SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J576

REV. JUL91

Issued 1955-01
Revised 1991-07

Superseding J576 SEP86

Submitted for recognition as an American National Standard

(R) PLASTIC MATERIALS FOR USE IN OPTICAL PARTS SUCH AS LENSES AND REFLEX REFLECTORS OF MOTOR VEHICLE LIGHTING DEVICES

***Foreword*—**This Document has also changed to comply with the new SAE Technical Standards Board Format, Definitions is now Section 3.

***1. Scope*—**This SAE Recommended Practice provides test methods and requirements to evaluate the suitability of plastic materials intended for optical applications in motor vehicles. The tests are intended to determine physical and optical characteristics of the material 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 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 Publications—The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply.

2.1.1 SAE PUBLICATION—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J578—Color Specification

2.1.2 ASTM PUBLICATIONS—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 1003-61—Test for Haze and Luminous Transmittance of Transparent Plastics
ASTM D 4364—Standard Practice for Performing Accelerated Outdoor Weathering Using Concentrated Natural Sunlight Utilizing Night Cycle Water Spray
ASTM E 308-66—Recommended Practices for Spectrophotometry and Description Color in CIE 1931 System

3. Definitions

3.1 MATERIAL**—**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.

QUESTIONS REGARDING THIS DOCUMENT: (724) 772-8512 FAX: (724) 776-0243
TO PLACE A DOCUMENT ORDER; (724) 776-4970 FAX: (724) 776-0790
SAE WEB ADDRESS http://www.sae.org

3.2 MATERIAL EXPOSURE

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

3.2.2 PROTECTED—Material used in inner lenses for optical devices where such lenses are protected from exposure to the sun by an outer lens made of 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 otherwise transparent specimen caused by light scattered from within the specimen or from its surface.

3.3.5 DELAMINATION—A separation of the layers of a material including coatings.

4. Test Procedures

4.1 Materials to be Tested—Outdoor exposure tests shall be made on each material (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, 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 = 2 samples/each thickness for each material. Control: 1 sample/each thickness for each material—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 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 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 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 and SAE outdoor exposure tests (4.3) for the plastic material 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 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 308-66 (1973).

4.4.2 HAZE MEASUREMENTS—Measurements shall be made in accordance with ASTM D 1003-61 (1977).

5. Material Performance Requirements—A material in the range of thickness as stated by the material 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 manufacturer.

5.2 After Outdoor Exposure

5.2.1 LUMINOUS TRANSMITTANCE—The luminous transmittance of the exposed samples using CIE Illuminant A (2856K) shall not have changed by more than 25% of the luminous transmittance of the unexposed control sample when tested in accordance with ASTM E 308.

5.2.2 CHROMATICITY COORDINATES—The chromaticity coordinates shall conform with the requirements of SAE J578 in the range of thickness stated by the material manufacturer.

5.2.3 HAZE—The haze of plastic materials used for lamp lenses shall not be greater than 30% as measured by ASTM D 1003 (1977). The haze of plastic materials used for reflex reflectors and/or exposed cover lens materials used in front of reflex reflectors shall not be greater than 7% as measured by ASTM D 1003. Plastic materials used for forward road illumination devices, excluding cornering lamps, shall show no deterioration.

5.2.4 APPEARANCE—The exposed samples when compared with the unexposed controls shall not show physical changes affecting performance such as color bleeding, delamination, crazing, or cracking.

6. ***Detection of Coatings—***In order to test for the presence of a coating, a trace quantity (100 ppm maximum in wet state) of an optical brightener should be added to a coating formulation. This should be checked by ultraviolet inspection against a known coated sample. Additionally, coating suppliers have the option of providing coatings without optical brighteners if they can provide an industry accepted method to detect the coating.

7. ***Notes***

7.1 **Marginal Indicia—**The change bar (l) located in the left margin is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. An (R) symbol to the left of the document title indicates a complete revision of the report.

PREPARED BY THE SAE LIGHTING COORDINATING COMMITTEE AND
THE SAE MATERIALS STANDARDS COMMITTEE