GE Silicones

GE UltraGlaze* SSG4600

High Performance Structural Silicone; Attribute Summary

Product History

In 1977, General Electric SPBD [Silicone Products Business Department - now Momentive Performance Materials] introduced the first 2-part structural silicone product for use in the glass and glazing industry. That product was IGS3204 and was targeted for use as the secondary sealant for insulating glass production. Within a few years, competition followed suit and (after a patent dispute & settlement) the world's two largest silicone suppliers subsequently brought this new technology to the curtainwall glazing segment in the mid-1980s. At that time GE launched UltraGlaze* SSG4200 for use in structural glazing applications. In the intervening decades, new global specifications have emerged in the *Structural Glazing* industry and performance requirements have become more demanding. In response to these changes, GE Silicones continued to implement improvements to our original patented 2-part technology to offer higher performing products to the marketplace. The timeline of GE UltraGlaze* 2-part structural silicone evolution is as below:

1980's	1990's	2000's
SSG4200 →	SSG4400 →	SSG4600

Improved Properties

Commercialized in 4Q09, SSG4600 is the latest-generation 2-part structural glazing adhesive from GE Silicones. This product incorporates numerous improvements which rank it superior when compared to previous-generation products. Regarding mechanical properties, the three fundamental ones of which structural silicones are often measured by [tensile, tear & elasticity] are significantly more robust in cured SSG4600 than its predecessor(s). From a system design perspective, these improvements can be contributive to performance in systems that place increased demand on the adhesive (blast mitigation, impact resistance, cold bending, etc.) and improve upon safety factors in SSG installations.

Property	SSG4400	SSG4600	Increase
Tensile Strength; ASTM C1135 (t=6mm)	153 psi (1.1 MPa)	192 psi (1.3 MPa)	↑ 25%
Tear Strength; ASTM D642 (die B)	39 ppi (6.8 N/mm)	64 ppi (11.2 N/mm)	↑ 64%
Ultimate Elasticity; ASTM C1135	100-110%	240-250%	↑ 133%
Elongation @ Max Stress; ASTM C1135	63%	161%	↑ 156%

Superior Adhesion

From a user perspective, SSG4600 offers rapid unprimed adhesion development even in unheated (winter) curing conditions; a feature largely unmatched by competitive 2-part products. Products with a slower adhesion build profile leads to frequent primer usage (see graphical comparison on following pages; Annex A) to attain reasonable unit movement times. Tested to hundreds of common finishes to date, SSG4600 attains a 96% primerless adhesion success rate. Further, eliminating the need for primer simplifies EHS concerns by reducing the amount of flammable materials as well as VOCs in the factory setting.

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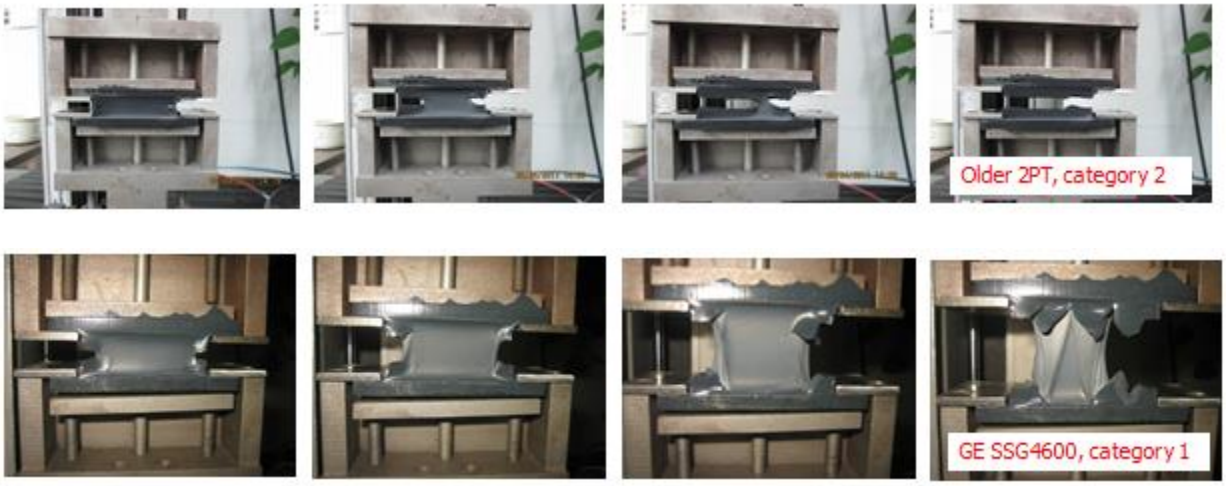
Improved Tear Resistance

SSG4600 also shows significant improvement in *Resistance to Tearing* and when tested to the European ETAG002 protocol (section 5.1.4.6.4) achieves *Category 1* classification. The photos below demonstrate the difference between a typical older-generation 2-part material (quick tear at low elongation) vs. SSG4600 which retains strength and elasticity without the 'zipper' type tear failure. This improvement is contributive to higher performing SSG systems and a video showing how this enhancement improves upon an SSG system's flexibility is available upon request.



Additional Advantages

- **EHS:** SSG4600 catalysts are non-flammable. This characteristic eliminates the need to keep catalyst pails in metal safety storage lockers and simplifies EHS concerns by reducing the amount of controlled materials in the glazing factory.

- **Flexibility:** SSG4600 has double the movement capability than its predecessor(s) and meets ASTM C719 movement class 25 (±25%). This additional flexibility is readily apparent when pull testing (stretches and does not break easily like other 2-part products). SSG4600 can be utilized as weatherseals in factory glazing eliminating the need to use slower curing single-component products.

- **Cartridges:** SSG4600 is available in cartridges for use with pneumatic or cordless dispensing guns. This is advantageous for field repairs where the use of a single-component material would dictate much longer cure times before temp clips can be removed. Also, since it is the same product used in the factory, there is no need to introduce a 2nd material into the project matrix.

- **Color Harmonization:** SSG4600 grey (SSG4607) is custom-matched to our 2-part IG grey products (IGS3727 & IGS3767) and to our SilPruf* weatherseal product (SCS2007). In addition, some silicone gasket suppliers have offerings already color-matched to SSG4600 grey.

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Annex A

Adhesion Development comparison of four competing products

The term *Adhesion Development* relates to mixed and dispensed 2-part sealant that is sufficiently cured to handle (material is a solid rubber, is tack free and to the touch, and exhibits elasticity when stretched) however has yet to attain adhesive bonds to its substrate. Most users do not want, or cannot afford to wait multiple hours or overnight for meaningful adhesion to develop so the use of primer solutions (aka, adhesion promoter and/or activator) has become commonplace to overcome this deficiency. Older 2-part formulations commonly suffered from slow adhesion development.

Since SSG4600 was specifically developed with adhesion development in mind, a test was orchestrated to compare its performance vs. three competing 2-part structural silicone products on various substrates and in sufficient quantity so as to be comprehensive and meaningful. Forty nine (49) random finishes (relevant to the structural glazing industry) were collected, cut into thirds and shipped to various users where each material was applied side-by-side vs. SSG4600 without using primer. Adhesion development was tested on all 49 substrates at 4 hours and again after 24 hours of cure with graphical results below. SSG4600 possess superior adhesion development performance and can save time and money of projects by eliminating the need to utilize primer.