leg, move it slowly around the window cutting the sealant line and finally removing the IG unit. Multiple passes around the unit and additional applications of solvent may be required to completely cut the unit free.

Figure 9: Deglazing Tool

An operator should stand in an ergonomic position as to be able to insert the blade and move it around the window without reaching well beyond their range of motion.

Deglazing can be used as a test for quality assurance. During production of window units, it is a good idea to periodically monitor sealant performance and application. Quality assurance tests are good practice and can alert the manufacturer to a potential quality issue prior to manufacturing a large quantity of units. It is the prerogative of the window manufacturer to determine the frequency of any test including deglazing based on quality assurance principles.

When used as a quality assurance procedure, units should sit for the prescribed cure time before deglazing to check for bead quality. The sealant should be inspected for wet-out to both the lite and the window sash. For best inspection results, the surface of the lite and/or window sash should not be damaged. The inspection should include the following:

- Uniformity of width of sealant bite
- Wet out of sealant on the lite and window sash
- Uniformity of cure
- Appearance of sealant, including uniformity of color for pigmented versions and presence of bubbles or foreign matter

Shop Reglazing

Window units originally glazed with silicone sealants should be reglazed with silicone sealants. Glazing tapes will not adhere to a glazing leg that has had a silicone-based material previously applied to it.

Once the glass is removed from the window sash, scrape away excess beads of sealant using a putty knife or a spatula with a finely ground sharp blade. A wide flat-head screwdriver is frequently used. It is unnecessary to clean the glazing leg with any chemical or to remove the sealant film. Reapply DOWSIL™ 2400 Silicone Assembly Sealant to the glazing leg and follow regular glazing installation procedures.

Field Reglazing

DOWSIL™ 2400 Silicone Assembly Sealant is 100% silicone: other cold applied silicone sealants are compatible and will adhere to it. Once the glass is removed from the window unit, scrape away excess beads of sealant. It is unnecessary to clean the glazing leg with any chemical or to remove any leftover film from the sealant bead.

Apply a fresh sealant bead to each glazing leg using either DOWSIL™ 1199 Silicone Glazing Sealant or DOWSIL™ 791 Silicone Weatherproofing Sealant. Immediately install the new IG unit (before a sealant skin forms) and reinstall opposite-side glazing beads and other components as needed according to the window manufacturer's procedures.

Finished Unit Recommendations

Avoid prolonged exposure to citrus-containing cleaners, solvents and solvent-based cleaners as they may damage the cured sealant.

Comparative Performance

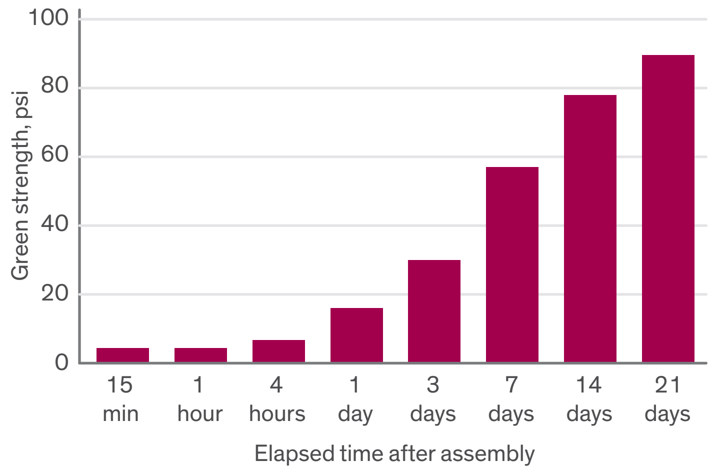
Green Strength

Green strength can be described as the initial shear strength before an adhesive or sealant exhibits significant cure as to build mechanical and adhesion strength. The Dow Corporate Test Method (CTM) 0243[1] is used to measure the amount of shear force required to separate a single-lap joint laminate under ambient conditions. A 0.10-in glue-line thickness is used between a 1×1 in^2 overlap of mill-finished aluminum substrates, which are pulled apart along its long axis at 0.5 $in \cdot min^{-1}$ after predefined cure intervals at 24 ± 2°C and 50 ± 5% RH. The result for DOWSIL™ 2400 Silicone Assembly Sealant is shown in Figure 10.

Adhesion-in-Peel Strength

The ability of a cured sealant to maintain an adhesive bond to a particular substrate while subjected to a 180° peel is evaluated using a modified version of ASTM C794 *Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants*. DOWSIL™ 2400 Silicone Assembly Sealant exhibits peel strengths of at least 25 pli after a 7-day water immersion to a variety of common substrates. Refer to the section on Substrate Selection. The mode of failure is greater than or equal to 90% cohesive.

Figure 10: Green strength build up of DOWSIL™ 2400 Silicone Assembly Sealant configured with a 0.10-in glue-line thickness in a single 1×1 in^2 overlap lap-shear joint at 24 ± 2°C and 50 ± 5% RH



[1] CTM 0243 is based on ASTM C961 *Standard Test Method for Lap Shear Strength of Sealants* and ASTM D1002 *Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-to-Metal).*

Frequently Asked Questions

Q: What are the handling precautions for DOWSIL™ 2400 Silicone Assembly Sealant?

A: Before handling, read product and safety data sheets and the container label for safe use. Exposure of opened containers to air is discouraged because these products will react with moisture in the atmosphere. The product is dispensed under pressure at approximately 248°F (120°C), and use of personal protective equipment to prevent contact with skin or eyes is recommended.

Q: Is any local exhaust ventilation required?

A: DOWSIL™ 2400 Silicone Assembly Sealant has a low volatile organic content of less than 24 g/L. The need for local exhaust ventilation should be discussed with your safety department personnel. An exhaust hood can be integrated into the design of the bulk melter to remove vapors directly from the container. Refer to the product and safety data sheets for further information.

Dow has an extensive Product Stewardship organization and a team of Product Safety and Regulatory Compliance (PS&RC) specialists to support customers for product safety needs. For further information, please see our website, consumer.dow.com, or consult your local Dow sales application engineer.

Q: What purge material can be used to clean existing material from dispensing equipment before using DOWSIL™ 2400 Silicone Assembly Sealant ?

A: Dow recommends retrofitted hot-melt pumping equipment be disassembled, cleaned and rebuilt if it has been used with other types of hot-melt materials (e.g. acrylics, butyls, urethanes). Dispensing hoses should be replaced. DOWSIL™ OS-20 Fluid may be used as a purge material and should be applied at room temperature. If you need to purge lines, contact your local Dow representative.

Q: How shall I conduct incoming product inspection?

A: A typical dispensed bead of DOWSIL™ 2400 Silicone Assembly Sealant will appear optically clear for desirable aesthetics. The product, before pumping, should be pliable but not stretchy. A stretchy response is an indication of a cured surface due most likely to the product container seal being compromised. Refer to the section “Determination of Cure State” for more information.

Q: How do I clean DOWSIL™ 2400 Silicone Assembly Sealant off my equipment and tools?

A: Isopropyl alcohol can be applied to areas where the sealant needs to be removed. This will soften the cured material and allow it to be scrubbed away with an abrasive pad. DOWSIL™ OS-20 Fluid, an ozone safe volatile methylsiloxane, or DOWSIL™ 3522 Cleaning Solvent may also be used to remove cured silicones.

Q: What bead size is recommended?

A: Manufacturers designing and testing fenestration systems should determine bead size that will provide the required sealant bite and glue-line thickness. Refer to the section “Sealant Design Considerations” for more information.

Q: What can be done if the table skips or there is a gap in the sealant bead?

A: DOWSIL™ 1199 Silicone Glazing Sealant Clear can be used to patch gaps in the sealant. Other silicones in use in your facility may also be applied (e.g., DOWSIL™ 9-1350 Silicone Glazing Sealant or DOWSIL™ 791 Silicone Weatherproofing Sealant). Refer to the section *Bead Consistency and Uniformity* for more information.

Q: When should setting blocks be used?

A: Dow recommends that setting blocks are always used based on Insulating Glass Manufacturers Alliance (IGMA) and GANA guidelines. In addition to setting blocks, side placement shims may be required to hold the IG unit in place in the event that the window unit is tilted on its side during production or shipment. Consult the IG manufacturer for additional support requirements.

Sealant Profile Calculation Inputs

Largest Window Height: ______________________________

Largest Window Width: ______________________________

Is the IG unit supported at the bottom by setting blocks?
Yes No

If the IG unit is not supported by setting blocks, maximum weight of IG:

If the unit is wider than it is tall, is the IG unit free to move in both horizontal directions?
Yes No

Shop Temperature During Fabrication: ______________________________

Expected Maximum Wind Load: ______________________________

Sash Material:
Aluminum Wood Vinyl Fiberglass
Other: ______________________________

Expected actual LOW temperature of sash, at sealant bond, during service:
____

Expected actual HIGH temperature of sash, at sealant bond, during service:
____

Expected actual LOW temperature of glass, at sealant bond, during service:
____

DOWSIL™ brand Sealant choice OR movement capability of selected sealant:
____

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