SAE International™

SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J576 FEB2010

Issued 1955-01
Revised 2010-02

Superseding J576 JAN2007

Plastic Material or Materials for Use in Optical Parts Such as Lenses and Reflex Reflectors of Motor Vehicle Lighting Devices

RATIONALE

The changes provide for the use of controlled forward light scattering plastic materials, herein referred to as Diffusing Plastic Materials. Diffusing Plastic Materials can not be evaluated for durability using the conventional "increase of haze" methodology since measurement of haze as diffusing materials are not within the scope of ASTM D 1003. This new evaluation methodology is limited to Diffusing Plastic Materials only and requires a more stringent maintenance of luminous transmittance. All other existing testing and requirements remain unchanged for all materials. No changes have been made or allowed in the 2009 revision for transparent plastic materials. New definitions have been incorporated as necessary.

1. SCOPE

This SAE Recommended Practice provides test methods and requirements to evaluate the suitability of plastic material or materials intended for optical applications in motor vehicles. The tests are intended to determine physical and optical characteristics of the material or materials only. Performance expectations of finished assemblies, including plastic components, are to be based on tests for lighting devices, as specified in SAE Standards and Recommended Practices for motor vehicle lighting equipment. Field experience has shown that plastic material or materials meeting the requirements of this document and molded in accordance with good molding practices will produce durable lighting devices.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J578 Color Specification

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http://www.sae.org/technical/standards/J576_201002

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D 1003-00 Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics

ASTM D 4364-05 Standard Practice for Performing Outdoor Accelerated Weathering Tests of Plastics Using Concentrated Sunlight

ASTM E 308-01 Standard Practice for Computing the Colors of Objects by Using the CIE System

3. DEFINITIONS

3.1 MATERIAL OR MATERIALS

The type and grade of plastics, composition, and manufacturer's designation (number) and color.

3.1.1 Coated Materials

A coated material is a material as defined in 3.1 which has a coating applied to the surface of the finished sample to impart some protective properties. Coating identification includes manufacturer's name, formulation designation (number), and recommendations for application.

3.1.2 Transparent Plastic Materials

A plastic material with an initial (unexposed) haze value of 30% or less when measured in accordance with ASTM D 1003.

3.1.3 Diffusing Plastic Material

A plastic material which intentionally scatters transmitted light to specific intended levels; and for the purpose of this standard has an initial (unexposed) haze value greater than 30% measured in accordance with ASTM D 1003.

3.2 MATERIAL OR MATERIALS EXPOSURE

3.2.1 Exposed

Material or materials used in lenses or optical devices exposed to direct sunlight as installed on the vehicle.

3.2.2 Protected

Material or materials used in inner lenses for optical devices where such lenses are protected from exposure to the sun by an outer lens made of material or materials meeting the requirements for exposed plastics.

3.3 WEATHERING EFFECTS

3.3.1 Color Bleeding

The migration of color out of a plastic part onto the surrounding surface.

3.3.2 Crazing

A network of apparent fine cracks on or beneath the surface of materials.

3.3.3 Cracking

A separation of adjacent sections of a plastic material with penetration into the specimen.

3.3.4 Haze

The cloudy or turbid appearance of an originally transparent plastic material caused by physical degradation of the material due to any of a variety of factors including natural environmental conditions. Haze is evaluated by measuring the amount of light scattered in a cone angle greater than 2.5 degrees from normal versus the total luminous transmittance as measured by ASTM D 1003-00. Total Luminous transmittance in this case includes the light not scattered, the light scattered less than 5 degrees as well as the light scattered more than 5 degrees. See additional notes in Section 7.

3.3.5 Delamination

A separation of the layers of a material including coatings.

4. TEST PROCEDURES

4.1 Material or Materials to be Tested

Outdoor exposure tests shall be made on each material or materials (as defined in 3.1 and 3.1.1) offered for use in optical parts employed in motor vehicle lighting devices. Concentrations of polymer components and additives such as plasticizers, lubricants, colorants, weathering stabilizers, light diffusion additives, and antioxidants in plastic materials and/or coatings may be changed without outdoor exposure testing if the changes are within the limits of composition represented by higher and lower concentrations of these polymer components and additives have been tested in accordance with 4.3 and found to meet the requirements of Section 5.

4.2 Samples Required

4.2.1 General

Samples of plastic preferably should be injection molded into polished metal molds to produce test specimens with two flat and parallel faces. Alternative processing techniques may also be used to produce equivalent test specimens. Test specimen shape may vary, but each exposed surface should contain a minimum uninterrupted area of 32 cm^2 (5.0 in^2).

4.2.2 Thickness

Samples shall be furnished covering the thickness range stated by the manufacturer. Recommended nominal thicknesses are: 1.6 mm (0.063 in); 3.2 mm (0.125 in); 6.4 mm (0.250 in). A 2.3 mm (0.090 in) sample is also suggested.

4.2.3 Number of Samples Required

Outdoor Exposure Test—1 sample/each thickness/each site x 2 sites for each material or materials = 2 samples/each thickness for each material or combination of materials. Control: 1 sample/each thickness for each material or combination of materials—1 sample each.

NOTE: The control sample must be kept properly protected from influences which may change its appearance and properties.

4.3 Outdoor Exposure Tests

4.3.1 Exposure Sites

Florida (warm, moist climate) and Arizona (warm, dry climate).

4.3.2 Sample Mounting

One sample of each thickness of each material or combination of materials at each test station shall be mounted so that the exposed upper surface of the samples is at an angle of 45 degrees to the horizontal facing south. The exposed surface of the sample shall contain a minimum uninterrupted area of 32 cm^2 (5.0 in^2). The sample shall be mounted in the open no closer than 30 cm (11.8 in) to its background.

4.3.3 Exposure Time and Conditions

The time of exposure shall be as noted in 4.3.3.1 for each type of material or combination of materials exposed. During the exposure time the samples shall be cleaned once every three months by washing with mild soap or detergent and water, and then rinsing with distilled water. Rubbing shall be avoided.

4.3.3.1 Exposure Time Based on Material or Materials Usage

Exposed—(defined in 3.2.1): 3 years. Protected—(defined in 3.2.2): 6 consecutive months starting in May.

4.3.3.2 Accelerated Weathering

After establishing and documenting correlation between accelerated, ASTM D 4364-05, and SAE outdoor exposure tests (4.3) for the plastic material or materials and colorant under consideration, accelerated weathering may be used to evaluate minor changes in concentrations of polymer components and additives (4.1) previously found to be acceptable in the outdoor exposure tests. These tests may be used to establish acceptable high and low concentrations of the components and additives pending completion of 3 year weathering tests. These tests will serve as an indication that the plastic material or materials are capable of meeting the performance requirements of Section 5.

4.4 Optical Measurements

4.4.1 Luminous Transmittance and Color Measurements

Measurements shall be made in accordance with ASTM E 308-01.

4.4.2 Haze Measurements

Measurements shall be made in accordance with ASTM D 1003-00.

5. MATERIAL OR MATERIALS PERFORMANCE REQUIREMENTS

A material or materials in the range of thickness as stated by the material or materials manufacturer, and defined in 3.1 or 3.1.1, shall conform to the following requirements:

5.1 Before Exposure to Any Tests

The chromaticity coordinates shall conform with the requirements of SAE J578 in the range of thickness stated by the material or materials manufacturer.