



Performance Requirements of an Exterior Lighting Structural Adhesive

1 Scope

This specification covers the performance requirements of an exterior lighting structural adhesive used to bond and seal the lens to housing.

1.1 Material Description.

1.1.1 The structural adhesive must be thermosetting (reactive hot melt, moisture-cure urethane, two-part urethane, two-part silicone, etc.) The material shall not cause crazing of acrylic or polycarbonate.

1.1.2 Additional mechanical retention (metal clips, plastic snap-in fasteners, fixtures, etc.) shall be used to retain the part in position during cure.

1.1.3 The material must be capable of being dispensed with current production equipment. It shall be compatible with production systems.

1.1.4 There are two classes of adhesive systems. Class I and Class II, which are based on application performance requirements and are not interchangeable. If no class designation or type designation is specified, Class I adhesive system applies as the default standard for exterior lighting.

- **Class I.** Structural adhesives primarily used to bond a lens and housing of an exterior lamp assembly. These materials may also be used for other suitable exterior lighting applications.

- **Class II.** Structural adhesives, typical two part silicone, for high-temperature applications (over 125 °C) and/or applications that do not exceed a bond joint greater than linear length of 500 mm (e.g., small Daytime Running Lamps).

1.2 Symbols. Not applicable.

1.3 Applicability. This material is used to bond/seal lighting assembly lenses to housings.

1.4 Remarks. Not applicable.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ASTM D1780	ISO 75-2	ISO 6452	SAE J2527
ISO 75-1	ISO 4892	SAE J1525	

2.2 GM Standards/Specifications.

GMW3059	GMW3221	GMW14729	GMW15790
GMW3116	GMW14124	GMW15735	GMW16259

2.3 Additional References.

Standard Plaque Inc., Melvindale, Michigan

3 Requirements

3.1 Requirements on Test Specimens. Unless otherwise specified, the materials shall be tested under standard conditions per GMW3221, Code A. Samples shall be tested after reaching full cure, unless otherwise specified in the test method.

3.2 Requirements on Delivery. Materials shall be received in the plants as part of an assembly or with fasteners so they may be attached to body structures in the assembly plants.

3.2.1 Chemical Requirements.

3.2.1.1 Color. To be called out on the part drawing, if required.

3.2.1.2 Shelf Life, GMW15735. Material conditioned using potential storage conditions must be capable of passing all the requirements of GMW15735, Storage Stability of Adhesives and Sealers.

3.2.2 Performance Requirements.

3.2.2.1 Adhesion. Test method: The tongue and groove plaques shall consist of materials molded by a GM approved source as recommended. (Contact Standard Plaque Inc. (313-383-7233) and reference mold numbers 12A and B for samples or equivalent). Use the tongue and groove plaques for the adhesion strength, if available, otherwise, use lap shear specimens prepared according to SAE J1525.

Substrates used in testing shall be those used in the production assembly. They are to include any coatings (paint, hardcoat, coatings, adhesion promoters, etc.) or treatments (flame, plasma, solvent wipe, etc.) that would be part of the production intent process.

If treatments are used, reports shall indicate the type of treatment used along with minimum surface energy produced, within ± 6 dyn/cm, of the test specimens used for the certification testing.

If coatings or treatments are not used, clean the surfaces to be bonded with a hot, soapy water solution. The soap shall be free rinsing, similar to that used for glassware. After cleaning, the plaques are blown dry and aged per GMW3221, Code A for 24 h to insure dryness. Test the assemblies at a crosshead speed of 12.7 mm/minute on a universal tensile test machine capable of measuring loads at an accuracy of 1%.

Note: Proper alignment of the test assembly is critical. Every effort should be made to maintain uniform tension across the bond area. Cleavage and/or peel of the bond area could yield inaccurate results. Document all concerns of alignment and relate to specific sample number tested. Evaluate a minimum of five assemblies per condition, for the initial approval of an adhesive formulation. Additional substrate approvals on an approved formulation require a minimum of three assemblies per condition. Report failure mode and peak load in Newtons.

3.2.2.1.1 Adhesion Strength. All samples must meet the minimum load specified and demonstrate 100% cohesive failure (which may include thin film cohesive failure) or substrate failure in all test conditions as described in Table 1.

Condition specimens for a minimum of 30 minutes at the specified temperature prior to adhesion strength test. Test specimen within 5 minutes of removal from environment.

Table 1: Initial Testing Conditions and Requirements

Condition	Class I	Class II
	Force (N)	Force (N)
Initial (test at 22 °C)	900	600
Hot (test at 82 °C)	400	400
Hot (test at 150 °C) Note 1	Not applicable	400
Cold (test at -30 °C)	1000	1000

Note 1: If production substrates are not suitable for test temperature listed for Class II adhesives requirements, substrate specific testing shall be done at 10 °C (15 °F) below materials heat deflection temperature (HDT) at 1.8 MPa per ISO 75-1, ISO 75-2 Method A or at 82 °C whichever is higher, along with high temperature testing using substrate per GMW16259 P-PC-HT-T3 or an alternative material approved by the appropriate Materials Engineering department(s).

3.2.2.1.2 Environmental Aging. All samples must meet the minimum load specified and demonstrate 100% cohesive failure (which may include thin film cohesive failure) or substrate failure in all test conditions as described in Table 2.

Condition per GMW3221, Code A for a minimum of 24 h after exposure, then test at GMW3221, Code A conditions.