SSG4600 UltraGlaze™

Silicone Structural Glazing Adhesive

Product Description

GE SSG4600 UltraGlaze is a high-strength, 2-component silicone elastomeric adhesive/sealant for a wide variety of glazing applications, including the fabrication and shop glazing of structurally glazed curtain wall systems. SSG4600 provides fast adhesion and strength build; curing quickly when mixed, to a very high strength, tear-resistant durable silicone rubber.

Key Features and Typical Benefits

Performance

- Silicone durability—Cured silicone rubber exhibits excellent long term resistance to natural weathering including: extreme temperatures, ultraviolet radiation, rain and snow, with negligible change in elasticity.
- Primerless adhesion—Attains strong bonds to many conventional substrates and finishes without the need of a primer.
- Low pumping viscosity—Decreased stress on equipment can lead to longer pump life and reduced maintenance costs.
- Fast adhesion build—Enhances early stability of assembled parts.
- Protective glazing—SSG4600 offers an excellent combination of strength, flexibility and tear resistance to help counter the higher forces created by hurricane, impact and blast loads.
- Product compatibility—Compatible with GE Insulating Glass, Structural and Weathersealing silicones.

Application

- Adjustable work life—Variable ratio of parts A+B to accommodate assembly and application under varying conditions.
- High application rate— Faster and more thorough joint filling capability with easier tooling effort.

Aesthetics

- Catalyst options—Non-flammable catalyst available in black or grey.
- Materials—Compatible with many types of coated glass, metal finishes, glazing gaskets, setting blocks and spacers.

Potential Applications

SSG4600 is an excellent candidate for use:

- In structural glazing applications such as factory glazing of curtainwall units and modules for unitized and panelized systems.
- As a weatherseal product, when movement expected in the joint does not exceed its movement capability (±25%).
- In *protective glazing* applications.

Packaging

SSG4600 is available as a "kit" containing the following:

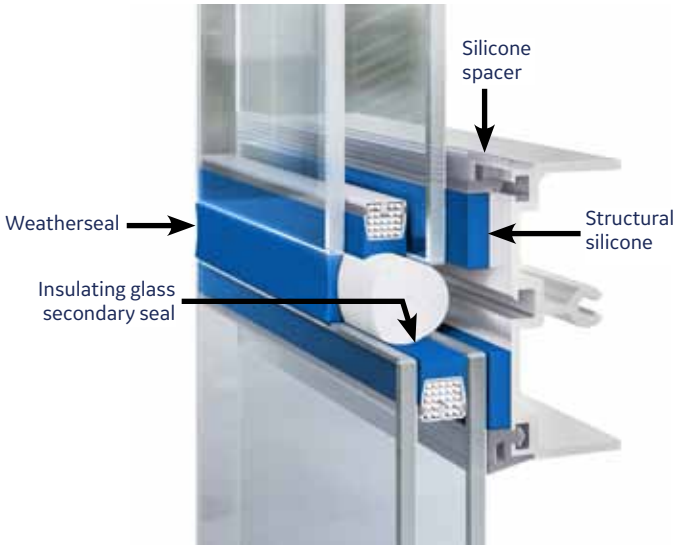
Base: SSG4600A UltraGlaze base, white paste in 55 gallon drum with a polyethylene liner.

Catalyst: There are two catalyst options for use with SSG4600A UltraGlaze base and are supplied in a 5 gallon pail.

- **SSG4603B UltraGlaze** catalyst, black paste mixes and cures to black silicone rubber
- **SSG4607B UltraGlaze** catalyst, grey paste mixes and cures to medium grey silicone rubber

- Both the drum and pail are straight-sided for use in commercially available pumping equipment.

Cartridges: SSG4600 grey and black is available in 12.8 oz. (380 ml) coaxial cartridges for factory and field repairs. Cartridges are packed 15 to a case.



Typical SSG configuration

Colors

SSG4600 UltraGlaze is available in black and medium grey.
Black: SSG4600A + SSG4603B
Medium Grey: SSG4600A + SSG4607B

Typical Physical Properties

Typical property values of SCS4600 as supplied and cured are set forth in the tables below. Assistance with specifications is available by contacting Momentive Performance Materials at 00.800.4321.1000.

Typical Properties – Supplied

Uncured Properties	**Base**	**SSG4600A**
Color	White	Thixotropic Paste
Specific Gravity	1.40	
Shelf Life	18 months(1)	
Viscosity	132.3 / 132,300	10 r/s, Pa·s / centipoise
Uncured Properties	**Catalyst**	**SSG4603B**
Color	Black	Thixotropic Paste
Specific Gravity	1.04	
Shelf Life	12 months(1)	
Viscosity	129.6 / 129,600	10 r/s, Pa·s / centipoise
Uncured Properties	**Catalyst**	**SSG4607B**
Color	Grey	Thixotropic Paste
Specific Gravity	1.10	
Shelf Life	12 months(1)	
Viscosity	163.5 / 163,500	10 r/s, Pa·s / centipoise

Mixed Compound Properties

SSG4600A+SSG460XB, X = 3 or 7		
	Base	
Color	Black or Medium Grey	Thixotropic Paste
Specific Gravity	1.38	Mixed at 12:1 weight
Mix Ratio Range	9:1 to 14:1, target 10:1 to 13:1	By weight
Work Life	20-90 minutes	Depends on ratio, temp. & RH
Tack Free Time	1-2 hours	Depends on ratio, temp. & RH
Consistency/Sag	0.1" (2.5 mm)	Non-sagging
VOC Content	21 g/l	Mixed at 12:1 weight

Typical properties are average data and are not to be used as or to develop specifications.

(1) When properly stored; see section on storage.

Typical Physical Properties—continued

Cured Properties[3]

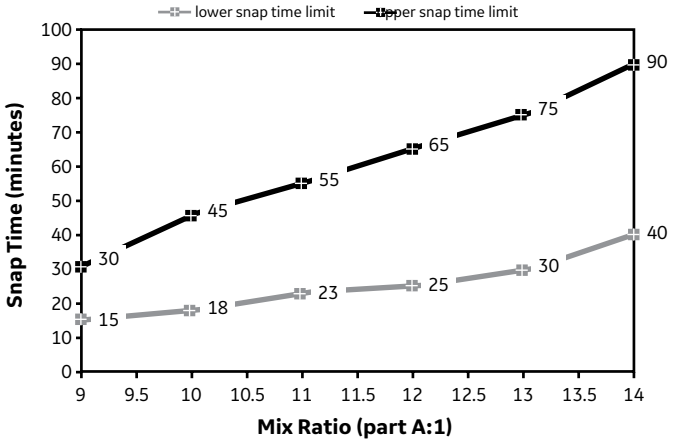
Full Cure at Standard Laboratory Conditions SSG4600A+SSG460XB @ 12:1 mix ratio		
	Base	
Color	Black or Medium Grey	SSG4603B or SSG4607B
Hardness (type A indentor)	40 ±	ASTM D2240
Ult. Tensile Strength Modulus @ 25% extension Modulus @ 50% extension Ult. Elongation	192 psi (1.3 MPa) 64 psi (0.44 MPa) 105 psi (0.72 MPa) 256%	ASTM C1135; t=0.25in
Tensile Adhesion Strength after 2 hours	63 psi (0.43 MPa)	ASTM C1135
Tensile Adhesion Strength after 4 hours	104 psi (0.72 MPa)	ASTM C1135
Tear Strength	64 ppi (11.2 N/mm)	ASTM D624, die B
Shear Strength	124 psi (0.85 MPa)	ASTM C961, 6mm thickness
Elastic Recovery	99%	ISO 7389; ETAG 002
Resistance to Tearing	Category 1, >95% / No Propagation	ETAG 002 / ASTM C1681
Resistance to Water Immersion	Excellent, no adhesion loss[2]	ISO 10591
Accelerated Weathering, 50,000 hours (5.7 years)	Excellent, negligible property change	ASTM C1135, D2240
Heat Resistance	300°F (149°C)	
Thermal Conductivity	0.30 W/m·K (cal/cm·s °C)	ASTM E1461
Cyclic Movement Capacity	±25%	ASTM C719

Typical properties are average data and are not to be used as or to develop specifications.

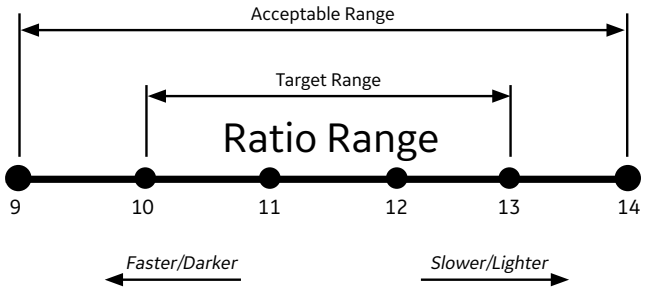
(2) Tested to glass and the following aluminum finishes: polyester powder coat, PVDF, anodized.

(3) Typical value, actual value may vary.

SSG4600 Work Life (Snap Time)



Graph is relevant to ambient conditions; see also section on Curing.



Weight to Volume	Ratio Correlation
9:1 by weight	(6.8:1 by volume)
10:1 by weight	(7.5:1 by volume)
11:1 by weight	(8.3:1 by volume)
12:1 by weight	(9:1 by volume)
13:1 by weight	(9.8:1 by volume)
14:1 by weight	(10.5:1 by volume)

Installation

Prior to production, a sample of base (part A) and catalyst (part B) should be taken from each lot of material to be used, weighed to the desired A/B ratio, mixed and checked for proper curing before placing material in production.

Surface Preparation

Sealants may not adhere or maintain long-term adhesion to substrates if the surface is not prepared and cleaned properly before sealant application. Using proper materials and following prescribed surface preparation and cleaning procedures is vital for sealant adhesion. MPM can provide quality control information and suggestions to users upon request.

Installation—continued

Materials

- Use clean, fresh solvent as recommended by the MPM project-specific test report. When handling solvents, refer to manufacturer's MSDS for information on handling, safety and personal protective equipment. Isopropyl Alcohol (IPA) is commonly used and has proven useful for most substrates encountered in SSG systems. Xylene, MEK and Toluene have also been found useful on many substrates. Do not use Denatured Alcohol. Denatured Alcohol is not suggested because of the variability of additives, which may or may not provide reproducible results.
- Use only clean 99.9% pure industrial grade solvents. Do not use diluted solvents.
- Use clean, white cloths free of lint or other suitable lint-free wiping materials.
- Use a clean, narrow-blade tooling knife when tooling structural silicone into the cavity.
- Use primer when required (reference MPM project-specific adhesion test report (s)).

Cleaning Procedures

- Remove all loose material (such as dirt and dust), plus any oil, frost or other contaminants from the substrates to which the structural silicone will be applied to.
- Do not use detergent to clean the substrate as residue may be left on the surface.
- Clean the substrates receiving the sealant as follows: Using a two-rag wipe technique. Wet one rag with solvent and wipe the surface with it, then use the second rag to wipe the wet solvent from the surface BEFORE it evaporates. Allowing solvent to dry on the surface without wiping with a second cloth can negate the entire cleaning procedure because the contaminants may be re-deposited as the solvent dries.
- Change the cleaning rags frequently, as they become dirty. It is easier to see dirt if white rags are used. Do not dip used wipe cloths into solvent as this can contaminate the solvent. Cleaning with contaminated solvent can result in sealant adhesion issues. Always use clean containers for solvent use and for solvent storage.
- When cleaning deep, narrow joints, wrap the cleaning cloth around a clean, narrow-blade putty knife. This permits force to be applied to the cleaned surface.
- Clean only as much area as can be sealed in one hour. If cleaned areas are again exposed to rain or contaminants, the surface must be cleaned again.

Primers

SSG4600 will bond to many clean surfaces without the aid of a primer. For difficult-to-bond substrates, the use of a primer or special surface preparation should be evaluated. An evaluation should be made for each specific application/substrate to determine quality of bond. When properly used, primers help assure strong and consistent sealant adhesion to surfaces that may be difficult to bond. Most primers are a blend of organic and inorganic chemicals, resins and solvents. NEVER APPLY PRIMER TO GLASS SURFACES OR TO CURED SILICONE RUBBER WITHOUT PRIOR CONSULTATION WITH MOMENTIVE PERFORMANCE MATERIALS TECHNICAL SERVICES. Obtaining the proper materials, as well as following the prescribed procedures, is vital to ensure the successful use of primers. PRIMER APPLICATION IS NOT A SUBSTITUTE FOR SURFACE PREPARATION. Consult primer datasheet(s) for specifics and instructions for use.

CAUTION

Primers may contain solvents. When handling solvents, refer to manufacturer's MSDS for information on handling, safety and personal protective equipment.

Masking

- To simplify clean up of excess sealant, use easy to release, pressure sensitive tape to mask adjacent surfaces before applying the structural silicone sealant.
- Start from the top down and overlap the runs. Tool in direction of over-lap so that masking is not disturbed during tooling.
- Remove masking immediately after application of silicone or as soon as practical.
- Drop cloths can be used to cover any surfaces likely to collect excess sealant removed during tooling operations.

Installation—continued

Sealant Application

- Apply the sealant by pushing the bead ahead of the nozzle and making sure that the entire cavity is filled. Tooling should be done neatly, forcing the sealant into contact with the sides of the joint, thus helping to eliminate any internal voids and assuring good substrate contact. AIR POCKETS OR VOIDS WITHIN THE STRUCTURAL CAVITY ARE NOT ACCEPTABLE.
- Sealant application is not recommended when the temperature is below 50°F (10°C) or if frost or moisture is present on the surfaces to be sealed.
- SSG4600 works best when applied to surfaces below 140°F (60°C).
- Due to the smooth consistency of SSG4600, tooling agents such as water, soap or detergent solutions are not necessary or recommended. Dry tooling is recommended.

Mixing, Pumping and Dispensing

- SSG4600 should be mixed and dispensed using suitable two-component mixing equipment, available from several equipment manufacturers. These mixing / pumping systems are specifically designed to meter precise proportions of A base and B catalyst, in an air-free environment, and mix and dispense material at proper pressures and volumes to insure thoroughly mixed air-free material. Reference MPM *SSG Technical Manual & Quality Control Information* document for information regarding suitable equipment type for use with SSG4600.
- Consult mixing equipment manufacturer or system operating manual for startup and shutdown procedures that cover proper operating pressures, mixing devices, and purging requirements.
- Hand mixing of A base + B catalyst is not recommended, except for pre-use testing to confirm cure.
- Kit matching of the A and B components of SSG4600 is not required.
- SSG4600 can be used successfully in both “In-line“ mixing systems and on “purgeless” after-the-gun mixing equipment. Consult equipment manufacturer and/or MPM for information on mixing device options.
- When properly mixed, the material should be a solid, homogeneous color (gray when using SSG4607B catalyst, black when using SSG4603B catalyst) free of any swirling or marbling of colors. If incomplete mixing is noticed, cease use of the material until equipment has been adjusted and confirmed that complete mixing is being attained.

Curing

- When mixing SSG4600A base + SSG460XB catalyst at approximately a 12:1 weight ratio, the material will become tack-free after about 1-2 hours under ambient conditions of @ 70°F (21°C), 50% R.H. Under these conditions approximately 70% of strength should develop within 24 hours. Development of full properties requires full liberation of cure by-products and will normally be achieved within 7 days. Full properties will take additional time in colder climates or deeper SSG cavities.
- Work life and cure rate may be adjusted by changing the A base to B catalyst ratio. Ratio must be within recommended range to achieve desired cured material property profile.
- Work life and cure rate can be affected by temperature and humidity levels. Mild heat (*i.e.,* around 120°F/49°C) will shorten the work life of the material, but will not significantly reduce the time required for complete cure. Cooler temperatures and lower humidity (*i.e,* <50°F/10°C and <30% R.H.) tend to slow the cure and adhesion process.
- The B catalysts are sensitive to prolonged exposure to atmospheric moisture and the storage containers should be kept tightly closed whenever possible to maximize useful life.
- The catalyst will require mixing before placing container in pumping equipment if settling of components has occurred. Contact MPM technical services for additional information.

Adhesion

Development of maximum bond strength will depend on substrate finish, joint configuration, primer use, adhesive width, substrate preparation and ambient conditions at location of use. Minimum stress should be applied to the adhesive bond for 24 hours. The adhesive strength of the bond should eventually exceed the cohesive strength of the silicone rubber adhesive.

Maintenance and Repairs

If repairs are required, the following products are candidates for use: SSG4600, SSG4000, SSG4000AC, SSG4000E, SSG4800J, SCS2000. Reference MPM *SSG Technical Manual & Quality Control Information* document regarding specific requirements for substrate preparation when reglazing.

Installation—continued

Joint Designs and Dimensions

Silicone contact width and thickness (see Figure 1) will vary by project with the design wind load and glass size. Contact width can be calculated using the following formula:

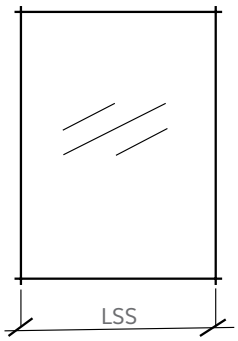
CW – Contact Width (inches or millimeters)
DWL – Design Wind Load (pressure in PSF or kPa)
LSS – Longest Short Span (largest piece of glass; shorter side)

SDS – Sealant Design Stress:
Dynamic (wind) loading: ≤20 psi (138 kPa)
Permanent (dead) loading: ≤1 psi (7 kPa)

$$CW = \frac{DWL\ (PSF) \times LSS\ (Ft)}{SDS \times 24}$$

$$CW = \frac{DWL\ (kPa) \times LSS\ (mm)}{SDS \times 2}$$

Alternate calculational methods may also be employed to derive the contact width. In all cases, a minimum safety factor of five (5) is to be used in conjunction with the sealant's ultimate tensile strength suitable in the proposed condtions of applicability. Contact Momentive Technical Services team for review of proposed designs.



A minimum sealant thickness of 1/4" (6mm) between substrates is required to accommodate thermal expansion and contraction (see Figure 2) of most systems and should be used in order to ensure that sealant can be injected into the structural cavity obtaining full contact with both the glass and metal surfaces while remaining free of voids. Greater joint thickness may be required to accommodate movement in some larger-sized SSG systems. MPM can be contacted to assist in determination of proper joint thickness to accommodate expected movement, in structurally glazed applications.

Pre-Construction Project Requirements

Required materials for submission:

- Curtainwall shop drawings for review and comment
- Design wind load requirement(s) for project
- Glass or panel sizes
- Production samples of metal, glass, gaskets, spacers and setting blocks with type and manufacturer identified
- Specification and/or identification of paint or finish to which SSG4600 is intended to adhere (*i.e.,* 215-R1 anodized or if paint, or powder coat; manufacturer, finish system and ID#)

Recommendations & information provided after review:

- Determination as to whether the submitted joint dimensions meet the minimum design criteria necessary for the use of SSG4600.
- Short-term adhesion data using (typically) ASTM C794, C1635, ISO 8340, ISO 8339, ISO 10591 and/or ASTM C1135 test method. Other test methods may be requested for a nominal charge.
- Short-term compatibility test results on gaskets, spacers and setting blocks and other accessories per ASTM C1087 or GE sealants test method for compatibility.
- Information regarding suggested primers, when required.

Figure 1:

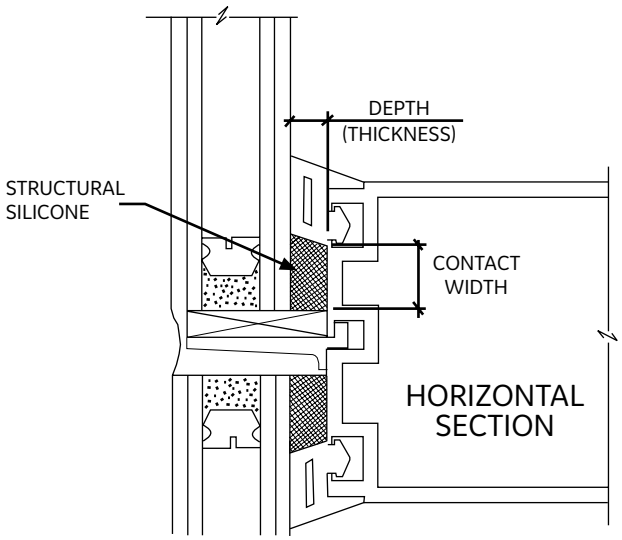
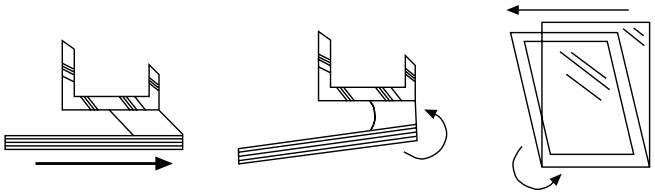


Figure 2: Movement from thermal expansion and contraction and/or glass rotation.



Installation—continued

Momentive Performance Materials will not:

- Provide comments on the structural integrity of overall framing system(s).

The design professional has final responsibility for the determination of structural sealant joint dimensions based on project conditions, design wind load(s), glass or panel sizes, anticipated thermal, seismic or other movement of the system.

Industry References

The ASTM C1401 Standard Guide for Structural Sealant Glazing provides a thorough overview of design topics and information for use in SSG systems.

ETAG 002 guideline for European Technical Approval for structural sealant glazing kits provides an overview of the requirements of materials appropriate for this application.

China industry standard JGJ 102 - 2003.

Applicable Standards

SSG4600 meets or exceeds the requirements of the following specifications for two-component sealants.

ASTM Specifications:

- C1184, Type M, Use G and O (aluminum)
- C920, Type M, Grade NS, Class 25, Use G and A

China Specification:

- GB16776-2005

– ASTM F1642-04 *Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings;* no silicone failure tested on 9.71' x 4.35' (1.3 x 3m) IG units, 4-side SSG; blast pressure: 7.5 psi @ 42 msec.

– ASTM E1886-02/05 *Standard Test Method for Performance of Curtain Walls Impacted by Missiles and Exposed to Cyclic Pressure Differentials* - no silicone failure tested on 13.5' x 9.5' (4.1 x 2.9m) IG units; pressure: ±250 psf (12 kPa) @ 9000 cycles.

Technical Services

Additional technical information and literature may be available from MPM. Laboratory facilities and application engineering are available upon request from MPM. Any technical advice furnished by MPM or any representative of MPM concerning any use or application of any product is believed to be reliable but MPM makes no warranty, express or implied, of suitability for use in any application for which advice is furnished.

Limitations

Customers must evaluate MPM products and make their own determination as to the fitness of use in their particular applications.

- Structural glazing industry guidelines (ASTM C1401) suggest that drawings and details are to be reviewed by all parties involved in the manufacture of an SSG system and for each building project. SSG4600 should be used in structural glazing applications only after Momentive Performance Materials (MPM) has reviewed detailed design drawings and has performed adhesion and compatibility tests on project substrates and relevant spacer materials. Review and testing is done on a project-by-project basis. No blanket approval is given by MPM for structural glazing applications.
- MPM requires testing on a project-by-project basis each substrate and component used in a structural glazing assembly for adhesion and compatibility. No blanket approvals exist relative to adhesion or compatibility of SSG4600 with such materials.
- Not recommended for water immersion applications.

Patent Status

Nothing contained herein shall be construed to imply the nonexistence of any relevant patents or to constitute the permission, inducement or recommendation to practice any invention covered by any patent, without authority from the owner of the patent.

Product Safety, Handling and Storage

SSG4600A base should be stored at or below 80°F (27°C). SSG4603B and SSG4607B catalyst must be stored at or below 90°F (32°C). Keep containers out of direct sunlight for prolonged periods. These materials may be shipped at ambient temperature.

Customers considering the use of this product should review the latest SDS and label for product safety information, handling instructions, personal protective equipment if necessary, and any special storage conditions required. SDS are available at www.siliconeforbuilding.com or, upon request, from any MPM representative. Use of other materials in conjunction with MPM sealants products (for example, primers) may require additional precautions. Please review and follow the safety information provided by the manufacturer of such other materials.

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