INCH-POUND
MIL-PRF-32215A
12 March 2009
MIL-PRF-32215
24 March 2008

PERFORMANCE SPECIFICATION

LIGHT EMITTING DIODE (LED) INFRA-RED SECURE BLACKOUT FRONT DRIVING LAMP

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification establishes, unless otherwise specified, the minimum requirements for engineering acceptance for the operation, performance, and reliability of Exterior Lighting Devices (LED), for military vehicles, with Light Emitting Diodes as the base of their technology for illumination and compliance with applicable SAE, United States FMVSS, Canadian CMVSS, STANAG, MIL Standards and Military Performance Specifications. The lamps will be designed to conform to the zone total photometric requirements of this specification and the associated standards referenced within this document where applicable. Please note the term "designed to conform" used throughout this document means, representative production level samples will be used for verification of compliance as specified below in this document.

1.2 Classification. The LED Infra-Red Secure Blackout Front Driving Lamps will be the following types and styles.

Type I – Lamp with Bucket
- Style 1- Green in color
- Style 2 - Tan in color
- Style 3 - Black in Color

Type 2 – Lamp Only
- Style 1- Green in color
- Style 2 – Tan in color
- Style 3 – Black in color

Comments, suggestions, or questions on this document should be addressed to: U.S. Army Tank-automotive and Armaments Command, ATTN: AMSRD-TAR-E/268, MS-268, Warren, MI 48397-5000 or emailed to dami_standardization@conus.army.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at http://assist.daps.dla.mil

AMSC N/A FSC 6220

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents in other sections of this specification, and is not recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they will meet all specified requirements of documents cited in sections 3 and 4 of this specification, whether they are listed or not.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

INTERNATIONAL STANDARDIZATION AGREEMENTS

STANAG 4381 ED. 1 - Blackout Lighting Systems For Tactical Land Vehicles

(Copies of the above specifications, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094 or from their website at http://assist.daps.dla.mil/online/start/)

FEDERAL STANDARDS

FED-STD-595/34083 – Green, Flat or Lusterless
FED-STD-595/33446 – Yellow, Flat or Lusterless
FED-STD-595/37030 – Miscellaneous, Flat or Lusterless

(Copies of these documents are available online at http://assist.daps.dla.mil/quicksearch/, or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

SAE INTERNATIONAL

SAE J576 - Plastic Material or Materials for Use in Optical Parts Such as Lenses and Reflex Reflectors of Motor Vehicle Lighting Devices

SAE J578 - Color Specification

SAE J1889 - L.E.D. Signal and Marking Lighting Devices.

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

(Copies of the above documents can be found by sending a letter to the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096-0001 or by visiting their website www.sae.org)

2.4 Order of precedence. Unless otherwise noted herein or in the contract in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified, samples shall be subjected to first article inspection in accordance with 4.1.1.

3.2 Design, materials, and manufacturing processes. Unless otherwise specified, the design, materials and manufacturing process selection is the prerogative of the contractor as long as all articles submitted to the Government fully meet the operating, interface, support and ownership, and environmental requirements specified.

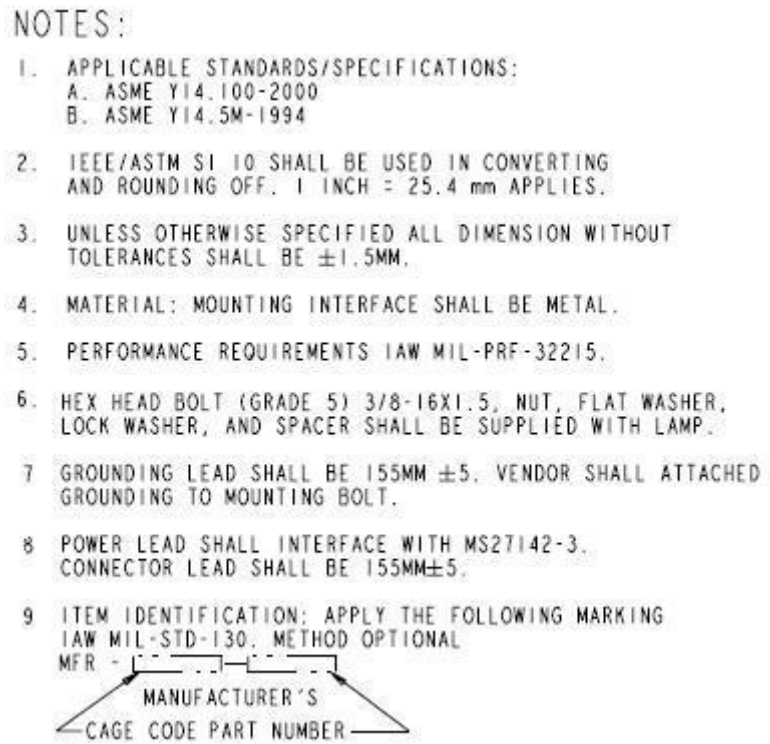
3.2.1 Recycled, recovered, or environmentally preferable materials. Materials shall be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.2.2 Materials. All metallic parts shall be made from corrosion resistant materials or treated for corrosion resistance. Separation of dissimilar metals shall be done by insulation between mating surfaces. Except where necessary to complete an electrical circuit, contact between dissimilar metals that would promote galvanic corrosion shall be avoided. All non-metallic materials shall be fungus resistant or treated to resist fungus growth. Asbestos, cadmium, and hexavalent chromium materials shall not be used in any form in any part of the device. No item, part or assembly shall contain radioactive materials in which the specific activity is greater than 0.002 microcuries per gram or total activity per item exceeds 0.01 microcuries.

3.2.3 Materials and Military LED Lamp Operational Temperatures. Materials shall be as specified herein, applicable specifications, and on applicable drawings. Materials not specifically designated shall be suitable for use in the LED lamp finished assemblies for operational temperature range, in degrees, of - 40°C (- 40°F) to 70°C (158°F), + or - 5°C (+ or - 9°F) without any adverse physical or dimensional properties that would cause lamp to fail or seal degradation resulting in moisture intrusion.

3.2.4 Finished Product Color. Unless otherwise specified by the procuring activity; the external finished lamp color (not lens) shall be green 383; FED-STD-595 Color Chip #34083 for green, #33446 for tan, and #37030 for black. The lens shall be clear in color. Refer to SAE J576 for lens materials.

3.3 Design and Construction. Potential suppliers of external LED Military Vehicle Lighting Lamps shall be aware of form, fit and functional parameters so as to produce a part that shall be backwards compatible with previously produced vehicle lamps. Lamp assembly form, the wire leads length and connector types can be found on Figure 1 below. A lamp comparable to the drawing found in MS51318 may be used in the instance that housing is necessary. The use of circuit board potting materials such as epoxies; sealing gels or silicon derivatives is not acceptable as a finished external surface on the lamp.



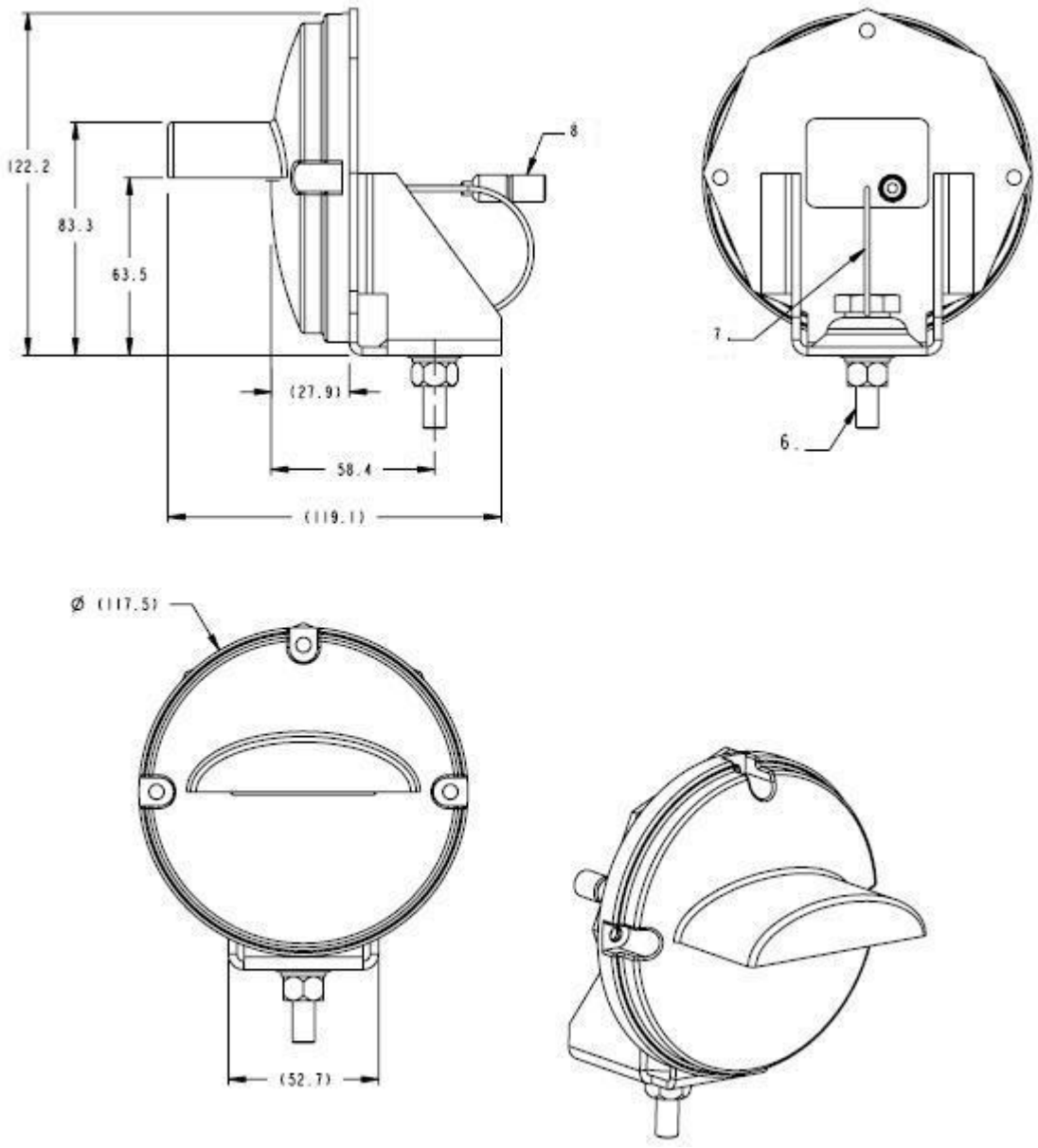


FIGURE 1: Driving Lamp, LED Blackout Envelope Drawing

3.3.1 Lighting section and wiring. The lamp assembly shall have the following wire labeling and lighting section designator:

Wire Label	Lamp Section	Description
19	A	Blackout Drive Lamp

3.3.2 Part numbering. The lamp assemblies are identified by the following:

Former MS Part No.	Volts	Former Ref. Drawing No.
MS51318-1	24	8747985 11668932

3.4 Photometry. Lamp shall be designed to conform with the blackout photometric lighting requirements in Table I, Table II or both below.

Table I. Non Infra Red Secure Blackout Driving Lamp Photometric Specification

Position (angular degrees) Tolerance +/- 0.1 degrees	Candlepower (candela) Tolerance +/- 4%	
	Minimum	Maximum
Line H 30°L to 30°R	0	10
Line 1° DOWN - 6° L to 6°R	5	50
Line 2° DOWN - 9° L to 9°R	5	55
Line 3° DOWN - 12 °L to 12R	5	55
Line 4° DOWN - 15 °L to 15°R	5	60
Line 5° DOWN - 18 °L to 18°R	5	55
Line 6° DOWN - 21 °L to 21°R	5	50
Line 7° DOWN - 24 °L to 24°R	5	30
Line 8° DOWN - 27 °L to 27°R	5	10

Table II. Infra Red Secure Blackout Driving Lamp Photometric Specification

Poition (angular degrees) Tolerance +/- 0.1 degrees	Candlepower (candela) Tolerance +/- 4%	
	Minimum	Maximum
Line H 30°L to 30°R	0	0
Line 1° DOWN - 6° L to 6°R	3	5
Line 2° DOWN - 9° L to 9°R	5	15
Line 3° DOWN - 12 °L to 12R	8	20
Line 4° DOWN - 15 °L to 15°R	7	25
Line 5° DOWN - 18 °L to 18°R	7	20
Line 6° DOWN - 21 °L to 21°R	7	20
Line 7° DOWN - 24 °L to 24°R	3	15
Line 8° DOWN - 27 °L to 27°R	2	10

3.4.1 Spectral Testing. Infra-red Range - Military Blue-Green LED Infra-red Secure Blackout Front Driving Lamps shall be designed such that the emission of any vehicle exterior light source which may be illuminated in the blackout mode, shall be limited to the visible spectrum (400 -700 nm). Emission peaks in the 700 to 920 nm portion of the electromagnetic (EM) spectrum shall not exceed 15% relative to peak emission in the visible spectrum.

3.5 Color. Lamp shall emit light that is Blue-Green in color. The fundamental requirements for color are expressed as the chromaticity coordinates determined by the tristimulus or spectrophotometric methods referenced in SAE J578.

3.6 SAE J2139 Requirements. The LED Infra-red Secure Blackout Front Driving Lamp shall meet all SAE Recommended practices for Mechanical testing listed below as required

a. Vibration
b. Moisture
c. Dust
d. Corrosion
e. Warpage

3.7 Military performance requirements. The LED Infra-red Secure Blackout Front Driving Lamp shall meet electromagnetic interference (EMI) methods CE102 and RE102 of MIL-STD-461 for established Army ground platform requirements.

3.8 Special performance requirements. The LED Infra-red Secure Blackout Front Driving Lamp shall meet all of the requirements listed below.

3.8.1 Water submersion moisture test. Refer to SAE J2139 water submersion moisture test section.

3.8.2 Thermal Cycle. The lamp must comply with SAE J1889 temperature range from minimum -40°C to maximum 70°C cycled 25 times.

3.8.3 5% Salt Water Immersion. The integrity of the lamp's seal and functionality shall be maintained against both moisture intrusion and corrosion at all interfaces of the lamp; including the electrical plug connection, when immersed in a 5% salt water solution for 5 days.

3.8.4 5% Salt Water Injection. The integrity of the lamp's functionality shall be maintained against severe corrosion and moisture due to cracked or broken casings (lenses, housings, etc.) when a 5% salt water solution is injected inside an energized lamp for 3 days.

3.8.5 Fording. The integrity of the lamp's seal and functionality shall be maintained when energized and submerged in 4 feet of water for a minimum of 6 minutes.

3.9 Operating Voltage. The LED Infra-red Secure Blackout Front Driving lamp shall meet the following requirements

3.9.1 Variable Voltage Lamp. The LED external lamps shall have an operational design voltage range of 10.0 VDC to 30.0 VDC. Lamps may be operational outside the stated design voltage range.

3.9.2 Single Voltage Lamp. Lamp components may be designed for a specific operational vehicle voltage range, such as 12 VDC or 24 VDC applications. Lamps may be operational outside the stated design voltage range.

3.9.3 Reverse Polarity. Individual Lamp functions shall meet SAE J2139 voltage regulation test section for 12 volt lamps or for 24 volt lamps, or both for variable voltage lamps.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 4.1.1)

4.1.1 First article inspection. First article inspection of the LED Infra-red Secure Blackout Front Driving lamp shall be produced prior to the manufacturing of the item in production quantities. A quantity of (50) LED Infra-red Secure Blackout Front Driving lamps that represent production level parts shall be used for both destructive and non-destructive testing requirements. Thereafter, random testing, if required, will be performed in the same manner. Any and all failures that may arise from any required testing shall be recorded in the documentation and summarized in a separate test failure document called "Failed Test Item Parameter".

4.2 Design, materials, and manufacturing processes. The lamps must meet the operating, interface, support and ownership and environmental requirements specified in solicitation.

4.2.1 Recycled, recovered or environmentally preferable materials. A bill of materials that meet or exceed the operational and maintenance requirements shall be provided with the verification documents.

4.3 Design and Construction. Evidence shall be provided demonstrating form, fit, function and backward compatibility with previously produced vehicle lamps.

4.4 Photometry. Lamp must comply with the blackout photometric lighting requirements of STANAG Agreement 4381 Edition 1 on pages A-1 Section 4 or A-2 Section 5.

4.4.1 Spectral Testing. The test lamp shall be energized to photometric stability IAW SAE J1889 and test voltages IAW with section 4.9.1 or 4.9.2. of this document. Emission peaks in the 700 to -920 nm portion of the electromagnetic (EM) spectrum shall not exceed 15% relative to peak emission in the visible spectrum (400-700nm). (5) production level parts must comply with this test.

4.4.2 Illumination. The lamp assembly illumination zones shall be measured to comply to a total of 81 test points in photometric mapping as:

Photometric Mapping

Down (degrees)	Candlepower (cd)																
H								○									
1							○	○	○								
2						○	○	○	○	○							
3						○	○	○	○	○	○	○					
4					○	○	○	○	○	○	○	○	○				
5				○	○	○	○	○	○	○	○	○	○	○			
6			○	○	○	○	○	○	○	○	○	○	○	○	○		
7		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
8	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	27	24	21	18	15	12	9	6	Center	6	9	12	15	18	21	24	27
	Left (degrees)									Right (degrees)							

Legend
○ peak

4.5 Color. Lamp shall emit light that is Blue-Green in color within the 400nm to 700nm range. The fundamental requirements for color are expressed as the chromaticity coordinates determined by the tristimulus or spectrophotometric methods referenced in SAE J578. (3) production level parts must comply

4.6 SAE J2139 Verification. The LED Infra-red Secure Blackout Front Driving Lamp shall meet all SAE Recommended practices for Mechanical testing listed below as required.

a. Vibration - (3) production level parts must comply
b. Moisture - (3) production level parts must comply
c. Dust - (3) production level parts must comply
d. Corrosion - (3) production level parts must comply
e. Warpage - (3) production level parts must comply

4.7 Military testing. (1) one production level part shall meet electromagnetic interference (EMI) requirements of CE102 and RE102 for Army ground platform vehicles of MIL-STD-461 when energized with test voltages in section 4.9.1 or 4.9.2 of this document.

4.8 Special performance testing. The LED Infra-red Secure Blackout Front Driving lamp shall be optically functional after each of the following tests. Any loss of function of the lamp or individual LED's is considered a failure for the "special test requirements". The LED Infra-red Secure Blackout Front Driving lamp shall pass the following tests:

4.8.1 Water submersion test. Refer to SAE J2139 water submersion moisture test section.

4.8.2 Thermal Cycle. (3) production level parts shall comply with SAE J1889. The temperature range is from -40°C to 70°C. Test duration is 25 cycles. The lamps are energized from the end of the cold cycle (point A) to the end of the hot cycle (point B).

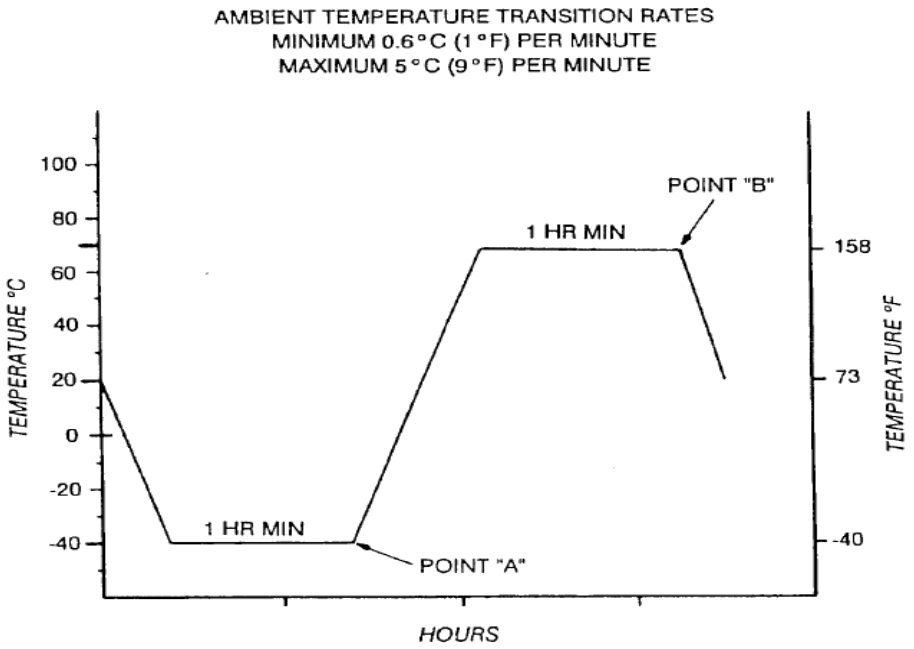


FIGURE 2: Thermal Cycle Profile

4.8.3 5% Salt Water Immersion. (3) production level parts must comply with the procedure listed below.

4.8.3.1 Procedure.

a. Select the samples and check them for proper functionality.
b. Prepare the 5% Salt/H_2O Solution.
c. Place the test samples in the test tank so that they are totally submersed.
d. Place a ground strap in the test tank creating a negative potential in the solution by connecting the strap to the negative side of the power supply.
e. Set the cycle timer to operate the samples at the desired cycle time (i.e. constant).
f. Operate the test samples at the voltage or amperage as described in section 3.9.1 or 3.9.2 of this document.

4.8.3.2 Test Duration. The length of the test is 5 days or 120 hours - minimum.

4.8.4 5% Salt Water Injection. (3) production level parts must comply with the procedure listed below.

4.8.4.1 Procedure.

a. Select the samples and check them for proper functionality.
b. Prepare the 5% Salt/H_2O Solution.

c. Drill a small 1/8" hole into the top of the lens area for injecting the solution. Fill the lamp to just under drilled hole, leaving room for expansion.
d. Set the cycle timer to operate the samples at the desired cycle time (i.e. constant).
e. Operate the test samples at the voltage or amperage as described in section 3.9.1 or 3.9.2 of this document.

4.8.4.2 Test Duration. The length of the test is 3 days or 72 hours - minimum.

4.8.5 Fording. (3) production level parts must comply with the procedure listed below. Any loss of function of the lamp or individual LED's or the presence of water in the interior of the lamp is considered a failure. The LED Infra-red Secure Blackout Front Driving lamp shall be submerged to a depth of 4 feet of fresh or salt water for 6 minutes while energized with test voltage in section 4.9.1 or 4.9.2. of this document.

4.9 Operating Voltage. The LED Blackout Infra-red Secure Front Driving lamp shall comply with the following, any loss of function of the lamp or individual LED's is considered a failure.

4.9.1 Variable Voltage Lamp. Operational DC Voltage: The LED external lamps shall have an operational design voltage range of 10.0 VDC to 30.0 VDC. The lamps shall operate at 14.0 VDC and 28.0 VDC +/- 1 VDC, while meeting all requirements in this standard. Testing and verification where applied voltage is required shall be performed at 14.0VDC and 28.0 VDC +/- 1 VDC. Lamps may be operational outside the stated design voltage range.

4.9.2 Single Voltage Lamp. Lamp components may be designed for a specific operational vehicle voltage range. Lamps designed specifically for 12 VDC or 24 VDC operational electrical vehicle systems shall be tested by using 14.0 VDC or 28.0 VDC +/- 1 VDC, while meeting all requirements in this standard. All required testing will be performed at 14.0 VDC or 28.0 VDC +/- 1 VDC or other design voltage as determined by the manufacturer. Lamps may be operational outside the stated design voltage range.

4.9.3 Reverse Polarity. Individual Lamp functions shall meet SAE J2139, Section 4.8.2.2, for -12 volt lamps or -24 volt lamps, or both for variable voltage lamps. The lamps must function normally when the correct polarity is re-applied. (3) production level parts shall comply with this test.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of material is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature which may be helpful, but is not mandatory.)

6.1 Intended use. Light Emitting Diode (LED) Lamps covered by this performance specification are intended primarily for the purpose of replacing current incandescent blackout infra-red secure front driving lamps. LED technology that is properly designed, is not vulnerable to shock and vibration and therefore performs much better in severe end-use environments. By converting Incandescent Lamp products to LED, the lamps often last the life of the vehicle thus eliminating maintenance and field service issues.

6.2 Acquisition requirements. Acquisition documents should specify the following.

a. Title, number, and date of the specification.
b. Packaging (See 5.1)

6.3 Subject term (key word) listing.

Photometry
Water submersion test

6.4 Definitions.

6.4.1 Defective. Defective is a unit of product which contains one or more defects.

6.5 International standardization agreement implementation. This specification implements STANAG 4381 Ed-1 “Blackout Lighting Systems For Tactical Land Vehicles”. When amendment, revision, or cancellation of this specification is proposed, the preparing activity must coordinate the action with the U.S. National Point of Contact for the international standardization agreement, as identified in the ASSIST database at http://assist.daps.dla.mil.

6.6 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Custodians:
Army - AT
Navy - MC
Air Force - 99

Preparing Activity:
Army - AT

(Project 6220-2009-004)

Review Activities:
Army – AV, CR
Navy – AS, CG, YD
Air Force – 03, 11, 71
DLA – GS2

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at http://assist.daps.dla.mil.