SAE International™

SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J2134

REV. JUL2005

Issued 1995-09
Revised 2005-07

Superseding J2134 SEP1995

(R) Luminous Reflectance in Safety Glazing Materials for Road Vehicles

Foreword

This SAE Recommended Practice, which provides a simple test procedure widely used in the optics field, may be used to measure the reflectivity which films applied to safety glazing materials for road vehicles may enhance. The test procedure is closely harmonized with a test method, adopted in response to wide demand in the international community, by the International Organization for Standardization. (See ISO 3538-1978 (E).)

1. Scope

The scope of this SAE Recommended Practice is to provide a simple, practical, and broadly applicable test procedure for appraising luminous Illuminant A reflectance of enhanced reflecting safety glazing materials for road vehicles.

1.1 Field of Application

This test procedure applies to conditions where feasibility, rather than accuracy of measurement, is of prime importance. Measurements can be made outside laboratories in a quality control environment and in similar applications, when glazings, instead of small test specimens, have to be tested.

1.2 Rationale

This document was revised in accordance to the harmonization of Z26 and ISO regulations.

2. References

2.1 Applicable Publication

The following publication forms a part of this specification to the extent specified herein.

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2.1.1 ISO PUBLICATION

Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002.

ISO 3538-1978(E)—Road vehicles—Glazing materials—Test methods for optical properties, Section 5.5 Luminous reflectance test

3. Definitions

For the purpose of this test procedure, the following definitions apply.

3.1 CIE Standard Illuminant A

A radiant source S_A (λ) whose relative spectral radiant power distribution in the visible spectrum (wavelength range: 380 to 780 nm) corresponds to a black body radiator at 2856 K ± 50 K.

3.2 CIE 1931 Standard Observer

The ideal colorimetric observer with color matching functions x(λ), y(λ), z(λ) corresponding to a field of view subtending a 2-degree angle on the retina is commonly called the "2 degree standard observer."

3.3 Luminous Reflectance

The ratio of the reflected luminous flux to the incident luminous flux. Luminous reflectance depends on relative spectral power distribution of the light source.

4. Apparatus[1]

4.1 Primary Instrument

A highly accurate, integrating sphere, laboratory photometer, or spectrophotometer capable of determining the Illuminant A reflectance of small working standards.

4.2 Secondary Instrument

A less accurate, generally portable, instrument that is capable of determining the Illuminant A reflectance on safety glazing materials by applying the formula in Section 7 to this instrument's measured values.

4.3 Light Trap

A device that reduces to 1% or less the contribution of reflection from the transmitted source beam to the measured reflectance value. The light trap should also block the ambient transmitted light.

[1] Since environmental conditions within the scope of this document render primary instruments impractical, secondary instruments are used to obtain reflectance data comparable to primary instrument data.

5. Requirements

5.1 The test conditions of temperature, pressure, and humidity must be such as not to affect the reflectance measurements.

5.2 Stray light must not be a part of the measured specimen reflectance and all measurements should be made with a light trap.

5.3 Primary standards are required to calibrate primary instruments. These are usually highly diffuse reflecting flat tiles with reflectance values traceable to an accredited standards supplier.

5.4 The total error of the primary instrument shall be within 1% absolute of the guaranteed primary standard value.

5.5 Secondary standards are required to calibrate secondary instruments. These standards shall be similar to the safety glazing materials to be measured. Their reflectance values shall have been determined from calibrated primary instruments.

6. Procedure

6.1 Calibrate primary instrument per the instrument manufacturer's instructions using a primary standard.

6.2 Measure a secondary standard with this primary instrument and light trap (B), noting its film side and curvature orientation according to the instrument manufacturer's recommendation.

6.3 Calibrate secondary instrument per the instrument manufacturer's instructions, using this secondary standard and light trap (Cb), noting its film side and curvature orientation.

6.4 Measure the test specimen in the secondary instrument with the specimen and light trap (Ca) oriented as was the secondary standard during calibration. Measure the reflectance (Ca) according to the instrument manufacturer's instructions.

6.5 Obtain at least three separate measurements, spanning the flattest area of the test specimen.

7. Calculation of Corrected Illuminant A Reflectance Values

7.1 Calculate corrected Illuminant A reflectance A (%) values from secondary instrument data by using Equation 1:

$$A(\%) = B(\%) \times \frac{Ca}{Cb} \qquad \text{(Eq. 1)}$$

where:

A(%) = Corrected (A) secondary instrument specimen value (%)
B(%) = Measured (A) primary instrument, secondary standard value (%)
Ca = Measured (A,C,D,) secondary instrument specimen data
Cb = Measured (A,C,D,) measured secondary instrument, secondary standard data