



SURFACE VEHICLE RECOMMENDED PRACTICE

J575™

MAY2025

Issued 1942-05
Reaffirmed 1988-12
Revised 2025-05

Superseding J575 JUN2024

Test Methods and Equipment for Lighting Devices for
Use on Vehicles Less than 2032 mm in Overall Width

RATIONALE

Many tests in SAE J2139 are duplicated in SAE J575, so SAE J2139 will reference SAE J575 for these tests. Other tests in SAE J2139 differ from SAE J575 as they are written specifically for heavy-duty environments. Several tests from SAE J2139 will be added to SAE J575 and referenced in SAE J2139. Both documents will be changed and go to ballot at the same time.

Common tests that were moved from SAE J2139:

Vibration

Moisture Intrusion

Dust Integrity

Corrosion

Photometry

Warpage Test for Devices with Plastic Components

Humidity-Temperature

Thermal Cycle

Changes to SAE J575:

SAE J1383 has been added to 2.1.1.

ASTM D1003 has been added to 2.1.2.

5.10 now describes which moisture intrusion test is appropriate for specific lamp structures.

5.10.3 is now designated for vented lamps.

5.10.4 Water Submersion Moisture Test for Sealed Lamps added (moved from SAE J2139).

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Full document details: SAE J575_202505

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6.10.1 Title changed.

6.10.2 Title changed.

6.10.3 Title changed.

6.10.4 Performance Requirement added for test moved for SAE J2139.

TABLE OF CONTENTS

1.	SCOPE	4
2.	REFERENCES	4
2.1	Applicable Documents	4
2.1.1	SAE Publications	4
2.1.2	ASTM Publications	4
2.1.3	U.S. Government Publications	5
2.1.4	DIN Publications	5
2.1.5	ISO Publications	5
2.1.6	United Nations Publications	5
3.	DEFINITIONS	5
4.	LIGHTING IDENTIFICATION CODE	5
5.	TESTS	6
5.1	Photometry Test	6
5.1.1	Photometric Test Equipment	6
5.1.2	Photometry Test Procedure	6
5.2	Vibration Test	8
5.2.1	Vibration Test Equipment	9
5.2.2	Vibration Test Procedure	9
5.3	Impact Test	10
5.4	Abrasion Test of Plastic Lamp Lens Material	10
5.4.1	Abrading Pad	10
5.4.2	Test Method for Flat Specimen	11
5.4.3	Test Method for Lamp Assembly	11
5.5	Warpage Test on Device with Plastic Components	11
5.5.1	Warpage Test Environment	11
5.5.2	Warpage Test Procedure	12
5.5.3	Sample Evaluation	12
5.6	Thermal Cycle Test	12
5.7	Internal Heat Test	13
5.8	Solar Irradiation	13
5.9	Underhood Thermal Test	14
5.9.1	Test Equipment	14
5.9.2	Underhood Thermal Recommended Test Procedure	14
5.10	Water Intrusion (Moisture) Test	16
5.10.1	Water Spray Test - Type A	16
5.10.2	Water Spray Test - Type B	17
5.10.3	Water Submersion Test for Vented Lighting Devices	18
5.10.4	Water Submersion Test for Sealed Lighting Devices	18
5.11	Humidity Test	19
5.12	Condensation Test for Headlamps	20
5.12.1	Test Equipment and Fixture	20
5.12.2	Preconditioning Lamps	20
5.12.3	Environmental Conditions	21
5.12.4	Lamp Operation	21
5.12.5	Water Spray	21
5.12.6	Initial Condensation Measurement	21

5.12.7	Exposure to Drying Conditions	21
5.12.8	Evaluation	21
5.12.9	Condensation Test Sequence	21
5.13	Dust Exposure Test	21
5.13.1	Dust Exposure Test Equipment	22
5.13.2	Dust Exposure Test Procedure	22
5.14	Corrosion Test	22
5.14.1	Corrosion Test Equipment	22
5.14.2	Corrosion Test Procedure	22
5.15	Corrosion Resistance Test for Reflectors of Replaceable Lens Lamps	23
5.16	Chemical Resistance Test	23
5.17	Chemical Resistance Test for Reflectors of Replaceable Lens Lamps	24
6.	REQUIREMENTS	24
6.1	Photometry	24
6.1.1	Luminous Intensity	24
6.2	Vibration	25
6.3	Impact	25
6.4	Abrasion of Plastic Lamp Lens Material	25
6.4.1	Test Method for Flat Specimen	25
6.4.2	Test Method for Lamp Assembly	25
6.5	Warpage	25
6.6	Thermal Cycle	25
6.7	Internal Heat	25
6.8	Solar Irradiation	25
6.9	Underhood Thermal	26
6.10	Moisture	26
6.10.1	Water Spray Test - Type A Requirements	26
6.10.2	Water Spray Test - Type B Requirements	26
6.10.3	Water Submersion Test for Vented Lighting Devices Requirements	26
6.10.4	Water Submersion Test for Sealed Lighting Devices Requirements	26
6.11	Humidity Test	26
6.12	Condensation Test for Headlamps	26
6.13	Dust Exposure	26
6.14	Corrosion	27
6.15	Corrosion Resistance of Reflectors of Replaceable Lens Lamps	27
6.16	Chemical Resistance	27
6.17	Chemical Resistance of Reflectors of Replaceable Lens Lamps Requirements	27
7.	NOTES	27
7.1	Revision Indicator	27
Figure 1	Lamp configurations for applying photometric test voltage	7
Figure 2	G-load PSD profile for passenger cars and light trucks	10
Figure 3	Abrasion test fixture	11
Figure 4	Thermal cycle profile	13
Figure 5	Underhood thermal test basic principle	15
Figure 6	Water spray nozzle dimensions	19
Figure 7	Humidity test lamp operation	20
Figure 8	Headlamp condensation test dual chamber	20
Table 1	Cycle times (minutes)	12
Table 2	Temperature classification for housing side of lamp	15
Table 3	Summarized condensation test sequence	21

1. SCOPE

This SAE Recommended Practice is intended as a guide toward standard practice and is subject to change to keep pace with experience and technical advances. This document provides standardized laboratory tests, test methods and equipment, and requirements for lighting devices covered by SAE Recommended Practices and Standards. It is intended for devices used on vehicles less than 2032 mm in width. Tests for vehicles larger than 2032 mm in overall width are covered in SAE J2139. Device-specific tests and requirements can be found in applicable SAE Technical Reports.

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 +1 724-776-4970 (outside USA), www.sae.org.

SAE J387	Terminology - Motor Vehicle Lighting
SAE J573	Signal and Marking Light Sources
SAE J577	Vibration Test Machine and Operation Procedure
SAE J1330	Photometry Laboratory Accuracy Guidelines
SAE J1383	Performance Requirements for Motor Vehicle Headlamps
SAE J1889	LED Signal and Marking Lighting Devices
SAE J2139	Tests for Signal and Marking Devices Used on Vehicles 2032 mm or More in Overall Width
SAE J2560	Halogen Light Source Performance Requirements for Motor Vehicle Forward Lighting
SAE J2650	Performance Requirements for Road Illumination Devices Using Light Emitting Diode (LED) Sources

2.1.2 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 B117-03	Method of Salt Spray (Fog) Testing
ASTM C150-84	Specification for Portland Cement
ASTM D471-12a	Standard Test Method for Rubber Property - Effect of Liquids
ASTM D1003	Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics
ASTM E308-08	Standard Practice for Computing the Colors of Objects by Using the CIE System

2.1.3 U.S. Government Publications

Copies of these documents are available online at <https://quicksearch.dla.mil>.

MIL-STD-810F Solar Radiation (Sunshine)

2.1.4 DIN Publications

Copies of these documents are available online at <https://www.din.de/en/>.

DIN 75-220 Ageing of Automotive Components in Solar Simulation Units

2.1.5 ISO Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ISO 12103-1 Road Vehicles - Test Dust for Filter Evaluation

2.1.6 United Nations Publications

Available from United Nations Economic Commission for Europe, Palais des Nations, CH-1211, Geneva 10, Switzerland, Tel: +41-0-22-917-12-34, www.unece.org.

ECE R37 Uniform Provisions Concerning the Approval of Filament Lamps for Use in Approved Lamp Units of Power Driven Vehicles and Their Trailers

3. DEFINITIONS

3.1 BULB

An indivisible assembly which contains a source of light and which is normally used in a lamp. Unless otherwise specified, bulbs used in the tests shall be supplied by the test facility and shall be representative of bulbs in regular production. Where special bulbs are specified, they shall be submitted with the sample devices and the same or similar bulbs shall be used in the tests. Lighting devices designed for use in 6-V, 12-V, or 24-V systems shall be tested with 12-V system bulbs.

3.2 LIGHTING DEVICES

An assembly (divisible or indivisible) which contains a bulb or other light source and generally an optical system such as a lens or a reflector, or both, and which provides a lighting function. Lighting device samples submitted for test shall be representative of the device as regularly manufactured and marketed, unless otherwise identified.

Each sample shall be securely mounted on a test fixture in its designed operating position and shall include all accessory equipment necessary to operate the device in its normal manner.

3.3 TEST FIXTURE

A device specifically designed to support the lighting device in its designed operating position during laboratory testing. This fixture, when used for the vibration test, shall not have a resonant frequency in the 10 to 250 Hz range.

3.4 NORMAL OPERATING CONDITIONS AND NORMAL OPERATING TOLERANCE

Ambient conditions in a laboratory during testing are defined as 23 °C ± 2 °C temperature and 50% relative humidity (RH) ±10% RH. Normal operating tolerance for equipment is defined as ±2 °C and ±10% RH.

4. LIGHTING IDENTIFICATION CODE

SAE J575 may be referenced on lighting devices that comply with this recommended practice.

5. TESTS

The following sections describe individual tests which do not need to be performed in any particular sequence. The completion of the tests may be expedited by performing the tests simultaneously on separately mounted samples. However, it is recommended that the design of each device be evaluated to determine if vibration or warpage tests might affect the results of other tests, in which case the vibration and/or warpage test(s) should be performed first.

5.1 Photometry Test

This test measures luminous intensities at test points throughout the light distribution pattern as specified by the applicable SAE report for the sample device.

5.1.1 Photometric Test Equipment

Unless otherwise specified, the following equipment shall be used to make the photometric measurements.

5.1.1.1 Positioner

The positioner (goniometer) configuration shall be capable of positioning the sample device at the test point positions specified in 5.1.2.4 and in the applicable SAE report. (The recommended configuration is shown in SAE J1330.) Other systems may be used to achieve equivalent positioning, but it may be necessary at compound angles greater than 5 degrees from H-V to calculate the position which is equivalent to that of the recommended goniometer.

5.1.1.2 Photometer

The photometer system consists of a sensor, amplifier, and indicator instrument. The system shall be capable of providing the luminous intensity readings (candela) of the output of the device being tested. The sensor shall be located at the distance from the device specified in the applicable SAE report and shall have the following characteristics.

5.1.1.2.1 Maximum Size

Unless otherwise specified, the maximum effective area of the sensor shall fit within a circle whose diameter is equal to 0.009X the actual test distance from the light source of the sample device to the sensor. The sensor effective area is the actual area of intercepted light striking the detector surface of the photometer. For systems with lens(es) that change the diameter of the intercepted light beam before it reaches the actual detector surface, the maximum size requirements shall apply to the total area of the light actually intercepted by the lens surface. The sensor shall be capable of intercepting all direct illumination from the largest illuminated dimension of the sample device at the test distance.

5.1.1.2.2 Photopic Response

The color response of the photometer sensor shall be corrected to that of $V(\lambda)$ as referenced in ASTM E308-08.

5.1.2 Photometry Test Procedure

The sample device shall be mounted on a test fixture and luminous intensity measurements made as follows.

5.1.2.1 Bulbs

Unless otherwise specified, for lamps requiring incandescent bulbs, accurate rated bulbs (selected per SAE J387) shall be used and shall be operated at their rated luminous flux output. Where specified in the lamp design, other types of light sources or special bulbs may be used and operated at their rated luminous flux output and/or design voltage as appropriate after seasoning per SAE J387 shall be used only where appropriate for the light source type.

5.1.2.2 Test Voltage

- 5.1.2.2.1 Where light source(s) listed in SAE J573, SAE J2560, SAE J2650, SAE J1889, and/or ECE R37 are used, and where the lamp does not have voltage modification circuitry, the light source(s) shall be energized so that they produce the rated (reference) luminous flux mentioned in the standards above (see Figures 1A and 1D).
- 5.1.2.2.2 Where light source(s) not listed in the standards above are used without voltage modification circuitry, they shall be seasoned per SAE J387 and operated at the rated (reference) luminous flux specified by the manufacturer of the light source(s). If the rated (reference) luminous flux output is not available, operate the light source(s) at the design voltage specified by the lamp manufacturer (see Figures 1A and 1D).
- 5.1.2.2.3 Where the lamp is designed to operate with integral voltage modification circuitry, operate the lamp at the design voltage specified by the lamp manufacturer applied to the input of the lamp (see Figure 1B).
- 5.1.2.2.4 Where the lamp is designed to operate with separate circuitry designed to modify vehicle operating voltage applied to the lamp, operate the lamp with this circuitry or circuitry with equivalent output and with the vehicle voltage applied to the input of the modification circuitry (see Figure 1C).
- 5.1.2.2.5 Where the lamp is designed specifically for a vehicle with a stabilized network (e.g., pulse width modulation [PWM]), operate the lamp with the voltage specified by the vehicle manufacturer applied to the input of the lamp (see Figures 1A and 1D).
- 5.1.2.2.6 Where the lamp is a sealed beam or a lamp comprised of a light source permanently sealed inside the lens and housing (reflector) with no additional circuits, operate the lamp with the voltage specified by the lamp manufacturer applied to the inputs of the lamp (see Figure 1D).

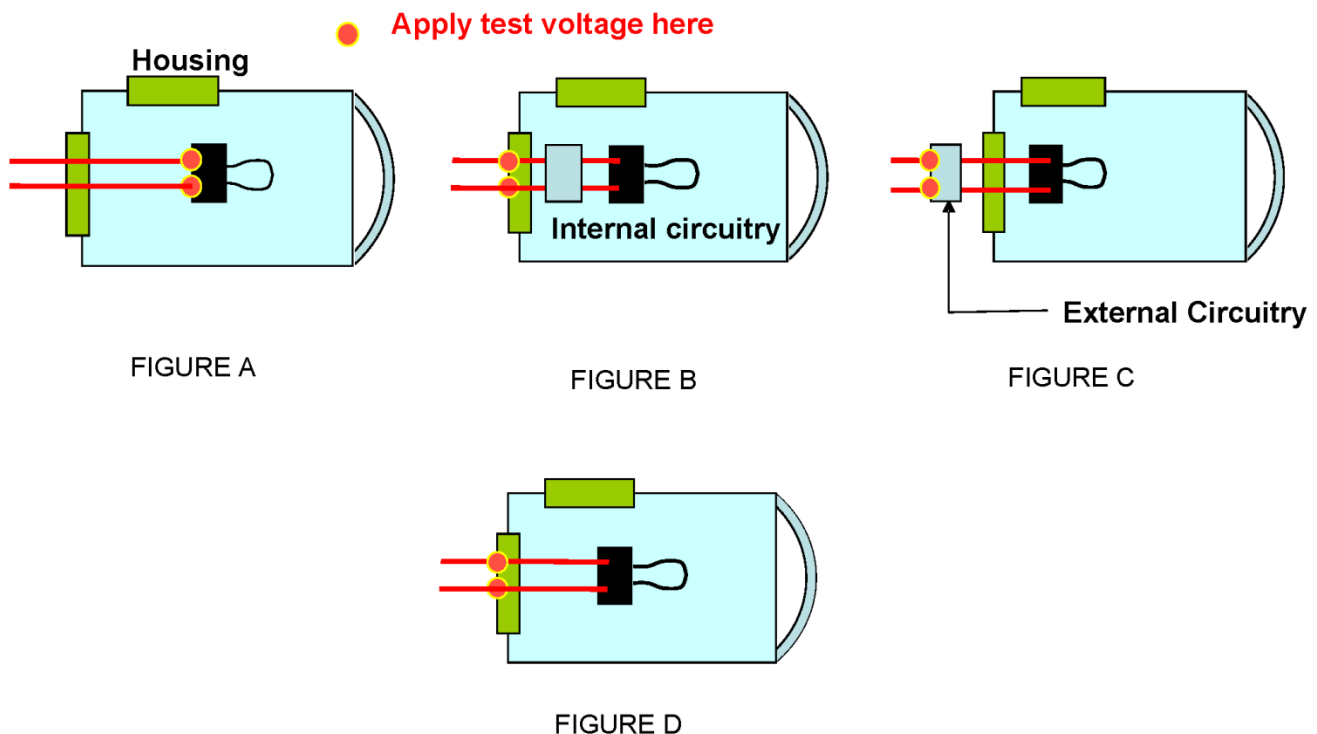


Figure 1 - Lamp configurations for applying photometric test voltage

5.1.2.3 Test Distance

The luminous intensity measurements shall be made at a distance equal to, or greater than, the minimum test distance between the center of the light source (or the face of a reflex reflector) and the photometer sensor as specified in the SAE document applicable to the function of the sample device. If no distance is specified, a distance of at least 3.05 m (10 feet) from the photometer is required for signal lighting, 18.3 m (60 feet) for forward lighting, and 30.5 m (100 feet) for reflex reflectors. The aperture of the receiving photocell shall be no greater than 1/1000 of the measuring distance.

5.1.2.4 Test Point Positions

Test point positions are specified in the applicable SAE document. The following nomenclature shall also apply. The letters "V" and "H" designate the vertical and horizontal planes intersecting both the device light source (or center of a reflex reflector) and the goniometer axis. A device using a bulb with a major and minor light source shall be oriented with respect to its major light source. "H-V" designates the test point angle at the intersection on the H and V planes ($H = 0$, $V = 0$ degrees). Unless otherwise specified, the intersection shall be parallel to the longitudinal axis of the vehicle in the case of the designed operating position of front and rear device functions and shall be horizontal and perpendicular to the longitudinal axis of the vehicle in the case of side function devices. The letters "U," "D," "L," and "R" (up, down, left, and right, respectively) designate the angular position in degrees from the H and V planes to the goniometer as viewed from a lamp or to the source of illumination as viewed from a reflex reflector. This angular direction is defined as follows.

5.1.2.4.1 Horizontal Angle (L and R)

The angle between the vertical plane and the projection onto the horizontal plane of the ray from the center of the light source of the device to the center of the photometer sensor.

5.1.2.4.2 Vertical Angle (U and D)

The angle between the horizontal plane and the ray from the center of the light source of the device to the center of the photometer sensor.

5.1.2.4.3 Measurement Direction

The direction can be visualized where an observer stands behind the device and looks in the direction of the emanating light beam toward the photometer sensor when the device is properly aimed with respect to H-V. It should be noted that when rotating the device on a goniometer, it is necessary to move the aim of the device from the H-V point in the opposite direction of the test point being measured. For example, to read a 5U-V test point, the goniometer shall aim the device 5 degrees down. A similar reversal applies to the down (D), left (L), and right (R) test points.

5.1.2.5 Photometric Measurements and Scan

Photometric measurements and scan shall be performed with the light source(s) steady burning. The luminous intensity measurements (in candela) shall be recorded for each of the test points and zones specified for the function of the device under test.

In addition, a photometric scan for road illumination devices shall be performed in 1-degree increments both horizontally and vertically in a zone defined as 10U to 60U with L and R limits specified by the applicable SAE document for the function of the device under test (e.g., headlamp, fog lamp, cornering lamp).

5.2 Vibration Test

This test evaluates the ability of the sample device to resist damage from vibration-induced stresses. This test is not intended to test the vibration resistance of bulb filaments or headlamp light sources or filaments.

5.2.1 Vibration Test Equipment

Either:

- a. The SAE design vibration machine described in SAE J577.
- b. A vibration test machine capable of wideband random vibration shall be used depending upon which of the two alternative vibration test procedures is used. In either case, the vibrator table shall be of sufficient size to completely contain the test fixture base with no overhang. If this is not possible, a transition table shall be used to mechanically interface the large test fixture base to the smaller vibrator table. Precautions shall be taken to minimize the introduction of extraneous responses in the test setup.

5.2.2 Vibration Test Procedure

A sample device, as mounted on a test fixture, shall be securely mounted to the vibration table and subjected to either:

- a. A vibration test duration of 60 +1/-0 minutes with fixture bolted to anvil end of the SAE J577 vibration machine
- b. The wideband random vibration test parameters and evaluation criteria specified in 5.2.2.1 through 5.2.2.6.

5.2.2.1 Frequency Varied from 10 to 250 Hz

5.2.2.2 G-Load Power Spectrum Density

See Figure 2 for both passenger cars and light trucks.

5.2.2.3 Direction of Vibration

Test on the vertical axis of the device as it is mounted on the vehicle.

5.2.2.4 Test Duration

Six hours at room ambient temperature (total 6 hours).

5.2.2.5 Tolerance Limit

The tolerance limit shall be ± 3 dB.

5.2.2.6 Root Mean Square (RMS) Value

The RMS value shall be 1.81 g for passenger cars and light trucks.