



SURFACE VEHICLE RECOMMENDED PRACTICE

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LED Work Lighting Devices

RATIONALE

Many lighting devices are now using LED light sources for signaling and marking applications. These light sources now have performance equaling or greater than the incandescent and halogen light sources previously used. With this technology being employed, it is reasonable to address this usage in machine work lamps with recommended practice in the design of a LED light source device. Photometric Tables 2 and 3 have been taken from SAE J598 as being reasonable and applicable to the general trapezoid and flood patterns used for work illumination on this equipment.

This document is cross-referenced with SAE J2121; therefore, both documents should be published at the same time.

1. SCOPE

This SAE Recommended Practice provides general design performance requirements and related test procedures for LED “white” lighting unit assemblies, other than signal and marking devices, used on Earthmoving, Road Building, and Maintenance off-road work machines as defined in SAE J1116. This report is intended to serve as a guide to standard practice and is subject to change to reflect additional experience and technical advances.

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 J180	Electrical Charging Systems for Off-Road Work Machines
SAE J576	Plastic Material or Materials for Use in Optical Parts Such as Lenses and Reflex Reflectors of Motor Vehicle Lighting Devices
SAE J578	Chromaticity Requirements for Ground Vehicle Lamps and Lighting Equipment
SAE J1029	Lighting and Marking of Construction, Earthmoving Machinery
SAE J1113-1	Electromagnetic Compatibility Measurement Procedures and Limits for Components of Vehicles, Boats (up to 15 m), and Machines (Except Aircraft) (16.6 Hz to 18 GHz)
SAE J1116	Categories of Off-Road Self-Propelled Work Machines

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TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
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For more information on this standard, visit

https://content/J2895_202206/

SAE WEB ADDRESS:

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SAE J1330	Photometry Laboratory Accuracy Guidelines
SAE J1455	Recommended Environmental Practices for Electronic Equipment Designed in Heavy-Duty Vehicle Applications
SAE J1889	LED Signal and Marking Lighting Devices
SAE J2121	Requirements for Composite Lighting Assemblies Used on Construction and Industrial Machinery
SAE J2139	Tests for Signal and Marking Devices Used on Vehicles 2032 mm or More in Overall Width
SAE J2650	Performance Requirements for Light Emitting Diode (LED) Road Illumination Device Systems

2.1.2 IEC Publications

Available from IEC Central Office, 3, rue de Varembe, P.O. Box 131, CH-1211 Geneva 20, Switzerland, Tel: +41 22 919 02 11, www.iec.ch.

CISPR 25 4th Edition, 2016 Vehicles, boats and internal combustion engines - Radio disturbance characteristics - Limits and methods of measurement for the protection of on-board receivers

2.1.3 ISO Publications

Available from International Organization for Standardization, ISO Central Secretariat, 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland, Tel: +41 22 749 01 11, www.iso.org.

ISO 11452 Road vehicles - Component test methods for electrical disturbances from narrowband radiated electromagnetic energy

Part 1: General and definitions

Part 2: Absorber-lined shielded enclosure

Part 3: Transverse electromagnetic mode (TEM) cell

Part 4: Harness excitation methods

Part 5: Stripline

Part 7: Direct radio frequency (RF) power injection

Part 8: Immunity to magnetic fields

Part 10: Immunity to conducted disturbances in the extended audio frequency range

Part 11: Reverberation chamber

ISO 7637-2 Road vehicles – Electrical disturbances from conduction and coupling

Part 2: Electrical transient conduction along supply lines only

ISO 10605 Road vehicles – Test methods for electrical disturbances from electrostatic discharge

3. DEFINITIONS

3.1 LED

An indivisible, discrete light source unit containing a semiconductor in which visible light is non-thermally produced when a forward current flows as a result of applied voltage. The abbreviation LED means Light Emitting Diode.

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3.2 LED LIGHTING DEVICE

A lighting device, in which light is produced by an LED light source, or a by an array of LEDs.

3.3 WORK LIGHTING DEVICE

A lighting device used to enhance the visibility of a task area and normally mounted on a vehicle or piece of equipment.

4. TESTS

The following section describes individual tests, which need not be performed in any particular sequence. Testing may be expedited by performing two or more tests simultaneously on separate samples. A minimum sample size of three LED work lighting devices is recommended.

4.1 Test Voltage

All tests are to be performed using the test voltages indicated in Table 1:

Table 1 - Test voltages

System Voltage	Test Voltage	Test Voltage Tolerance
12	12.8	±0.1
24	25.6	±0.2
36	38.4	±0.3
42	44.8	±0.35
48	51.2	±0.4
72	76.8	±0.6
80	85.3	±0.66

CAUTION: Adequate care shall be exercised in order to maintain a safe test environment when handling voltages higher than 36 V.

Tests are to be made using the wiring supplied by the device manufacturer or wire of the minimum size recommended by the device manufacturer. For devices intended to be hard wired into the vehicle electrical system, the voltage shall be measured at 300 mm from the point at which the wiring exits the device. For devices equipped with an electrical connector, the voltage shall be measured at the supply side of the connector.

4.2 Reverse Polarity Protection

LED light sources may be damaged by the application of a voltage of reverse polarity. Protection shall be provided in the LED work lighting device to prevent any damage when the voltage polarity to the device is reversed. A special warning shall be provided on the LED work lighting device in a case, where reverse polarity is not provided, but must be ensured by an external system.

4.3 Photometry Test

All photometry tests should be performed in accordance with SAE J1330.

4.3.1 Mounting and Orientation

The LED work lighting device shall be mounted on a test fixture simulating the vehicle mounting system and any optically significant surrounding area that would either enhance or block the beam. The device shall be operated at room temperature with the design voltage applied. The beam pattern listed in Table 2 or 3 (as indicated below) will detail the photometric minimum for either a trapezoid or flood beam.