The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
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SURFACE VEHICLE RECOMMENDED PRACTICE

An American National Standard

SAE J2081

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(R) Test Procedure for Determining the Resistance of Safety-glazing Materials, of Which One Surface is Plastic, to Simulated Weathering

1. *Scope*—This SAE Recommended Practice determines whether plastic and glass-plastic safety glazing materials will successfully withstand exposure to simulated weathering conditions.

2. *References*

2.1 Applicable Publications—The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated the latest revision of SAE publications shall apply.

2.1.1 ANSI PUBLICATION—Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ANSI Z26.1-1996—Glazing Materials for Glazing Motor Vehicles and Motor Vehicle Equipment Operating on Land Highways, Safety Standard

2.1.2 ISO PUBLICATIONS—Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ISO 3537-93—Road vehicles—Safety glazing materials—Test methods for mechanical properties
ISO 3538-78—Road vehicles—Safety glazing materials—Test methods for optical properties
ISO 3917-92—Road vehicles—Safety glazing materials—Test methods for resistance to radiation, high temperature, humidity, fire, and simulated weathering
ISO 4892—Plastics—Methods of exposure to laboratory light sources—Part 1: General guidance
ISO 4892-2—Plastics—Methods of exposure to laboratory light sources—Part 2: Xenon-arc sources

2.1.3 CIE PUBLICATION—Available from Commission International de L'eclairage, 52 Bd Malesherbes, F-75008 Paris, France.

CIE Publication No. 15.2 (1986)—Colorimetry

3. ***Exposure Apparatus—***The light source included in this document is the long-arc xenon lamp.

3.1 **Long-Arc Xenon Lamp—**The exposure apparatus[1] shall utilize a long-arc xenon lamp as the source of irradiation, which shall comply with ISO 4892, Part 2.2, Section 4 (artificial weathering).

The long-arc xenon lamp is advantageous in that it can, when correctly filtered and maintained, yield a spectrum most closely approximating that of natural sunlight. To this end, the quartz xenon burner tube, shall be fitted with suitable borosilicate glass optical filter(s)[2]. The xenon lamps employed shall be operated from a suitable 50 or 60 Hz power supply through suitable reactance transformers and electrical equipment.

The UV radiation distribution shall be as specified in ISO 4892–2.2, Section 4.1.2, Table 1, Relative spectral irradiance for artificial weathering (Method A).

The exposure apparatus shall include equipment necessary for measuring and/or controlling the following:

a. Irradiance
b. Black panel temperature
c. Water spray
d. Operating schedule or cycle

The exposure apparatus shall be made from inert materials which do not contaminate the water employed in the test.

Irradiance shall be measured at the test specimen surface and shall be controlled according to the recommendations of the manufacturer.

Total ultraviolet[3] radiant exposure (Joules per square meter) shall be measured or computed and shall be considered the primary measure of test specimen exposure.

4. ***Test Specimens—***The dimensions of the test specimen shall normally be those specified in the appropriate test method for the property or properties to be measured after exposure.

The number of test specimens for each test condition or exposure stage shall be determined, in addition to those required for visual evaluations as referenced in Section 6 of this document, by the number required by the test methods.

It is recommended that visual evaluations be conducted on the largest test specimens tested.

5. ***Procedure—***Measure according to ANSI Z26.1 (1996) or ISO 3538, the luminous transmission of the test specimen(s) to be exposed. (It is not necessary to condition specimens prior to exposure in this test, as the test itself includes special conditions.) Measure, according ANSI Z26.1 (1996) or ISO 3537, the resistance to abrasion of the plastic surface(s) (whether coated or uncoated) of the control specimen(s).

That face of each test specimen, which would represent the exterior surface when mounted on the road vehicle, shall face the lamp.

Other exposure conditions shall be as follows:

5.1 In accordance with ISO 4892, the irradiance shall not vary more than ±10% over the whole test specimen area.

1. Such as Atlas Ci or Xenotest Series, or Suga WEL-X Series.
2. Such as Corning 7740 or Atlas Type S or Atlas Suprax.
3. Total ultraviolet is considered to be all radiation of wavelength less than 400 nm.

5.2 At appropriate intervals, clean lamp filters by washing with detergent and water. Xenon-arc filters shall be replaced according to the recommendations of the equipment manufacturer.

5.3 The temperature within the exposure apparatus during the dry portion of the cycle shall be controlled by circulation of sufficient air to maintain a constant black standard temperature. This temperature shall be 70 °C ± 3 °C as indicated by a Black Standard Thermometer[4] or equivalent.

The thermometer is preferably mounted on a support for a test panel in such a way that it receives the same radiation and cooling conditions as a flat test panel surface on the same support. It may also be located at a fixed distance position different from the specimen distance and calibrated for temperature at the specimen distance.

5.4 The relative humidity within the exposure apparatus shall be controlled at 50% ± 5% during the dry portions of the cycle.

5.5 The deionized water used in the spray cycle shall contain less than 1 ppm silicon dioxide solids and shall leave no permanent deposit or residue on the test specimens which would interfere with subsequent measurements.

5.6 The pH of the water shall be between 6.0 and 8.0, and the conductivity shall be less than 5 microsiemens.

5.7 The temperature of the water in the line where it enters the exposure apparatus shall be the ambient water temperature.

5.8 The water shall strike the test specimens in the form of a fine spray in sufficient volume to wet the test specimens uniformly, immediately upon impact. Water spray will be directed only against the test specimen surface facing the light source. No recirculation of the spray water or immersion of the test specimens in the water shall be permitted.

5.9 The test specimens shall be rotated about the arc in order to provide uniform distribution of the light. All positions in the exposure apparatus shall be filled with test specimens or surrogates to ensure that a uniform temperature distribution is maintained. Test specimens shall be held in frames with backs exposed to the cabinet environment. However, reflections from cabinet walls shall not be permitted to strike the back surface of specimens. If necessary, samples may be backed to block such reflections; the backing must not be in direct contact with the specimen and must not impede the free circulation of air at the specimen surface.

5.10 The exposure apparatus shall be operated to provide continuous light and intermittent water spray in 2 h cycles. Each 2 h cycle, in accordance with ISO 4892, shall be divided into periods during which the test specimens are exposed to light without water spray for 102 min and to light with water spray for 18 min.

6. Evaluation—After exposure, the test specimens may be cleaned, if necessary, by a practice recommended by their manufacturer to remove any residues present. The irradiated specimens shall be conditioned prior to testing for a minimum time of 48 h at 22 °C to 24 °C and 50% ±2% relative humidity.

Evaluate the exposed test specimens visually with respect to the following properties:

a. Bubbles
b. Color[5]
c. Haze
d. Noticeable decomposition

4. The Black Standard Thermometer (BST) is defined by ISO 4892, Part 1, Section 4.1.5.
5. Color change may be evaluated optionally by method of CIE publication No. 15.2 (1986), Colorimetry.

Measure, according to ANSI Z26.1 (1996) or ISO 3537 and ISO 3538, respectively, the luminous transmission and the resistance to abrasion on both sides of the exposed specimen.

7. ***Expression of Results—***Report visual evaluations of exposed test specimens, comparing the appearance of each with that of the unexposed control specimens. If color is measured instrumentally, compute and report the color change.

   Report the change in luminous transmittance and the changes in resistance to abrasion, comparing results of tests on exposed test specimens with results of tests on unexposed control specimens. Note whether the side tested was facing toward or away from the xenon lamp.

8. ***Report of Test Parameters—***Report the following:

   a. Exposure apparatus (manufacturer, model)
   b. Exposure time, hours
   c. Total ultraviolet radiant exposure, Joules per square meter

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