SURFACE VEHICLE RECOMMENDED PRACTICE

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(R) Performance Requirements for Road Illumination Devices Using Light Emitting Diode (LED) Sources

RATIONALE

The following revisions have been made to this version:

- Title and scope are revised to be more accurately reflect the content of the document.
- 2.2, all relevant SAE road illumination device standards added.
- 2.2.2, publication references updated.
- 3.1, LED road illumination device definition was removed.
- 5.2.1, photometry tests are revised, Table 1 is revised, rationale is listed in Section 8.
- 5.2.8, the exception of integral beam headlamp removed.
- 6.2.1, photometry requirements are revised, rationale is listed in Section 8.
- 6.2.5, 6.2.6, 6.2.7, renumbered for consistency with 5.2.
- Section 7, guidelines section added.
- 7.1, added guideline for engine start-stop system.
- Section 8, renumbered (was Section 7).
- 8.1, added.

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 establishes additional performance requirements specifically for road illumination devices using light emitting diode (LED) sources.

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For more information on this standard, visit
https://www.sae.org/standards/content/J2650_202104

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

SAE J578 Chromaticity Requirements for Ground Vehicle Lamps and Lighting Equipment

SAE J759 Lighting Identification Code

SAE J2938 LED Light Sources Tests and Requirements Standard

2.2 Related Publications

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

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

SAE J387 Terminology - Motor Vehicle Lighting

SAE J581 Auxiliary High Beam Lamps

SAE J583 Front Fog Lamp

SAE J584 Motorcycle Headlamps

SAE J852 Front Cornering Lamps for Use on Motor Vehicles

SAE J1306 Motorcycle Auxiliary Front Lamps

SAE J1330 Photometry Laboratory Accuracy Guidelines

SAE J1383 Performance Requirements for Motor Vehicle Headlamps

SAE J1889 LED Signal and Marking Lighting Devices

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

SAE J2591 Limited Adaptive Forward Lighting System

SAE J2838 Full Adaptive Forward Lighting System

SAE J3069 Adaptive Driving Beam

2.2.2 U.S. Government Publications

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

CFR Title 49 Part 571.108 (FMVSS108) Lamps, Reflective Devices and Associated Equipment

2.2.3 Transport Canada Publications

Transport Canada documents are available from Transport Canada, Tower C, Place de Ville, 330 Sparks Street Ottawa, Ontario K1A 0N5, Tel: 1-800-305-2059, www.tc.gc.ca.

Canada Motor Vehicle Safety Standard 108 (CMVSS 108) Lighting Systems and Reflective Devices

2.2.4 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 E308-66 Recommended Practices for Spectrophotometry and Description Color in CIE 1931 System

3. DEFINITIONS

3.1 DUT (DEVICE UNDER TEST)

Refers to the road illumation device using LED sources (including low beam, high beam, front fog lamp, auxilary high beam, and front cornering lamp) that is being tested.

4. IDENTIFICATION CODES, MARKINGS, AND NOTICES

4.1 The device may be marked in accordance with SAE J759. Headlamps using LED devices shall be identified by the code “HL.” Refer to specific device standards for possible additional marking requirements.

4.2 Permanent identification markings may be located on any component of the lamp assembly.

4.3 The design voltage shall be permanently marked on the lamp, unless a control module is used to supply power to the lamp. Where a control module is used, the wording “Control Module Required” shall be indicated on the exterior of the lamp assembly.

5. TESTS

5.1 Each device shall be tested in accordance with the test section of each applicable SAE standard appropriate for the function of the device.

5.2 Tests per SAE J575 with the modifications as indicated.

5.2.1 Photometry

5.2.1.1 For lamps where LED contribute to the beam pattern, all applicable SAE standards photometry tests shall be conducted after the DUT is energized continuously for 30 minutes.

5.2.1.2 For lamps where LED contribute to the beam pattern, test points or lines in Table 1 shall be measured within 1 minute after the DUT is energized.

Table 1 - Cold start photometry requirement

Function	Point and Line to Measure	Max Cd
Low Beam	1U - 1.5L-L 0.5U - 1.5L-L	700 1000

5.2.2 Vibration Test

5.2.3 Impact Test

5.2.4 Abrasion Test of Plastic Headlamp or Fog Lamp Lens Material

5.2.5 Thermal Cycle Test

5.2.6 Internal Heat Test

5.2.7 Humidity Test

5.2.8 Dust Test

5.2.9 Corrosion Test

5.2.10 Corrosion Resistance Test of Reflectors of Replaceable Lens Headlamps or Fog Lamps

5.2.11 Chemical Resistance Test

5.2.12 Chemical Resistance Test of Reflectors of Replaceable Lens Headlamps or Fog Lamps

5.3 Luminous Flux Maintenance Test

5.3.1 The LED packages used in the DUT shall be tested according to SAE J2938.

5.4 Color Test

The color for the emitted light from the DUT shall be measured per the test method specified in SAE J578. It shall also be measured before and after the luminous flux maintenance test (see 5.3).

5.5 Red Spectral Content

A spectrophotometric method shall be used to check the “red” spectral content, red, of the light from the light source for compliance with minimum red content specifications. Refer to ASTM E308-66 for more details on spectrophotometric measurement.

$$k_{red} = \frac{\int_{\lambda=610nm}^{780nm} E_e(\lambda)V(\lambda)d\lambda}{\int_{\lambda=380nm}^{780nm} E_e(\lambda)V(\lambda)d\lambda} \quad \text{(Eq. 1)}$$

where:

Ee(λ) [W/nm] = the spectral distribution of radiant flux

V(λ) = the spectral luminous efficiency

λ [nm] = the wavelength