SAE International

SURFACE VEHICLE STANDARD

SAE J594

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Superseding J594 JUL95

Reflex Reflectors

1. Scope

This SAE Standard provides test procedures, requirements, and guidelines for reflex reflectors.

2. References

2.1 Applicable Publications

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

2.1.1 SAE PUBLICATIONS

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

SAE J575—Tests for Motor Vehicle Lighting Devices and Components
SAE J576—Plastic Materials for Use in Optical Parts Such as Lenses and Reflectors of Motor Vehicle Lighting Devices
SAE J578—Color Specification
SAE J759—Lighting Identification Code

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this document.

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2.2.1 SAE PUBLICATIONS

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-001.

SAE J585—Tail Lamps (Rear Position Lamps) for Use on Motor Vehicles Less Than 2032 mm in Overall Width
SAE J586—Stop Lamps for Use on Motor Vehicles Less Than 2032 mm in Overall Width
SAE J588—Turn Signal Lamps for Use on Motor Vehicles Less Than 2032 mm In Overall Width
SAE J592—Clearance, Side Marker, and Identification Lamps
SAE J1395—Front and Rear Turn Signal Lamps for Use on Motor Vehicles 2032 mm or More in Overall Width
SAE J1398—Stop Lamps for Use on Motor Vehicles 2032 mm or More in Overall Width
SAE J2040—Tail Lamps (Rear Position Lamps) for Use on Vehicles 2032 mm or More in Overall Width
SAE J2041—Reflex Reflectors for Use on Vehicles 2032 mm or More in Overall Width
SAE J2042—Clearance, Sidemarker, and Identification Lamps for Use on Motor Vehicles 2032 mm or More in Overall Width

2.2.2 FEDERAL SPECIFICATIONS:

Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

FMVSS 108 56FR 64733 - 64737—Turn Signal Geometric Visibility Requirements

3. Definitions

3.1 Reflex Reflectors

Devices that are used on vehicles to give an indication of presence to an approaching driver by reflected light from the headlamps on the approaching vehicle.

3.2 The Observation Angle

The angle between a line from the observation point to the center of the reflector and a second line from the center of the reflector to the source of illumination.

3.3 The Entrance Angle

The angle between the axis of the reflex reflector and a line from the center of the reflector to the source of illumination.

4. Identification Code

Reflex reflectors may be identified by the Code "A" in accordance with SAE J759.

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5. Tests

5.1 SAE J575 is a part of this report. The following tests are applicable with the modifications as indicated**.**

5.1.1 VIBRATION TEST

5.1.2 MOISTURE

5.1.3 DUST TEST

5.1.4 CORROSION TESTT

5.1.5 PHOTOMETRY

In addition to the test procedures in SAE J575, the following apply:

5.1.5.1 Test Setup

Photometric measurement shall be made at a test distance of at least 30 m with the reflex reflector setup for testing as shown in Figure 1. The reflex reflector shall be mounted in a goniometer with the center of the reflex area at the center of rotation and at the same horizontal level as the source of illumination.

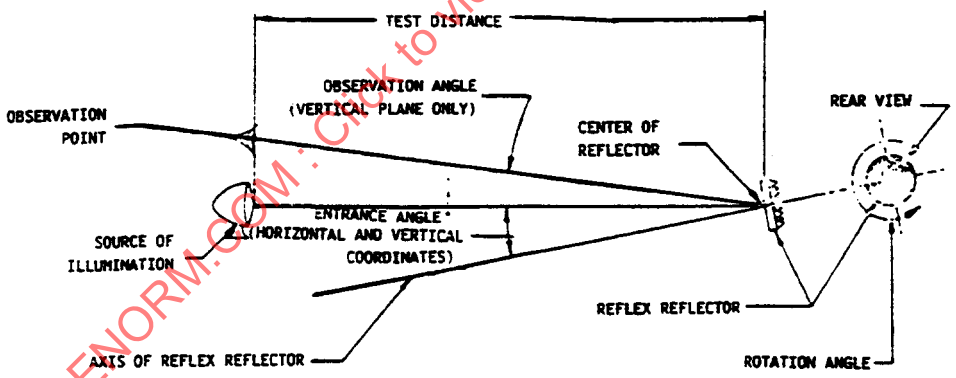

FIGURE 1—SETUP FOR TESTING

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5.1.5.2 Light Source and Sensor

The source of illumination shall be a projector with a 50 mm ± 5 mm effective diameter and a lamp filament operating at 2856 K (nominal) color temperature. In making photoelectric measurements, the opening to the photo cell shall not be more than 13 mm vertical by 25 mm horizontal with the observation point above (geometrically) the source of illumination.

5.1.5.3 Measurements

Reflex reflectors shall be photometered at the observation and entrance angles shown in Table 1. The entrance angle shall be designated left, right, up, and down in accordance with the position of the source of illumination with respect to the axis of the reflex reflector as viewed from behind the reflector. The H-V axis of reflex reflectors shall be taken parallel to the longitudinal axis of the vehicle for rear reflectors and perpendicular to a vertical plane parallel to the longitudinal axis of the vehicle for side reflectors.

Photometric measurements shall be made photoelectrically. The recorded value for each test point shall be the quotient of luminous intensity of the reflected light expressed as millicandela (candela [1]) divided by the illumination on the reflector measured in lux (foot candle). Also, the illumination on the reflex reflector from the source of illumination shall be measured in lux (foot candle). Reflex reflectors may have any linear or area dimension; but, for the photometric test, a maximum projected area of 7740 mm^2 contained within a 254 mm diameter circle shall be exposed.

5.1.5.4 Rotational Position

Reflex reflectors that do not have a fixed rotational position with respect to the vehicle shall be rotated 360 degrees about their axis to find the minimum millicandela per incident lux (candela per incident foot candle), which shall be reported for each test point. If the output falls below the minimum requirement at any test point, the reflector shall be rotated ±5 degrees about its axis from the angle where the minimum output occurred; and the maximum millicandela per lux (candela per foot candle) within the angular range reported as a tolerance value.

Reflex reflectors that, by their design or construction, permit mounting on the vehicle in fixed rotational position shall be tested in this position. A visual locator, such as the word TOP, shall not be considered adequate to establish a fixed rotational position on the vehicle.

5.1.5.5 Uncolored Reflections

If uncolored reflections from the front surface interfere with photometric readings at any test point, the operator shall check 1 degree above, below, right, and left of the test point, and report the lowest reading and location. The latter must meet the minimum requirement for the test point.

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5.2 Color Test

SAE J578 is a part of this report. Additionally, the test sample may be either the reflex reflector or a disc of the same material, technique of fabrication, and dye formulation as the reflex reflector. If a disc is used for color determination by the transmission technique, the thickness should be twice the thickness of the reflector as measured from the face of the lens to the apexes of the reflecting elements. For either sample, a Source "A" illumination shall be used for color measurement.

6. Requirements

6.1 Performance Requirements

A reflex reflector, when tested in accordance with the test procedures specified in Section 5, shall meet the following requirements:

6.1.1 VIBRATION

SAE J575

6.1.2 MOISTURE

SAE J575, except that in the case of sealed units the alternate water submersion test (5.2.4) is required.

6.1.3 DUST

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6.1.4 CORROSION

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6.1.5 PHOTOMETRY

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The reflex reflectors under test shall meet the photometric performance requirement contained in Table 1 or Table 1A.

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TABLE 1—MINIMUM MILLICANDELAS PER INCIDENT LUX FOR A RED REFLEX REFLECTOR[1]

Observation Angle (deg)	Entrance Angle (deg) 0 deg	Entrance Angle (deg) 10 deg Up	Entrance Angle (deg) 10 deg Down	Entrance Angle (deg) 20 deg Left	Entrance Angle (deg) 20 deg Right
0.2	420	280	280	140	140
1.5	6	5	5	3	3

1. Yellow values shall be 2.5 times indicated red values and white values shall be 4 times indicated red values.

TABLE 1A—MINIMUM CANDLEPOWER PER INCIDENT FOOTCANDLE FOR A RED REFLEX REFLECTOR[1]

Observation Angle (deg)	Entrance Angle (deg) 0 deg	Entrance Angle (deg) 10 deg Up	Entrance Angle (deg) 10 deg Down	Entrance Angle (deg) 20 deg Left	Entrance Angle (deg) 20 deg Right
0.2	4.5	3.0	3.0	1.5	1.5
1.5	0.07	0.05	0.05	0.03	0.03

1. Yellow values shall be 2.5 times indicated red values and white values shall be 4 times indicated red values.

6.1.6 COLOR

The color of the light from a reflex reflector shall be red, yellow, or white as defined in SAE J578.

6.2 Material Requirements

Plastic materials used in the optical portion of each reflex reflector unit shall meet the requirements of SAE J576.

6.3 Photometric Design Requirements

6.3.1 If a reflex reflector is optically combined with signaling or marking bulb type devices, it shall be photometered independently by masking from the other functions and shall meet the performance values contained in Table 1 or 1A.

6.4 Installation Requirements

Reflex reflectors shall be designed to comply with all photometric requirements of Table 1 as installed on the vehicle, with all vehicular obstructions considered.

7. Guidelines

7.1 Photometric Design Guidelines

Reflex reflectors, when tested in accordance with 5.1.5, should be designed at least equal to the values contained in Table 1 or 1A.

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7.2 Installation Guidelines

The following guidelines apply to reflex reflectors as used on the vehicle and shall not be considered a part of this report:

7.2.1 Reflex reflectors when used on the exterior of vehicles should be mounted to minimize the accumulation of dirt, grime, and/or snow so that adequate illumination is maintained from the low beam headlamps of approaching vehicles.

7.2.2 If reflex reflectors must perform in severe environments, such as periodic total immersion in water, the user should specify reflex reflector designs suitable for such use.

8. Notes

8.1 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.

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PREPARED BY THE SAE GEOMETRIC VISIBILITY TASK FORCE OF THE SAE SIGNALING AND MARKING DEVICES STANDARDS COMMITTEE AND THE SAE LIGHTING COORDINATING COMMITTEE