



SURFACE VEHICLE RECOMMENDED PRACTICE

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Discharge Signal Lighting System

RATIONALE

SAE J2320 will be stabilized at this time because no further changes to the procedures or requirements are foreseen in the immediate future since the September 2008 updates were made. If proposed changes come about the document will be opened for review and action.

STABILIZED NOTICE

This document has been declared "Stabilized" by the SAE Signaling and Marking Devices Standards Committee and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

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1. SCOPE

This SAE Recommended Practice applies to motor vehicle signaling and marking devices which use light generated by a discharge source. This document provides test methods, requirements, and guidelines applicable to the unique characteristics of discharge lighting systems and their components. These are in addition to those required for signal and marking devices. This document is intended to be a guide to standard practice and is subject to change to reflect additional experience and technical advances.

2. REFERENCES

2.1 Applicable Publications

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the latest issue of the identified standard 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 724-776-4970 (outside USA), www.sae.org.

SAE J575 Test Methods and Equipment for Lighting Devices and Components for Use on Vehicles Less than 2032 mm in Overall Width

SAE J578 Color Specification

SAE J2009 Discharge Forward Lighting System and Subsystems

SAE J2357 Application Guidelines for Electronically Driven and/or Controlled Exterior Automotive Lighting Equipment

2.1.2 ANSI Publications

Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ANSI Z535.4 Product Safety Signs and Labels

ANSI/IESNA RP 27.1 Photobiological Safety for Lamps and Lamp Systems—General Requirements

2.1.3 Federal Publications

Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, <http://assist.daps.dla.mil/quicksearch/>.

CFR Title 49 Part 571.108 Lamps, Reflective Devices and Associated Equipment (FMVSS 108)

CFR Title 49 Part 564 Replaceable Light Source Information (Part 564)

2.2 Related Publications

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

2.2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J387 Terminology—Motor Vehicle Lighting

SAE J2139 Test for Signal and Marking Devices Used on Vehicles 2032 mm or More in Overall Width

2.2.2 ANSI Publication

Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ANSI/IESNA RP 27.1 Photobiological Safety for Lamps and Lamp Systems—Measurement Techniques

2.2.3 Underwriters Laboratories Publication

Available from Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096, Tel: 847-272-8800, www.ul.com.

Underwriters Laboratories (UL) 935 Fluorescent-Lamp Ballasts

3. DEFINITIONS

3.1 Discharge Signal Lighting (DSL) System

An automotive lighting system used in signal and marking applications. The DSL system is composed of a discharge light source, an electronic control system (ballast), and a lens/reflector assembly.

3.2 Light Rise-Up Time

The period of time between the instant that power is applied to the system and the instant the system reaches 90% of steady-state photometric light output.

3.3 Photometric Maintenance

Change in luminous intensity over operational life.

3.4 Color Maintenance

Change in color over operational life.

3.5 Life

Time in hours "ON," including starting cycles representative of the intended application, of a DSL system during which it meets the specified operational characteristics under specified test conditions. (Reference/Source SAE J2009)

3.6 Rated Laboratory Life

Life specified by the manufacturer as the period during which the DSL system meets the performance specifications. (Rated laboratory life equals design life.) It is not the same as service life, which is generally shorter due to environmental conditions such as vibration, voltage fluctuations, and temperature. (Reference/Source SAE J2009)

3.7 Steady-State

A condition under which the operating characteristics are considered to be stable or changing at such a slow rate as to be insignificant. A "Steady-State" condition would generally be identified in terms of a "maximum percent change per time period."

3.8 Discharge Lamp Ballast

A device for stabilizing the operating characteristics of a discharge light source. The ballast contains all the necessary circuitry to ignite a discharge light source and cause it to operate within a specified power profile range. It controls the required output characteristics of the DSL system. The ballast may consist of one or more separate components. (Reference/Source SAE J2357)

3.9 Ultraviolet Radiation

Radiation in the spectral region between 200 and 400 nm. Definitions and terminology are adopted in accordance with ANSI/IESNA standard IES RP 27.1.

3.10 Design Voltage

The nominal voltage at which the DSL is designed to be operated as specified by the manufacturer.

3.11 Hot Restrike

The restarting of a DSL after it has heated up during operation and before its temperature has returned to initial ambient.

3.12 High Voltage Vapor Ignition

The ignition of combustible vapors by sparks originating from a high voltage electrical system where the insulation is inadequate.

4. LIGHTING IDENTIFICATION CODES AND MARKINGS

4.1 Compliance with Federal Regulations

Markings or labels that are used on vehicle lighting or vehicle lighting electronic control devices shall comply with 49 CFR 564 and 49 CFR 571.108.

4.2 Compliance with Standard on Color of Safety Labels

Labeling on DSL devices using colors to denote the level of safety shall comply with ANSI Z535.4.

5. TESTS

5.1 General Testing Practices

5.1.1 Seasoning

All light sources shall be seasoned prior to being subjected to the tests that follow.

5.1.2 Mounting Orientation

If orientation affects the performance of any component, the component shall be maintained in its vehicle design orientation throughout the test.

5.1.3 Power Supply Capability

The DSL system shall be connected to a laboratory power supply capable of supplying the test voltage regulated to $\pm 1\%$. The power supply shall also be capable of satisfying the DSL system's peak current drain in all operational modes.

5.1.4 Operating Voltage

Unless otherwise specified, the system under test shall be operated at its design voltage.

5.1.5 Operating Temperature

Unless otherwise specified, the ambient temperature shall be $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$. Unless otherwise specified, the system under test shall be kept unenergized for one hour at $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ prior to the start of the test.

5.1.6 Test Piece Selection

A new DSL system may be used for each test.

5.2 Electronic Control Module Testing

The DSL system shall be tested according to SAE J2357.

5.3 Intended Lighting Function Testing

The DSL system shall be tested according to the SAE standard for the intended lighting function.

5.4 Photometrics

5.4.1 Photometry Test

SAE J575 is a part of this document. Unless otherwise specified, the Photometry Test is applicable with the following additions and modifications.

5.4.2 Light Rise-Up Time

The starting characteristics of the light source shall be measured. The light source sub-system will be mounted in a fixture having electrical capacitance and ground plane characteristics as specified by the light source manufacturer. The photocell used shall have a response time constant (time to reach 63.2% of final value) of less than 10 ms. The system shall be off for a minimum of 5 min prior to the application of power. The system shall be in the dark (less than 0.004 Lux at the lamp) when power is applied. Power shall be applied to the ballast and the luminous intensity at the test point shall be recorded as a function of time. Light rise-up time will be reported as the time between application of power and the time when 90% of steady-state luminous intensity is achieved. Light rise-up shall be measured at design voltage, 9.0 V and 16 V.

5.4.3 Color

The color coordinates shall be tested per SAE J578 at each test point in the beam pattern where luminous intensity is specified for the lamp function.

5.5 Hot Restart

The light source shall be energized at design voltage for 5 min minimum. After this time period, the lamp shall be turned off and then reenergized after a specified off time. The light rise-up time will be measured as in 5.4.2. This test will be repeated for each of the following off times: (0.25 s, 1.0 s, 2.0 s, 4.0 s)

5.6 Life/Photometric and Color Maintenance

This test may be performed on the light source and electronic control system (ballast) separated from the housing. The light source and ballast shall be mounted in its design orientation and energized for each hour of the test alternating 30 min running cycle 1 then 30 min running cycle 2 as shown in Table 1. The test shall be instrumented to identify any occurrences of the lamp not lighting when energized. The test will be interrupted periodically, at minimum every 20% of rated laboratory life, to evaluate lamp performance characteristics (Lumens, X and Y Chromaticity and light rise up time). The lamp life reported will be the accumulated on time hours up to the last evaluation where the lamp met required performance characteristics in 6.6.

TABLE 1 - LIFE TEST OPERATING CYCLE

Cycle	Time On	Time Off
Cycle 1	570 s	30 s
Cycle 2	7 s	2 s

5.7 UV Exposure Test

The measurement setup shall be as shown in IES RP 27.1 and the radiation sensor shall be located at 20 cm distance from the source. The light source may include internal shields or filters, which are part of the light source. The system shall be tested with and without its outer lens. Energy levels shall be recorded at 10 nm intervals over the UV range.

5.7.1 Light Source Photometry at Temperature Extremes

The relative lumen output of the light source will be measured at temperature extremes by operating the light source in an environmental chamber at $-40\text{ }^{\circ}\text{C}$, $23\text{ }^{\circ}\text{C}$, and $50\text{ }^{\circ}\text{C}$. The environmental chamber shall be designed to maintain a uniform temperature and shall have no additional convection fans directed at the device under test. At each temperature a consistent portion of the light output shall be measured by a calibrated photometry instrument. Light output will be reported as a percentage of the measurement at $23\text{ }^{\circ}\text{C}$.

6. PERFORMANCE REQUIREMENTS

6.1 General Testing Practices

Specifics of setup and procedure not given in the testing standard shall be noted in the test report.

6.2 Electronic Control Module Testing

The DSL system shall meet the requirements of SAE J2357.

6.3 Intended Lighting Function Testing

The DSL system shall meet the requirements of the SAE standard for the intended lighting function.

6.4 Photometrics

6.4.1 Photometry

The DSL system shall meet the photometric requirements specified in the appropriate SAE standard for the intended lamp function. The requirements shall be applied based on the total projected luminous area for the function being tested. Refer to Table 2.

TABLE 2 - EFFECTIVE PROJECTED LUMINOUS AREAS

Effective Projected Luminous Area	Size
Less than 225 cm^2	1
225 to 450 cm^2	2
Greater than 450 cm^2	3

6.4.2 Light Rise-Up Time

The DSL shall have a light rise-up time of less than 250 ms when energized.

6.4.3 Color

The x and y chromaticity coordinates of the DSL system shall meet those listed in SAE J578 for the appropriate lamp function.

6.5 Hot Restart

The DSL system shall have a hot restart time of less than 250 ms.