SAE International™

SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J1383 MAY2010

Issued 1985-04
Revised 2010-05

Superseding J1383 MAY2005

Performance Requirements for Motor Vehicle Headlamps

RATIONALE

Revisions to this document were made to improve the readability and to revise the photometric tables format. In addition, the replaceable bulb wording was removed/revised to apply to other types of motor vehicle headlamp systems. Specific changes are detailed below:

a. Title of document changed to remove replaceable bulb restriction for this document.

b. Table of Contents changed to remove "replaceable bulb" on Figures 1, 3, and 4. Figure titles also changed. Table of Contents updated to mirror changes in the document.

c. Revised section 3 to remove definitions duplicated from SAE J387 and added definitions for Integral Beam Headlamp, Combination Headlamp, Replaceable Bulb Headlamp, and Replaceable Light Source Headlamp. Revised Replaceable Light Source definition. Removed H-V axis definition.

d. Updated section 4 to include markings for Integral Beam Headlamps and Combination Headlamps. Changed title of 4.5 to Optical Axis Marking for a more accurate description of this section.

e. Revised Section 5 to more closely match SAE J575. Also, removed duplicate wording from SAE J575 and just referred to SAE J575 when appropriate.

f. Revised Section 6 to match Section 5 renumbering. Also, removed duplicate wording from SAE J575 and just referred to SAE J575 when appropriate.

g. Revised the 10U-60U measuring procedure to ensure that the test is repeatable and accurate. Width of scans revised to ±20 degrees to reflect only the important area for veiling glare. Graphics changes as required to reflect the zone.

h. Added similar requirements for two zones defining 0U-10U as previously there were no requirements/restrictions for this zone. "Zone 2" created to define requirements for the left side of the beam pattern and "Zone 3" created to define the requirements for the right side of the beam pattern.

i. Moved Figures into the body of the text and deleted photo Tables as they are incorporated into the figures. Figures renumbered as appropriate. Figures duplicated in SAE J575 removed.

j. Added text describing the photometric charts and added some chart footnotes into the document text.

k. Modified Scope to match actual contents of document by removing the words "material requirements, design requirements, and design guidelines."

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: http://www.sae.org

TABLE OF CONTENTS

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 performance requirements for headlamps.

2. REFERENCES

2.1 Applicable Publications

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

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 J599 Lighting Inspection Code

SAE J600 Headlamp Aim Test Machines

SAE J602 Headlamp Aiming Device for Mechanically Aimable Headlamp Units

SAE J759 Lighting Identification Code

SAE J2442 Harmonized Provisions for Installation of Lamps and Retro-Reflecting Devices on Road Vehicles Except Motorcycles

SAE J2595 Performance Requirements for Sealed Beam Motor Vehicle Headlamps

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 Federal Publications

Available from the Superintendent of Documents, U. S. Government Printing Office, Mail Stop: SSOP, Washington, DC 20402-9320.

FMVSS 108

2.2.2 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 E 308-85 Standard Method for Computing the Color of Objects by Using the CIE System

3. DEFINITIONS

3.1 HEADLAMP

A lighting device providing a high and/or a low beam designed to provide illumination forward of the vehicle.

3.2 REPLACEABLE LIGHT SOURCE

A light source with related envelope and mounting base which is removable from the headlamp for the purpose of replacement.

3.3 MECHANICALLY AIMABLE HEADLAMP

A headlamp having three pads on the lens, forming an aiming plane or an aiming ring, the aiming plane or aiming ring being used for laboratory photometric testing and for inspecting the aim of the headlamp when installed on the vehicle.

3.4 AIMING PLANE

A plane defined by the surface of the three aiming pads on the headlamp lens or by the forward surface of an aiming ring.

3.5 HEADLAMP OPTICAL AXIS

The line formed by the intersection of a horizontal and a vertical plane through the light source parallel to the longitudinal axis of the vehicle. If the optical axis of the headlamp is not at the geometric center of the lens or multiple light sources are used, then the location will be indicated by the manufacturer on the headlamp.

3.6 SEASONING - FILAMENT BULBS

Process of energizing the filament of a bulb at design voltage for a period of time equal to 1% of design life or 10 h, whichever is shorter

3.7 TEST VOLTAGE

The specified voltage and tolerance to be used when conducting a test.

3.8 RATED VOLTAGE

The nominal circuit or vehicle electrical system voltage classification. (Example: 12 V headlamp.)

3.9 HEADLAMP TEST FIXTURE

Device specifically designed to support a headlamp in the test position during laboratory testing. Mounting hardware and components shall be representative of those necessary to operate the headlamp in its normal manner.

3.10 AIMING SCREWS

Screws with self-locking features used for adjusting horizontal and/or vertical aim and to retain the headlamp unit in the proper position.

3.11 VEHICLE HEADLAMP AIMING DEVICE (VHAD)

An aiming device incorporated in the headlamp system which allows for inspection and adjustment of headlamp aim without the use of aim measuring equipment external to the vehicle.

3.12 HIGH BEAM

A beam intended primarily for distant illumination and for use when not meeting or following other vehicles.

3.13 LOW BEAM

A beam intended to illuminate the road ahead of the vehicle when meeting or following another vehicle.

3.14 HIGH BEAM FILAMENT SOURCE(S)

Filament coil designed to provide high beam function.

3.15 LOW BEAM FILAMENT SOURCE(S)

Filament coil designed to provide low beam function.

3.16 AIMING REFERENCE PLANE

A plane which is perpendicular to the longitudinal axis of the vehicle and tangent to the forward most aiming pad on the headlamp or, where such a plane would intersect the surface of the lens between the aiming pads, a plane which is perpendicular to the longitudinal axis of the vehicle and is located forward of and as close to the lens as possible without causing interference.

3.17 DIRECT READING INDICATOR

A device that is mounted in its entirety on a headlamp or headlamp aiming or headlamp mounting equipment, is part of a VHAD, and provides information about headlamp aim in analog or digital format.

3.18 REMOTE READING INDICATOR

A device that is not mounted in its entirety on a headlamp or headlamp aiming or headlamp mounting equipment, but otherwise meets the definition of a direct reading indicator.

3.19 VISUALLY/OPTICALLY AIMABLE HEADLAMP

A headlamp which is designed to be visually/optically aimable.

3.20 CUTOFF

A visual/optical aiming cue in the low beam that marks a separation between areas of higher and lower luminance.

3.21 Integral Beam Headlamp

A headlamp, other than a standardized sealed beam headlamp or a replaceable bulb headlamp, comprising an integral and indivisible optical assembly including lens, reflector, and light source.

3.22 COMBINATION HEADLAMP

A headlighting system comprised of two different headlamp types, each of which shall be either a sealed beam headlamp, an integral beam headlamp, or a replaceable bulb headlamp.

3.23 REPLACEABLE LIGHT SOURCE HEADLAMP

A headlamp utilizing a replaceable light source(s) to provide illumination.

4. LIGHTING IDENTIFICATION CODE, MARKINGS AND NOTICES

4.1 SAE J759 Lighting Identification Code

4.1.1 Replaceable Bulb

Headlamps meeting the requirements herein for replaceable bulb headlamps shall be identified by the code “HR” in accordance with SAE J759.

4.1.2 Integral Beam

Headlamps meeting the requirements herein for integral beam headlamps shall be identified by the code “HI” in accordance with SAE J759.

4.1.3 Combination Headlamp

Headlamps meeting the requirements herein for combination headlamps shall be identified by the codes of the headlamp types incorporated in the headlamp system in accordance with SAE J759.

4.2 Headlamp Marking Requirements

Headlamps shall be permanently marked with the following markings:

4.2.1 Name and/or trademark of the manufacturer, importer, or vehicle manufacturer shall be visible when installed on the vehicle.

4.2.2 Design voltage and part number or trade number shall appear on the headlamp.

4.2.3 If markings are molded on the surface of the lens, the face of letters, numbers, or other symbols molded on the surface of the lens shall not be raised more than 0.5 mm (0.020 in).

4.2.4 The letters, numbers, or other symbols shall be not less than 3 mm in height.

4.3 Headlamp Aim-Type Code

4.3.1 Mechanical Aim Headlamp

4.3.1.1 The lens shall have three aiming pads which meet the requirements of Figures 1 to 4, which detail the dimensional specifications for the location of aiming pads on replaceable bulb headlamps. The aiming pads need not be centered at the geometric center of the lens, or on the optical axis. Except as provided in 4.3.1.2, a whole number, which represents the distance in tenths of an inch (i.e., 0.3 in = 3) from the aiming reference plane to the respective aiming pads which are not in contact with that plane, shall be inscribed adjacent to each respective aiming pad on the lens. The height of these numbers shall be not less than 0.157 in (4 mm). If there is interference between the plane and the area of the lens between the aiming pads, the whole number represents the distance to a secondary plane. The secondary plane shall be located parallel to the aiming reference plane and as close to the lens as possible without causing interference.

4.3.1.2 If the forward aiming pad is the lower inboard aiming pad, then the dimensions may be placed anywhere on the lens. The dimension for the outboard aiming pad (Dimension F in Table 1) shall be followed by the letter “H” and the dimension for the center aiming pad shall be followed by the letter “V.” The dimensions shall be expressed in tenths of an inch.

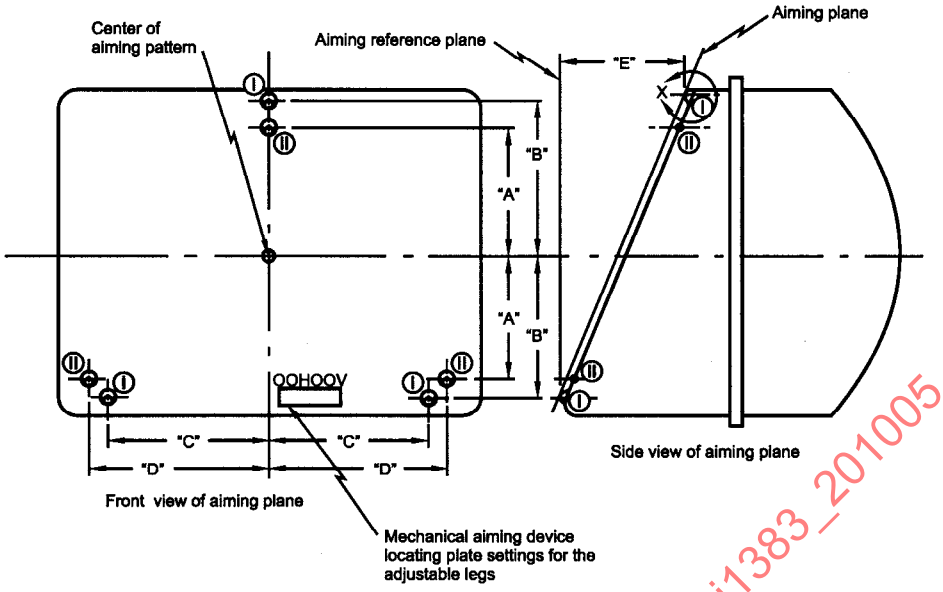


FIGURE 1 - DIMENSIONAL SPECIFICATIONS FOR LOCATION OF AIMING PADS ON HEADLAMPS

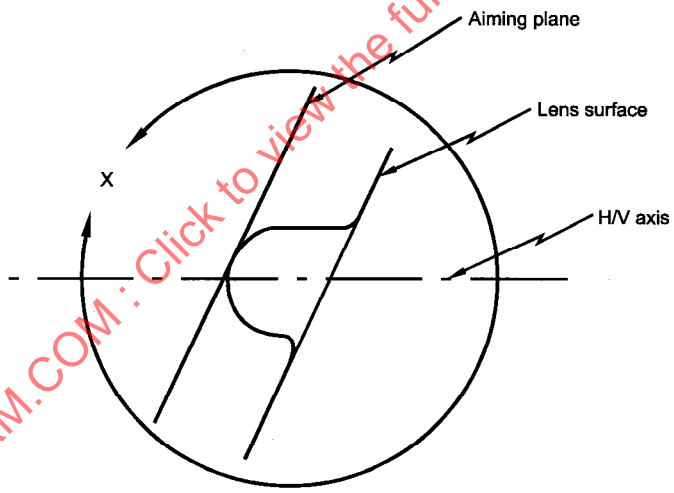
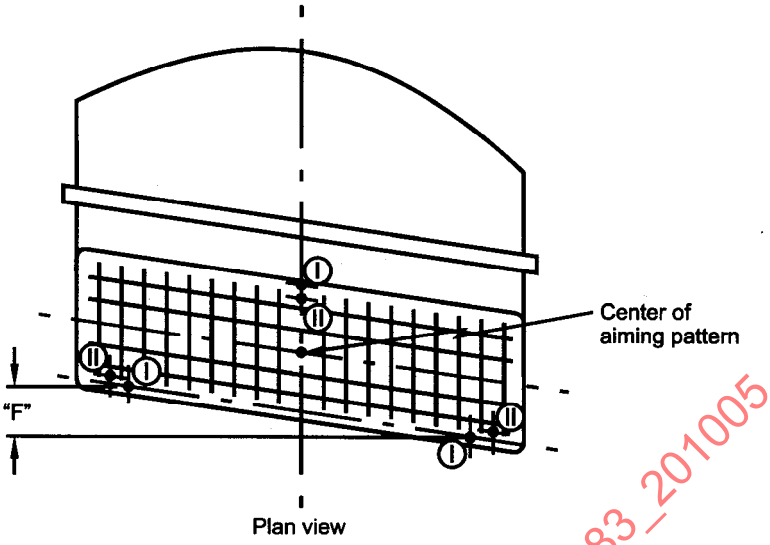


FIGURE 2 - DETAIL EXAMPLE OF AIMING PAD



Notes:

- Group I or Group II aiming pad locations may be used.
- Group I aiming pad location (front view) is that prescribed for 2B1 sealed beam units.
- Group II aiming pad location (front view) is that prescribed for 1A1and 2A1 sealed beam units.

FIGURE 3 - DIMENSIONAL SPECIFICATIONS FOR LOCATION OF AIMING PADS ON HEADLAMP UNITS

Dimension	Millimeters	Inches
A	42.16 ± 0.25	1.660 ± 0.010
B	60.05 ± 1.00	2.364 ± 0.039
C	64.0 ± 1.00	2.520 ± 0.039
D	68.58 ± 0.51	2.700 ± 0.020
E	Mechanical aiming device locating plate setting for the vertical adjustable leg. (Millimeters)	
F	Mechanical aiming device locating plate setting for the horizontal adjustable leg. (Millimeters)	

TABLE 1 - DIMENSIONAL SPECIFICATIONS FOR LOCATION OF AIMING PADS ON HEADLAMP UNITS

4.3.2 Visual/Optical Aim Headlamp

4.3.2.1 Vertically Aimed Headlamp

4.3.2.1.1 Headlamps intended to be aimed vertically using the left side of the low beam pattern shall be marked "VOL."

4.3.2.1.2 Headlamps intended to be aimed vertically using the right side of the low beam pattern shall be marked "VOR."

4.3.2.2 Vertically and Horizontally Aimed Headlamp (Reference 6.8.5.1.4)

4.3.2.2.1 Headlamps intended to be aimed horizontally using a 0.2D scan and be aimed vertically via the right side of the low beam pattern shall be marked "VORH1."

4.3.2.2.2 Headlamps intended to be aimed horizontally using a 0.2D scan and be aimed vertically via the left side of the low beam pattern shall be marked "VOLH1."

4.3.2.2.3 Headlamps intended to be aimed horizontally using a 3-line scan shall be aimed vertically via the left side of the low beam pattern and shall be marked "VOLH2."

4.3.2.3 High Beam Headlamp

4.3.2.3.1 Headlamps intended to be aimed via the high beam pattern shall be marked "VO."

4.3.3 VHAD Aim Headlamp: VHAD aim headlamps do not require any aim-type code markings.

4.4 Replacement Component Marking

4.4.1 Replaceable lens headlamps shall have the manufacturer's name and/or trademark identification permanently marked on the lens and housing. In addition, a replacement component shall be marked with all markings that appear on the original equipment component that it replaces except that the name of the manufacturer may be different. Replacement components must be marked with the name of the manufacturer or importer of the component.

4.5 Optical Axis Marking

To assure proper horizontal and vertical alignment of the aiming screen or optical aiming equipment, the optical axis location shall be indicated. The mark or markings may be on the interior or exterior of the lens or indicated by a mark or central structure on the interior or exterior of the headlamp.

5. TESTS

The voltage for all testing shall be design voltage ±0.1 V DC as measured at the terminals of the headlamp unless otherwise specified. The test procedures and test requirements specified in this document were developed emphasizing extreme conditions in the headlamp environment. Separate headlamps shall be used for each test. Unless otherwise indicated, all drain holes, breathing devices or other openings or vents of headlamp units under test shall be in their normal operating condition.

Light Sources - Unless otherwise specified, light sources used in the tests shall be representative of light sources in regular production.

5.1 SAE J575, Tests for Motor Vehicle Lighting Devices and Components

The following tests are applicable with the modifications as indicated.

5.1.1 Photometry

5.1.1.1 Headlamp Photometric Aim

5.1.1.1.1 Mechanically aimable headlamps shall be aimed with the aiming plane at the design angle(s) to the photometer axis and the headlamp optical axis coincident with the photometer axis.

5.1.1.1.2 VHAD aimable headlamps shall be aimed to the zero indication of the VHAD.

5.1.1.1.3 On headlamps with visual/optical aim, photometric tests shall be performed with the aim set vertically by the gradient value as described in 6.8.5.1. Aim is then to be set horizontally by the appropriate means according to the lamp design.

5.1.1.1.3.1 Adjust the horizontal VHAD to "0," or

5.1.1.1.3.2 Aim the horizontal gradient value if the lamp has a horizontal adjustment mechanism without a VHAD, or

5.1.1.1.3.3 Mount the headlamp assembly to the test fixture in its design mounting position in the vehicle if it does not have a horizontal adjustment mechanism.

5.1.2 Vibration Test

5.1.3 Humidity

5.1.4 Dust Test – Integral beam headlamps are not subject to this test

The headlamp shall be seasoned and photometered to the test points in Figure 5 and/or Figure 6 as applicable before and after the dust test. If no dust is visible inside the headlamp after the dust test, the headlamp does not need to be photometered after the dust test.

5.1.5 Corrosion Test

5.1.6 Corrosion Resistance of Reflectors of Replaceable Lens Headlamps

5.1.7 Chemical Resistance Test

5.1.8 Chemical Resistance of Reflectors of Replaceable Lens Headlamps

5.1.9 Thermal Cycle Test

5.1.10 Internal Heat Test

5.1.11 Impact Test

5.1.12 Abrasion Test of Plastic Headlamp Lens Material

5.2 Color Test

SAE J578 is a part of this report.

5.3 Plastic Materials

SAE J576 is a part of this report except for Luminous Transmittance Test.

5.4 Aiming Adjustment Test

5.4.1 When making the aiming adjustment test, an accurate measurement technique shall be used. This may consist of:

5.4.1.1 Attaching a device such as a spot projector to the headlamp, or

5.4.1.2 Replacing the replaceable bulb with a mirror along with a separate light source, or

5.4.1.3 Other equally accurate means.

5.4.2 When conducting the test, the headlamp shall be mounted initially in the design position with the unit at nominal aim (0,0).

5.4.3 The vertical aiming screw shall be turned to the upper and lower extremes of its range as defined in 6.4 and the vertical angle between the mechanical and H-V axes shall be measured in each position. Any change in horizontal angle throughout the vertical aim range shall also be recorded.

5.4.4 The horizontal aiming screw shall be turned to the left and right extremes of its range as defined in 6.4 and the horizontal angle between the mechanical and H-V axes shall be measured in each position. Any change in vertical angle throughout the horizontal aim range shall also be recorded.

5.5 Aim Range Test

For headlamps aimed by moving the reflector relative to the lens and headlamp housing or vice versa.

5.5.1 Test the photometry per 5.1.1 with the lens at any position relative to the reflector within the range limits as specified in 6.4.

5.6 Inward Force Test

For mechanically aimable headlamps.

The headlamp assembly, including the aiming adjusters, shall be subjected to an inward force of 222 N directed normal to the headlamp aiming plane and symmetrically about the center of the headlamp assembly face (Figure 5).

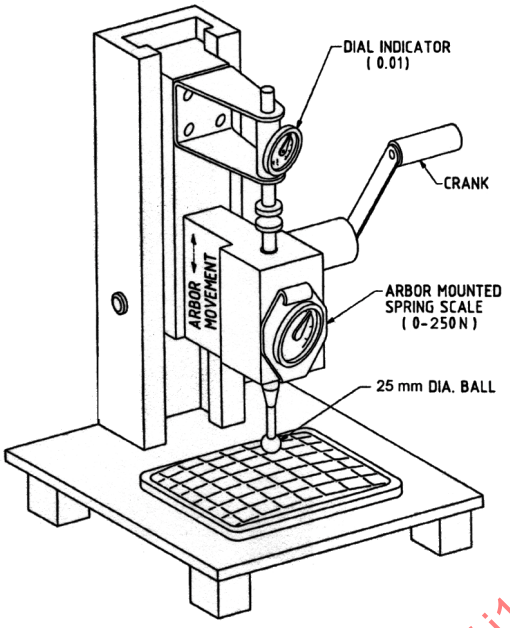


FIGURE 4 - INWARD FORCE TESTER

5.7 Torque Deflection Test

For mechanically aimable headlamps.

5.7.1 The headlamp assembly to be tested shall be mounted in design vehicle position and set at nominal aim (0,0).

5.7.2 Replaceable bulb headlamps shall be equipped with an appropriate fixture which mates to one of the deflectors shown in SAE J2595 on the face of the lens with an applied torque of 222 N acting parallel to the aiming reference plane and in a downward direction. The force shall be applied through the aiming pads.

5.7.3 The torque shall be applied to the headlamp assembly through the deflectometer and a reading on the thumbwheel shall be taken. The torque shall then be removed and a second reading on the thumbwheel shall be taken.

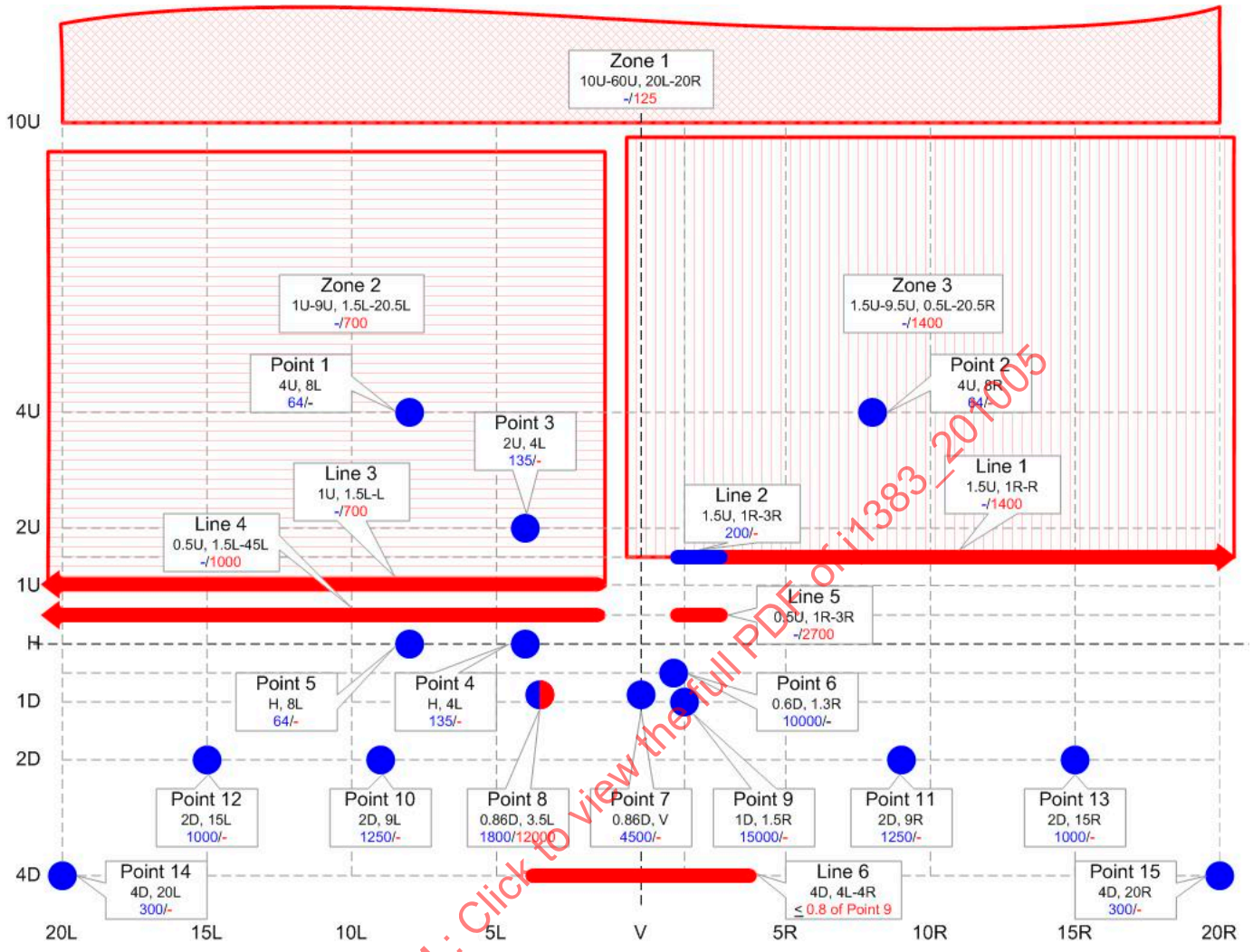
6. PERFORMANCE REQUIREMENTS

A headlamp, when tested in accordance with the test procedures specified in Section 5, shall meet the following requirements:

6.1 SAE J575, Test Requirements for Motor Vehicle Lighting Devices and Components and additional requirements as detailed.

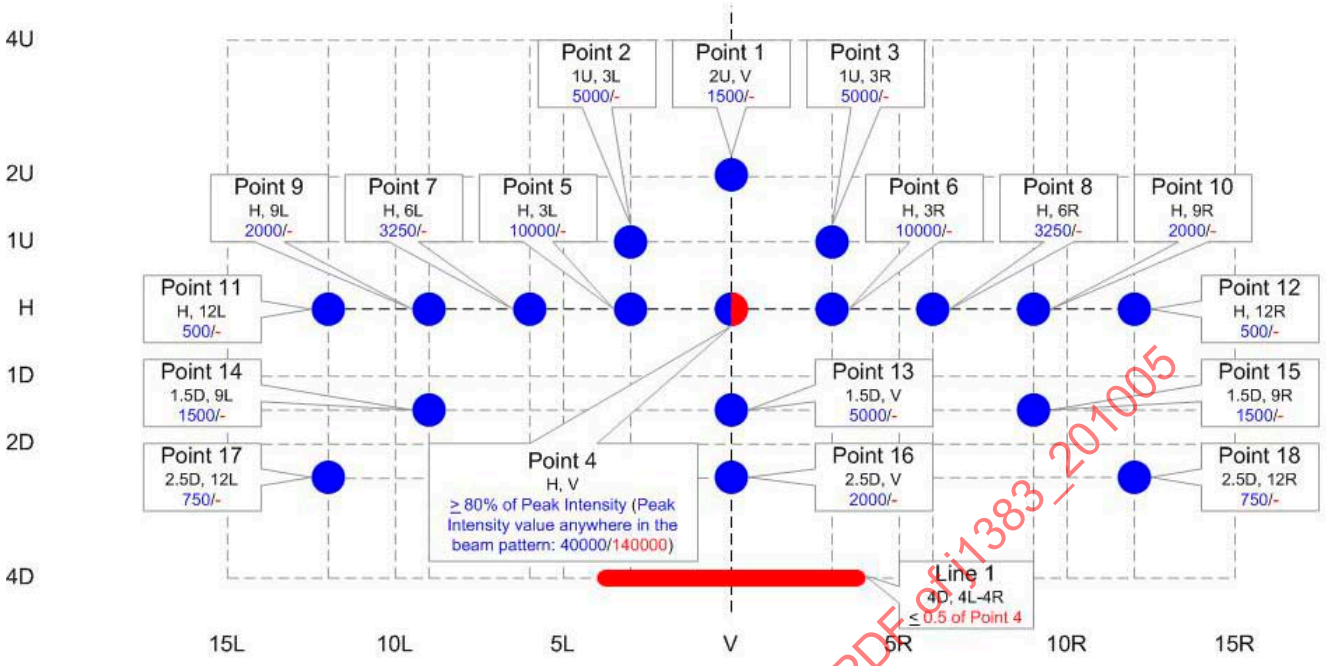
6.1.1 Photometric Performance Requirement

Headlamps shall be designed to conform to the photometric requirements of Figures 6 and 7.



1. A tolerance of ±0.25 degrees in location is allowed at any test point or line except as noted in the footnotes below.
2. **Zone 1** shall be photometrically tested in 1 degree increments from **20** degrees left to **20** degrees right and 10 degrees up to 60 degrees up forming a grid of points **totaling 2091 test points**. The photometric values measured at each increment shall be recorded. Photometric values at each increment (test point) that exceed 125 cd are permissible provided that no more than **105** test points **(5% of the total test points)** exceed 125 cd and none of these test points shall exceed 550cd. Note: 0.25 degree re-aim is not permitted at test points for this test.
3. **Zone 2** shall be photometrically tested in 1 degree increments from **20.5** degrees left to 1.5 degrees left and 1 degree up to **9** degrees up forming a grid of points **totaling 180 test points**. The photometric values measured at each increment shall be recorded. Photometric values at each increment (test point) that exceed 700 cd are permissible provided that no more than **18** test points **(10% of the total test points)** exceed 700 cd and no test points shall exceed 1000 cd. Note: 0.25 degree re-aim is not permitted at test points for this test.
4. **Zone 3** shall be photometrically tested in 1 degree increments from **0.5 degrees left** to **20.5** degrees right and 1.5 degrees up to **9.5** degrees up forming a grid of points **totaling 189 test points**. The photometric values measured at each increment shall be recorded. Photometric values at each increment (test point) that exceed 1400 cd are permissible provided that no more than **19** test points **(10% of the total test points)** exceed 1400 cd and no test points shall exceed 2000 cd. Note: 0.25 degree re-aim is not permitted at test points for this test.

FIGURE 5 - PHOTOMETRY—LOW BEAM HEADLAMPS



1. A tolerance of ±0.25 degrees in location is allowed at any test point or line.
2. The peak intensity is the maximum candela value found anywhere in the beam pattern.
3. The intensity at Point 4 shall be equal to or greater than 80% of the peak intensity.

FIGURE 6 - PHOTOMETRY—HIGH BEAM HEADLAMPS

6.1.1.1 In Figures 6 and 7, the minimum photometric requirements, in cd, are shown on the left of each text box describing the Point, Line or Zone and the maximum photometric requirements, in cd, are shown on the right of each text box describing the Point, Line or Zone. Where there is a dash (-), it signifies there is no requirement. Each text box for Points, Lines and Zones gives the location of the Point, Line, or Zone as well. For example, Point 1 in Figure 5 describes a Point located at 4 degrees Up and 8 degrees Left with a minimum photometric requirement of 64 cd and no maximum photometric requirement.

6.1.1.2 A tolerance of 0.25 degrees is permitted during photometric tests for Low Beam and High Beam at any test point or line except as noted in the footnotes for Figure 5.

6.1.1.3 The peak intensity for the High Beam is the maximum candela value found anywhere in the beam pattern.

6.1.1.4 The intensity at Point 4 in Figure 6 (High Beam) shall be equal to or greater than 80% of the peak intensity.

6.1.2 Vibration Requirement

6.1.3 Humidity Performance Requirement

6.1.4 Dust Requirement

6.1.5 Corrosion Requirement

6.1.6 Corrosion Resistance of Reflectors of Replaceable Lens Headlamps Requirements

6.1.7 Chemical Resistance Requirement

6.1.8 Chemical Resistance of Reflectors of Replaceable Lens Headlamps Requirements

6.1.9 Thermal Cycle Requirement

6.1.10 Internal Heat Requirement

6.1.11 Impact Requirement

6.1.12 Abrasion of Plastic Headlamp Lens Material Requirements

6.2 Color Requirement

The color of the emanating light produced by a headlamp shall be white per SAE J578.

6.3 Plastic Materials Requirements

Headlamps shall meet the material requirements of SAE J576, except Luminous Transmittance.

6.4 Aiming Adjustment Requirement

When tested in accordance with 5.4, the headlamp shall meet the following requirements:

6.4.1 When a headlamp system is tested in a laboratory, the range of its vertical aim shall not be less than ±4.0 degrees in the vertical plane from the nominal correct aim position or the full range of pitch of the vehicle on which the headlamp system is installed [from empty to full rated Gross Vehicle Weight].

6.4.2 A minimum aiming adjustment of ±2.5 degrees from the nominal correct aim position shall be provided in the horizontal plane for headlamp assemblies that have a horizontal adjuster.

6.4.3 When tested in the laboratory, adjustment of one aim axis through its full on-vehicle range (specified in 6.4.1 and 6.4.2) shall not cause the aim of the other axis to deviate more than ±0.76 degrees.

6.4.3.1 If the aim mechanism does not meet the requirements of 6.4.3, a cautionary label shall be placed adjacent to the mechanism stating the caution and including either the reason for the caution or the corrective action necessary. Each such label shall also refer the reader to the vehicle operator's manual for complete instructions. Each such vehicle shall be equipped with an operator's manual containing the complete instructions appropriate for the mechanism installed.

6.4.4 On headlamps with a vertical VHAD tested in the laboratory, the headlamp shall be able to indicate variations in vertical aim within a range extending from 1.2 degrees above to at least 1.2 degrees below a longitudinal horizontal plane through the center of the headlamp system.

6.4.5 On headlamps with a horizontal VHAD tested in the laboratory, the headlamp shall be able to indicate variations in horizontal aim within a range extending from 0.76 degrees left to at least 0.76 degrees right of a longitudinal vertical plane through the center of the headlamp system.

6.4.6 The self-locking devices used to hold aiming screws in position shall continue to operate satisfactorily for a minimum of 20 adjustments on each screw, over a length of screw thread of not less than 3 mm.

6.4.6.1 When a headlamp system is installed on a motor vehicle, it shall be aimable with at least one of the following: An externally applied aiming device, an on-vehicle headlamp aiming device (VHAD) installed by the vehicle or lamp manufacturer, or by visual/optical means.

NOTE: Paragraphs 6.4.3, 6.4.4 and 6.4.5 are not applicable to headlamps with ball and socket or equivalent adjusting means.

6.5 Aim Range Requirements

Headlamps shall be designed to conform to the photometric requirements of Figure 5 and/or Figure 6 as applicable when tested within the limits defined in 6.4.

6.6 Inward Force Requirements

When subjected to the tests in 5.6, the headlamp shall meet the following requirements:

6.6.1 The headlamp shall not permanently recede by more than 2.5 mm.

6.6.2 The aim of the headlamp shall not permanently deviate in any direction by more than 32 mm at a distance of 7.6 m (equivalent to 0.25 degree).

6.7 Torque Deflection Requirement

When subjected to the tests in 5.7, the difference between the two readings shall not exceed 0.30 degree.

6.8 Headlamp Aim Requirements

6.8.1 Dimensions for Mechanical Aiming of Headlamps

Headlamps shall meet the following requirements to assure compatibility with mechanical aimers.

6.8.1.1 Aiming pad design may vary but shall meet the limiting dimensions as shown in Figures 1 to 4.

6.8.1.2 Except as provided in 6.8.1.4, a whole number, which represents the distance in tenths of an inch (i.e., 0.3 in = 3) from the aiming reference plane to the respective aiming pads which are not in contact with that plane, shall be inscribed adjacent to each respective aiming pad on the lens.

6.8.1.3 The height of these numbers shall not be less than 4 mm.

6.8.1.4 If the most forward aiming pad is the lower inboard aiming pad, then the numbers may be placed anywhere on the lens.

6.8.1.5 The number for the outboard aiming pad shall be followed by the letter “H” and the number for the center aiming pad shall be followed by the letter “V.”

6.8.2 Headlamps when mounted on a vehicle shall meet the aimer compatibility requirements described in 6.8.3, or the Vehicle Headlamp Aiming Device (VHAD) requirements described in 6.8.4, or the Visual/Optical Aim requirements described in 6.8.5.

6.8.3 Aimer Compatibility

Mechanically aimable headlamps shall be designed and installed so that they may be inspected and aimed by mechanical aimers as specified in SAE J602 without the removal of any ornamental trim rings or other parts.

6.8.4 A Vehicle Headlamp Aim Device (VHAD) shall meet the requirements specified as follows:

6.8.4.1 Aim

The VHAD shall provide for headlamp aim inspection and adjustment in the vertical and/or horizontal directions.

6.8.4.2 Vertical Aim

The VHAD shall include the necessary references and scales relative to the horizontal plane to assure correct vertical aim for photometry and on-vehicle usage. An off-vehicle measurement of the angle of the plane of the ground is permitted. In addition, an equal number of graduations from the “0” position representing angular changes in the axis in the upward and downward directions shall be provided. The “0” position shall be marked “0” and shall be accurate to within ±0.1 degree.

6.8.4.2.1 Each graduation shall represent a change in the vertical angle not larger than 0.19 degree. Graduations shall provide for variations in aim at least 1.2 degrees above and below the horizontal axis. For each graduation, the angle indicated by the mark or number shall be accurate to within ±0.1 degree of the actual angle between the mark and the horizontal axis.

6.8.4.2.2 Graduations on the VHAD scale shall be spaced a minimum of 1.27 mm (0.05 in) apart. If a direct reading analog indicator is provided, it shall represent the actual aim movement in a clear, understandable format.

6.8.4.2.3 The graduations shall be legible at a distance of 0.3 m under an illumination of 30 fc maximum, measured at the top of the radiator, by an observer having 20/20 vision (Snellen).

6.8.4.3 Horizontal Aim

The VHAD shall include references and scales relative to the longitudinal axis of the vehicle necessary to assure correct horizontal aim for photometry and on-vehicle usage. A mark shall be used to indicate alignment of the headlamps relative to the longitudinal axis of the vehicle. The mark shall consist of the symbol “0” and shall be accurate to within ±0.2 degree. In addition, an equal number of graduations representing equal angular changes in the leftward and rightward directions relative to the vehicle longitudinal axis shall be provided.

6.8.4.3.1 Each graduation shall represent a change in the horizontal angle not greater than 0.38 degree to the left and right of the longitudinal axis of the vehicle, and shall have an accuracy relative to the zero mark of equal to or better than ±0.1 degree.

6.8.4.3.2 The graduations shall be legible at a distance of 0.3 m under an illumination of 30 fc maximum, measured at the top of the radiator, by an observer having 20/20 vision (Snellen).

6.8.4.3.3 The horizontal indicator shall perform through a minimum range of 0.76 degrees left and right; however, the indicator itself shall be capable of recalibration over an angular range of ±2.5 degrees relative to the longitudinal axis of the vehicle to accommodate any adjustment necessary for recalibrating the indicator.

6.8.5 Visual Optical Aim lamps shall meet requirements as follows:

6.8.5.1 Visual/Optical Aiming

Each visually/optically aimable headlamp shall be designed to conform to the following requirements:

6.8.5.1.1 Vertical aim, low beam. Each low beam headlamp, designed to be visually/optically aimed, shall have a horizontal cutoff in the beam pattern. It may be either on the left side or on the right side of a vertical line through the optical axis. The minimum gradient of the cutoff shall be not less than 0.13 when measured as described in 6.8.5.1.3.

6.8.5.1.1.1 For a headlamp designed with the cutoff on the left side of the vertical line, the headlamp shall be aimed vertically so that the cutoff on the left side shall be positioned at 0.4 degree down from the H-H line when the cutoff is measured at 2.5°L of the vertical.

6.8.5.1.1.2 For a headlamp designed with the cutoff on the right side of the vertical line, the headlamp shall be aimed vertically so that the cutoff on the right side shall be positioned at the H-H line when the cutoff is measured at 2.0°R of the vertical.