SURFACE VEHICLE RECOMMENDED PRACTICE

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(R) Harmonized Provisions for Installation of Exterior Lamps and Retro-Reflecting Devices on Road Vehicles Except Motorcycles

RATIONALE

Worldwide, there are many regulations and standards for the installation of lighting and signaling devices on road vehicles. Differences in engineering and human-factors philosophy, compliance systems, industry practice, and other factors mean the specifications for any given functions or device differ by issuing body, but all the standards have the same general intent. That is to ensure the driver can see safely in darkness or inclement weather without causing blinding glare to other drivers, and that the vehicle is adequately conspicuous with regard to its presence, position, size, direction of travel, and driver's intent to decelerate or change directions.

There are windows of overlap among the various standards for installation of each particular lighting device or function, created by cooperative effort among the various standards-issuing bodies. There are also windows of overlap among the various standards for design, construction, and performance of each particular lighting device or function, but those aspects are outside the scope of this document. The purpose of this SAE Recommended Practice is to describe the overlapped common specifications for installation of each device and function so that vehicle manufacturers can minimize the proliferation of vehicle configuration variants and associated costs. This document is intended as an international industry guide to lighting and light signaling device installation. Manufacturers installing lighting and signaling devices in accordance with this SAE Recommended Practice will maximize their ability to equip any given vehicle model with one lighting system configuration acceptable for sale in the greatest possible number of markets.

FOREWORD

This document considers U.S. regulations (FMVSS 108), Canadian regulations (CMVSS 108), UNECE Regulation 48, ISO 303 – “Road Vehicles–Installation of lighting and light signaling devices for motor vehicles and their trailers”, and APEC’s Regulation Analysis - Road Transport - harmonization Project. This document also considers Japanese standards (JIS D-5500) and the work of GRE, the United Nations working party on lighting and light signaling. FMVSS and CMVSS 108 contain some requirements from obsolete versions of industry standards (SAE, ASTM, etc.). In such cases the more stringent requirements are considered in this document. Because the intent of this Recommended Practice is to provide specifications for a single lighting system configuration acceptable in the maximum possible number of markets, some provisions may be more stringent than the legal requirements in effect in any particular market.

Although the internationalized UNECE Regulations and/or North American (MVSS 108) standards are widely accepted around the world, there remain some markets maintaining their own technical standards. Those regulations may be included in future revisions of this document.

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http://www.sae.org/technical/standards/J2442_201507

APPLICATION NOTES

This document is intended to supplement - not replace or supersede - documents from SAE, UNECE, and other technical bodies describing and prescribing the design, construction, performance, installation, and other requirements of the various lighting, light-signaling, and retro-reflective devices. This document is meant to be used in conjunction with those documents, as an installation guideline. To the maximum practicable degree, language in this document mirrors that in other SAE J-documents. However, there are some deviations in language to provide optimal clarity in describing the overlapping provisions of SAE and non-SAE technical standards, since that is the primary purpose of this document. Individual device documents remain the preferred source for comprehensive specifications of vehicle lighting and retro-reflective devices without regard to non-SAE practice.

Nomenclature remains an area of incomplete worldwide agreement, and any given device or function may have multiple names in common use worldwide. Terminology in this document is primarily in accordance with SAE nomenclature current as of this document's publication date. Parenthetical reference to non-SAE designations is made in the heading of each relevant section, but in the body text only where necessary for clarity. A glossary of SAE to non-SAE terms can be found in Section 8 of this document.

Global harmonization is not yet complete, so un-harmonized competing regulations that complicate or prevent single-specification global compliance are denoted within the text by **(Not Harmonized)** or **(Not Fully Harmonized)**. This is to flag those aspects of lighting system configuration that must be different for different markets, and to draw attention to topics warranting special attention in ongoing international cooperative efforts toward harmonization.

TABLE OF CONTENTS

1. SCOPE

This SAE Recommended Practice applies to road vehicles except motorcycles. It describes the commonalities of installation requirements for lighting and light signaling devices contained in the regulatory requirements and industry standards of North America, Japan, and the widely-adopted UNECE ("European") Regulations. It does not apply to installation of lighting and light signaling devices specific to special purpose vehicles, including but not limited to police, medical and other emergency or public service vehicles.

This document does not carry force of law and does not replace regulatory requirements in effect at the time of application. It is subject to change to reflect additional experience, technical advances, and especially changes in government and industry documents used as references. Users of this document are advised to mind the applicable legal requirements in effect where their vehicles will be sold and registered.

2. REFERENCES

2.1 Applicable Documents

The following documents form a part of this document to the extent specified herein. Unless otherwise indicated, the latest version of a referenced SAE document shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096, USA Tel 1-877-606-7323 (inside USA and Canada) or +1-724-776-4970 (outside USA), www.sae.org

SAE J578 Color Specification

SAE J594 Reflex Reflectors

SAE J759 Lighting Identification Code

SAE J1373 Rear Cornering Lamps for Use on Motor Vehicles Less than 9.1 m in Overall Length

SAE J2087 Daytime Running Light

SAE J2338 Recommendations of the SAE Task Force on Headlamp Mounting Height

SAE J2584 Headlamp Mounting Height for Passenger and Pickup Truck Vehicles

2.1.2 ASTM Publication

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 D 4956-90 Specification for Retroreflective Sheeting for Traffic Control

2.1.3 United States Federal Publications

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

Code of Federal Regulations 49 - Part 571.108 (FMVSS 108)

Trailers: Federal Lighting Equipment Location Requirements – DOT HS 808545

Trucks, Buses, MPVs: Federal Lighting Equipment Location Requirements – DOT HS 808546

2.1.4 Canadian Publications

Available from Transport Canada, Motor Vehicle Standards and Research Branch, 330 Sparks Street, Ottawa, Ontario K1A 0N5, Canada, Tel +1-613-990-2309, www.tc.gc.ca

Canada Motor Vehicle Safety Act and Regulations – Section 108 (CMVSS 108)

Technical Standards Document No. 108

Trailers: Federal Lighting Equipment Location Requirements

Trucks, Buses, MPVs: Federal Lighting Equipment Location Requirements

2.1.5 Japanese Publications

Available from webstore.ansi.org/

JIS D-5500 (1995) Automobile parts - Lighting and light signalling devices

Available from: Japan Automobile Standards Internationalization Center, 2-16-13, Akasaka Minato-ku, Tokyo 107, Japan, www.jasic.org

Final Report – Road Transportation Harmonization Project (TPT 01/96) – Analysis of Motor Vehicle Safety Standards Including Canada, US and ECE. Prepared for Asia Pacific Economic Cooperation (APEC)

2.1.6 United Nations Publications

Available from United Nations Economic Commission for Europe, Palais des Nations, CH-1211, Geneva 10, Switzerland, Tel +41-0-22-917-12-34, www.unece.org

UNECE Regulation No. 48 Uniform Provisions Concerning the Approval of Vehicles with Regard to the Installation of Lighting and Light-signaling Devices

2.1.7 International Organization for Standardization (ISO) Publications

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

ISO 303 Road Vehicles - Installation of lighting and light signaling devices for motor vehicles and their trailers

ISO 2575 Road vehicles - Symbols for controls, indicators and tell-tales

2.2 Related Publications

The following publications are for information purposes only and are not a required part of this document. The information contained in the following publications, contemporary to the edition of this document, was used in the development of this document.

2.2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096, USA Tel 1-877-606-7323 (inside USA and Canada) or +1-724-776-4970 (outside USA), www.sae.org

SAE Technical Paper 890691Update: Lighting Devices and Their Installation—Compatibility and Harmonization of International Requirements

SAE J222 Front Position Lamp

SAE J387 Terminology – Motor Vehicle Lighting

SAE J578 Color Standard

SAE J581 Auxiliary High Beam Lamps

SAE J583 Front Fog Lamp

SAE J585 Tail Lamps (Rear Position Lamps) for Use on Motor Vehicles Less Than 2032 mm in Overall Width

SAE J586 Stop Lamps for Use on Motor Vehicles Less than 2032 mm in Overall Width

SAE J587 License Plate Illumination Devices (Rear Registration Plate Illumination Devices)

SAE J588 Turn Signal Lamps for Use on Motor Vehicles Less than 2032 mm in Overall Width

SAE J592 Sidemarker Lamps for Use on Road Vehicles Less than 2032 mm in Overall Width

SAE J593 Backup Lamp (Reversing Lamp)

SAE J594 Reflex Reflectors

SAE J759 Lighting Identification Code

SAE J852 Front Cornering Lamps for Use on Motor Vehicles

SAE J914 Side Turn Signal Lamps for Vehicles Less than 12 m in Length

SAE J1319 Rear Fog Lamp Systems

SAE J1373 Rear Cornering Lamps for Use on Motor Vehicles Less than 9.1 m in Overall Length

SAE J1383 Performance Requirements for Motor Vehicle Headlamps

SAE J1432 Rear High Mounted Stop Lamps and Rear High Mounted Turn Signal Lamps for Use on Vehicles 2032 mm or More in Overall Width

SAE J1735 Harmonized Vehicle Headlamp Performance Requirements

SAE J1957 Center High Mounted Stop Lamp Standard for Vehicles Less than 2032 mm Overall Width

SAE J2009 Discharge Forward Lighting System and Subsystems

SAE J2039 Side Turn Signal Lamps for Long Vehicles

SAE J2040 Tail Lamps (Rear Position Lamps) for Use on Vehicles 2032 mm or More in Overall Width

SAE J2041 Reflex Reflectors for Use on Vehicles 2032 mm or More in Overall Width

SAE J2042 Clearance, Sidemarker, and Identification Lamps for Use on Motor Vehicles 2032 mm or More in Overall Width

SAE J2087 Daytime Running Light

SAE J2261 Stop Lamps and Front- and Rear-Turn Signal Lamps for Use on Motor Vehicles 2032 mm or More in Overall Width

SAE J2338 Recommendations of the SAE Task Force on Headlamp Mounting Height

SAE J2584 Headlamp Mounting Height for Passenger and Pickup Truck Vehicles

3. DEFINITIONS

For the purpose of this SAE Recommended Practice:

3.1 Vehicle Characteristics

3.1.1 Front

Part of the vehicle between the transverse vertical plane tangent to the extreme front-end including all original equipment components and the transverse vertical plane passing through the centre of the foremost axle.

3.1.2 Ground

A horizontal surface on which the vehicle stands.

3.1.3 Movable Components

Vehicle body components, including but not limited to, doors, bonnet (hood), boot (trunk lid), roof, rear hatch, tailgate, retractable spoiler, bus storage compartment door and other exterior access panels, or other vehicle parts that can change position(s) by tilting, rotating or sliding without the use of tools. Forward-tilting truck cabs are not moveable components.

3.1.3.1 Fixed (open) position of a movable component

Stable or natural rest position(s) of the movable component, specified by the vehicle manufacturer, whether locked or not.

3.1.3.2 Normal position of use of a movable component

Position(s) of a movable component specified by the vehicle manufacturer for the time when the vehicle is moving.

3.1.4 Normal Condition of Use of a Vehicle

a. For a motor vehicle, when the vehicle is ready to move with its propulsion system activated and its movable components in the normal position(s) of use;

b. For a trailer, when the trailer with its movable components in the normal position(s) of use is connected to a towing motor vehicle in its normal condition of use.

3.1.5 Outer Edge

Plane parallel to the median longitudinal plane of the vehicle and tangent to the vehicle's side, disregarding the projection of:

a. Any anti-skid devices mounted on the wheels

b. Headlamp cleaners

c. Door handles; customs sealing devices and their protection

d. Tarpaulin-securing devices and their protection

e. Tire failure tell-tale devices

f. Tire pressure indicators

g. Protruding flexible parts of a spray-suppression system (e.g., side curtains or mud flaps)

h. Lighting and light-signaling devices

i. Access ramps, lifting platforms, and similar equipment in their stowed position on buses (coaches)

j. Rear-view mirrors or other devices for indirect vision

k. Retractable steps

l. The deflected part of the tire walls immediately above the point of contact with the ground

m. External lateral guidance devices of guided vehicles

n. Running boards

o. Removable mudguard (fender)-broadening extensions

3.1.6 Practicable

Feasible. Able to be done or used or accomplished. Capable of being put into practice. Rear

That part of a vehicle *between* the transverse vertical plane tangent to the rearmost point of the vehicle structure including all original equipment components *and* the transverse vertical plane passing through the center of the vehicle's rearmost axle.

3.1.7 Structural Length

A dimension measured according to ISO standard 612-1978, term No 6.1, but disregarding the following:

a. Wiper and washer devices

b. Front or rear marker (conspicuity or identification) plates

c. Customs sealing devices and their protection

d. Devices for securing the load restraint(s)/cover(s) and their protection

e. Lighting and light signaling devices

f. Mirrors or other devices for indirect vision

g. Reversing aids

h. Air intake pipes

i. Length stops for removable bodies

j. Access steps and hand-holds

k. Ram rubbers and similar equipment

l. Lifting platforms, access ramps and similar equipment in running order, not exceeding 30 cm

m. Coupling and recovery towing devices for power driven vehicles

n. Trolleybus current collection devices in their elevated and retracted positions

o. External sun visors

p. Removable spoilers

r. Exhaust pipes

3.1.8 Structural Width

A dimension measured according to ISO standard 612-1978, term No. 6.2., but disregarding the following:

a. Customs sealing devices and their protection

b. Tarpaulin-securing devices and their protection

c. Tire failure tell-tale devices

d. Tire pressure indicators

e. Protruding flexible parts of a spray-suppression system (e.g., side curtains or mud flaps)

f. Lighting and light signaling devices

g. Access ramps, lifting platforms, and similar equipment in their stowed position on buses (coaches)

h. Rear-view mirrors or other devices for indirect vision

i. Retractable steps

j. The deflected part of the tire walls immediately above the point of contact with the ground

k. External lateral guidance devices of guided vehicles

l. Running boards

m. Removable mudguard (fender)-broadening extensions

3.1.9 Tell-Tale (for symbols refer to ISO 2575)

3.1.9.1 Circuit-closed telltale

A visual indicator to the vehicle operator that a device has been switched ON.

3.1.9.2 Failure tell-tale

A visual and/or auditory indicator to the vehicle operator (or any equivalent such as a text display) that a device does not or will not operate correctly.

NOTE: An operating tell-tale or circuit-closed tell-tale may be used to indicate failure of a device.

3.1.9.3 Operating telltale

A visual and/or auditory indicator to the vehicle operator (or any equivalent such as a text display) that a device has been switched ON and is operating (correctly or not).

3.1.10 Removable Components of the Vehicle

Components that may be removed from the vehicle without rendering it inoperable or illegal to be operated.

3.1.11 Transverse Plane

A vertical plane perpendicular to the median longitudinal plane of the vehicle.

3.1.12 Unladen Vehicle Mass

The nominal mass of a complete vehicle as determined by the following criteria:

a. Mass of the vehicle with bodywork and all factory fitted original equipment, electrical and auxiliary equipment for normal operation of vehicle including fluids, tools, fire extinguisher, standard spare parts, chocks and spare wheel, if fitted.

b. The fuel tank shall be filled to at least 90 percent of rated capacity and the other liquid containing systems (except those for wastewater) to 100 percent of the capacity specified by the manufacturer.

3.2 Lighting and Light Signaling Device Characteristics

3.2.1 Angles of Geometric Visibility

The angles defining the field of the minimum solid angle throughout which the apparent surface of the lamp or reflex reflector is visible.

NOTES: This field is determined by the segments of a sphere, the center of which coincides with the reference axis of the lamp, and the equator of which is parallel to the ground. The horizontal angles β (beta) denote the longitude, and the vertical angles α (alpha) denote the latitude.

3.2.2 Apparent Surface (refer to Figure 2)

The area of the projection **either** of the boundary of the illuminating surface (a-b) projected on the exterior surface of the lens, **or** of the light-emitting surface (c-d) onto a plane perpendicular to the direction of observation and tangent to the most exterior point on the lens.

3.2.3 Axis of Reference (Reference Axis)

The characteristic axis of the lamp determined by its manufacturer for use as the direction of reference (H=0°, V=0°) for angular photometric measurements and for installing the lamp on the vehicle.

3.2.4 Center of Reference

The intersection of the reference axis with the exterior light-emitting surface.

3.2.5 Concealable Lamp

A lamp which, when not in use, may be partly or completely hidden by means of a movable cover, displacement of the lamp, or otherwise.

NOTE: The term “retractable” is used more specifically for a lamp which, when concealed, does not protrude from the bodywork of the vehicle.

3.2.6 Device

An element or an assembly of elements used to perform one or more functions.

3.2.7 Function

3.2.7.1 Lighting function

The light emitted by a device to illuminate the road and objects in the direction of vehicle movement.

3.2.7.2 Light-signaling Function

The light emitted or reflected by a device to give to other road users visual information on the presence, position, size, direction of travel, and/or the change of movement of the vehicle.

3.2.8 Illuminating Surface (refer to Figures 1 and 2)

3.2.8.1 Illuminating Surface of a Device Providing Lighting Function

The orthogonal projection, on a transverse plane, of the full aperture of the optically active portion(s) of the reflector, **or** of the front condensing lens of a projector lamp, **or** of the aggregate of the full aperture of each reflector and each condensing lens in the case of a headlamp with multiple light sources and/or optics, such as an LED headlamp.

NOTES: If light is emitted from only part of the reflector, only the projection of that illuminated portion of the reflector is taken into account. For example, in the case of a reflector-type lower (passing, low, dipped) beam headlamp, the illuminating surface may be limited by the apparent trace of the light/dark cutoff onto the lens of the operating headlamp. If the reflector and lens are adjustable relative to one another, the illuminating surface shall be measured at the midpoint of the adjustment range. If the device has no reflector, the definition of paragraph 3.2.8.2 shall be applied.

3.2.8.2 Illuminating Surface of a Device Providing a Light-Signaling Function (other than a reflex reflector)

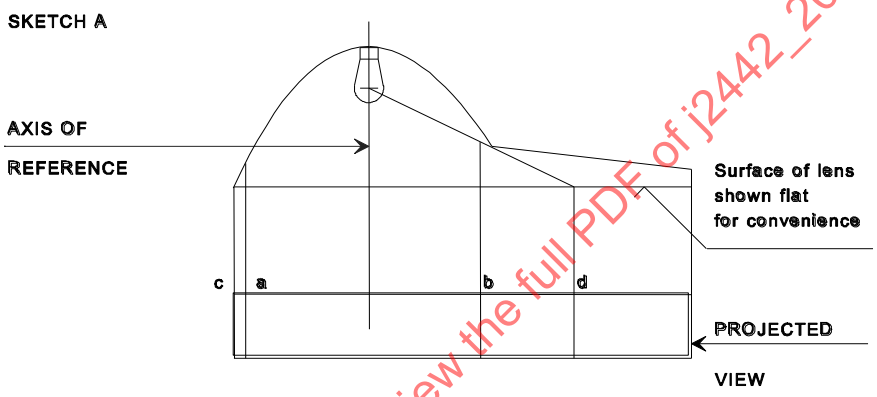
The orthogonal projection of the lamp in a plane perpendicular to its reference axis and tangent to the outermost illuminating surface of the lamp, this projection being bounded by the edges of screen situated in this plane, each screen decreasing by two percent the luminous intensity of the light from the device as measured at (H,V).

NOTE: To determine the lower, upper, and lateral limits of the illuminating surface, only screens with horizontal or vertical edges shall be used.

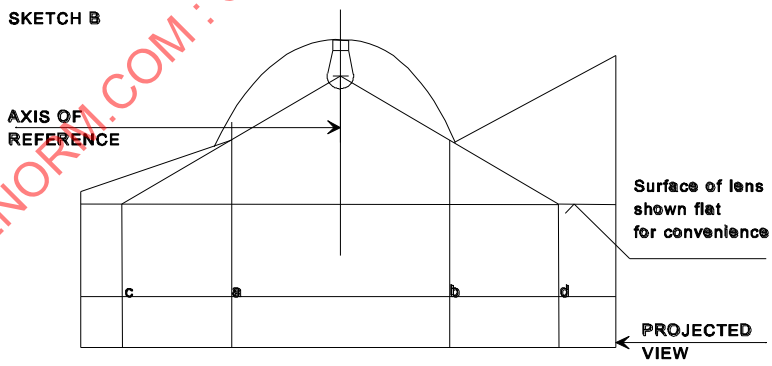
3.2.8.3 Illuminating Surface of a Reflex Reflector (Retro-reflector)

The orthogonal projection of a reflex reflectorin a plane perpendicular to its reference axis, and delimited by planes parallel to that axis and contiguous to the outermost parts of the reflex reflector's optical system.

NOTE: To determine the lower, upper, and lateral edges of the device, only horizontal and vertical planes shall be considered.



	Illuminating surface	Light-emitting surface
Edges are	a and b	c and d



	Illuminating surface	Light-emitting surface
Edges are	a and b	c and d

Figure 1 - Lamp surfaces, axis and center of reference

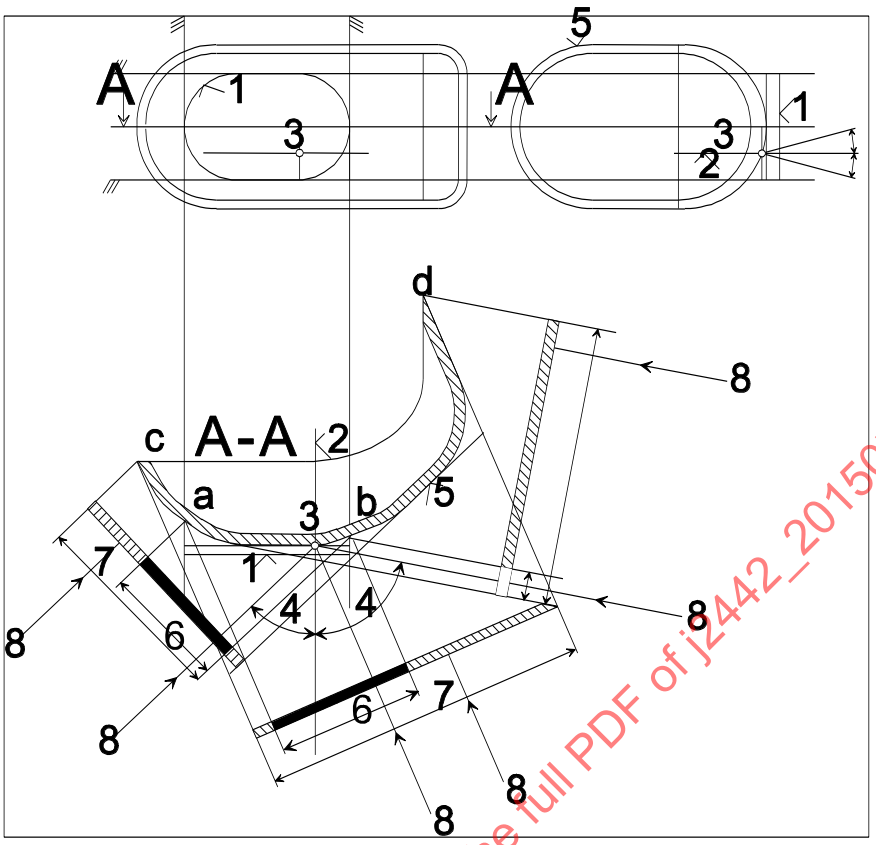


Figure 2 - Illuminating surface compared with light-emitting surface

KEY

1. Illuminating surface
2. Reference axis
3. Center of reference
4. Angle of geometric visibility
5. Light-emitting surface
6. Apparent surface based on illuminating surface
7. Apparent surface based on light-emitting surface
8. Direction of visibility

NOTE: Notwithstanding the drawing, the apparent surface shall be considered as tangent to the light-emitting surface.

3.2.9 Lamp

A device designed to illuminate the road or to emit a light signal to other road users. Rear license plate illuminating devices are likewise to be regarded as lamps.

NOTES: For the purpose of this Recommended Practice, the service-door lighting system on a bus (coach) is not considered as lamps. When applying definitions in subsections 3.2.9.1 through 3.2.9.4 to rear registration plate illuminating devices and side direction indicators, read "light emitting surfaces" for "illuminating surfaces".

3.2.9.1 Combined Lamps

Lamps having separate illuminating surfaces, a common light source, and a common lamp body.

3.2.9.2 Grouped Lamps

Lamps having separate illuminating surfaces, separate light sources, and a common lamp body.

3.2.9.3 Independent Lamps

Lamps having separate illuminating surfaces, separate light sources, and separate lamp bodies.

3.2.9.4 Optically Combined Lamps

Lamps having totally or partially common illuminating surfaces, separate light sources or a single light source operating under different conditions (e.g., optical, mechanical, electrical differences), and a common lamp body. The equivalent non-SAE term is "reciprocally incorporated lamps".

3.2.9.5 Single Lamp

A device or part of a device producing one lighting or light-signaling function, having one or more light source(s) and one apparent surface in the direction of the reference axis, which may be a single continuous surface or composed of two or more distinct parts.

3.2.10 Light-Emitting Surface (refer to Figures 1 and 2)

All or part of the exterior surface of the translucent material (lens) which is lighted directly by the light source(s) and does not include mounting hole bosses, reflex reflector area, beads or rims that may glow or produce small areas of increased intensity as a result of uncontrolled or indirect light emitted by the light source(s).

3.2.11 Light Sources

3.2.11.1 Light Source

An emitter of visible radiant energy.

NOTE: A light source may also be the extreme outlet of a light guide, as part of a distributed lighting or light-signaling system not having an inbuilt outer lens.

3.2.11.2 Replaceable Light Source

A light source designed to be installed in and removed from its holder without the use of tools.

3.2.11.3 Non-replaceable Light Source

A light source that can be replaced only by replacement of the device containing this light source; **or** in case of a light source module, a light source that can be replaced only by replacement of the light source module containing this light source; **or** in case of adaptive front-lighting systems (AFS), a light source which can be replaced only by replacement of the lighting unit containing this light source.

3.2.12 Nominal Luminous Flux

A design value of the luminous flux produced, within the specified tolerances, by a replaceable light source energized at the voltage specified by its manufacturer. The equivalent non-SAE term is "objective luminous flux".

3.2.13 Optional Lamp or Retro-Reflecting Device

A lamp or retro-reflecting device installed at the discretion of the vehicle manufacturer, which does not interfere with any mandatory lighting device.

NOTE: Optional lamps may be required, allowed, or prohibited by the regulations in effect where the equipped vehicle is to be registered.

3.2.14 Substitute Lamp or Retro-Reflecting Device

A lamp or retro-reflecting device that performs the function(s) of another device for which it is substituting, subject to the requirements of §5.1.6 of this Recommended Practice.

3.2.15 Supplementary Lamp or Retro-Reflecting Device

A lamp or retro-reflecting device that augments, enhances, or supplements the operation of a mandatory or optional lamp or retro-reflecting device.

NOTE: A supplementary device may (but does not necessarily) fulfill all or part of the compliance requirements of the device it supplements.

3.2.16 Conspicuity Marking

Device(s) intended to increase the conspicuity of the equipped vehicle by reflecting light from approaching vehicle headlamps to the eyes of approaching drivers.

3.2.16.1 Contour Marking

Conspicuity marking intended to indicate length, width, and height of the equipped vehicle;

3.2.16.2 Full Contour Marking

Contour marking that indicates the outline of the vehicle by a continuous line;

3.2.16.3 Partial Contour Marking

Contour marking that indicates the length and width of the vehicle by a continuous line, and the height by marking the upper corners;

3.2.16.4 Line Marking

Conspicuity marking intended to indicate length and width of a vehicle by a continuous line.

4. LAMP MARKINGS

4.1 Lens Marking

All lenses of mandatory lamps and retro-reflecting devices shall be marked according to the requirements in effect where the vehicle is to be registered. It is recommended that these markings be applied so as not to create confusion or conflict with each other, and that they include the identification code described in SAE J759.

4.2 Housing Marking

All housings of mandatory lamps and retro-reflecting devices shall be marked according to the requirements in effect where the vehicle is to be registered. It is recommended that these markings be applied so as not to create confusion or conflict with each other, and that they include the identification code described in SAE J759.

5. GENERAL REQUIREMENTS

5.1 Aiming of Road Illumination Devices

All road illumination devices, except reversing and cornering lamps, shall allow for adjustment of their orientation according to requirements in effect where the vehicle is to be registered, and according to the instructions provided with the vehicle by the vehicle manufacturer, and without the use of special tools other than those provided with the vehicle by the vehicle manufacturer.

5.2 Assembly of Lamps and Retro-Reflecting Devices

Except as stipulated in the following subparagraphs, lamps and retro-reflecting devices may be grouped, combined, and/or reciprocally incorporated with one another if all requirements regarding color, position, orientation, geometric visibility, and any other applicable requirements are fulfilled for each function of the lamp(s) and retro-reflecting device(s) involved.

a. A clearance lamp shall not be combined or optically combined with a front position or tail (rear position) lamp;

b. A center high mounted stop lamp shall be independent of any other lamp or retro-reflecting device, except that it may be grouped with a cargo lamp;

c. A turn signal lamp shall not be optically combined with a stop lamp.

5.3 Compliance

Every lamp and retro-reflecting device installed on a vehicle shall meet all design, construction, performance, and durability requirements in effect where the vehicle is to be registered.

5.4 Concealable Lamps

a. Headlamps and/or front fog lamps may be concealed when they are not in use. No other lamps or retro-reflecting devices may be concealed.

b. In the event of a failure affecting operation of the concealment device(s), the lamps shall remain in the position of use if already in use, or shall be movable into the position of use without tools.

c. It shall be possible to move the lamps into the position of use and to switch them on by means of a single control, without excluding the possibility of moving them into the position of use without switching them on. However, in the case of grouped upper and lower beam headlamps, the single control is required only to activate the lower beam headlamps.

d. When the concealment device is at any temperature between –30 °C and +50 °C, the headlamps shall reach the position of use within three seconds of initial operation of the control.

e. It shall not be possible from the driver's seat, to deliberately stop the movement of switched-on lamps before they reach the position of use. If there is a danger of directing glare toward other road users by the movement of the lamps, they may illuminate only once they have reached their position of use.

5.5 Electrical Connections

a. Unless otherwise specified in this recommended practice, lighting and light signaling devices shall illuminate steadily when activated.

b. The electrical connections shall be such that the front and rear position lamps, the sidemarker lamps, the rear license plate illumination device, and any clearance and identification lamps can be switched ON and OFF only simultaneously. This condition does not apply to sidemarker lamps flashing with turn signals, nor to front and rear position lamps being used as UNECE parking lamps, nor to sidemarker lamps combined or optically combined (reciprocally incorporated) with said lamps, nor to rear position lamps operating together with lamps providing the daytime running light function.

c. The electrical connections shall be such that the headlamps and the front fog lamps cannot be switched ON unless the front and rear position lamps, the sidemarker lamps, the rear license plate illumination device, and any clearance and identification lamps are also switched ON. This requirement does not apply to upper or lower beam headlamps operated briefly and intermittently to communicate with other drivers, nor to alternating illumination at short intervals of the upper and lower beam headlamps, nor to headlamps while they are providing a daytime running light function where permitted by national law.

5.6 Geometric Visibility

a. On the inside of the angles of geometric visibility there shall be no obstacle, except any obstacle(s) present when the lamp was photometrically tested, to the propagation of light from any part of the apparent surface of the lamp.

b. If any part of the installed lamp's apparent surface is hidden by any part of the vehicle, the unhidden portion of the lamp shall conform to the photometric values prescribed for the device.

c. When it is permitted to reduce the vertical angle of geometric visibility to 5° below horizontal (for a lamp mounted less than 75 cm above the ground), the photometric field of measurements for the installed lamp may also be reduced to 5° below horizontal.

5.7 Grouped, Combined or Optically Combined (Reciprocally Incorporated) Lamps

Lamps may be grouped, combined, or optically combined with one another provided that all applicable requirements are fulfilled, and:

a. Where stop lamps and turn signal lamps are grouped, any horizontal or vertical straight line passing through the projections of the apparent surfaces of these functions on a plane perpendicular to the reference axis, shall not intersect more than two borders separating the stop and turn signal functions;.

b. Where the apparent surface of a single lamp is composed of two or more distinct parts, it shall satisfy one of the following requirements:

   i. The total area of the projection of the distinct parts on a plane tangent to the exterior surface of the translucent material (lens) and perpendicular to the reference axis shall occupy not less than 60 percent of the smallest quadrilateral circumscribing the said projection, or

   ii. The shortest distance between two adjacent distinct parts shall not exceed 15 mm when measured perpendicularly to the reference axis.

5.8 Installation (general)

a. Unless otherwise specified by the requirements in effect where the vehicles to be registered, installation of lamps not described in section 6 of this Recommended Practice is prohibited except on special purpose vehicles including but not limited to police, medical, fire, and other emergency or public service vehicles;

b. Lighting and light-signaling devices shall be so fitted that during the operation of the vehicle and notwithstanding any vibrations to which they may be subjected, they retain the characteristics prescribed by this Recommended Practice and enable the vehicle to comply with the requirements of this Recommended Practice; in particular, it shall not be possible for the devices to become maladjusted purely as a result of normal vehicle use, barring physical impact to the devices.

c. The reference axis of all light-signaling devices when fitted to the vehicle, including those mounted on the side panels, shall be parallel to the ground and perpendicular (for side reflex reflectors and sidemarker lamps) or parallel (for all other light-signaling devices) to the median longitudinal plane of the vehicle. In each direction, a tolerance of ± 3° shall be allowed. In addition, any specific installation instructions from the lamp manufacturer shall be followed;

d. As installed on a vehicle, lamps shall allow light source replacement in accordance with the instructions provided with the vehicle by the vehicle manufacturer and without special tools other than those provided with the vehicle by the vehicle manufacturer. This requirement does not apply to devices equipped with a non-replaceable light source or to gas-discharge light source(s).

e. The lower and upper beam headlamps and the front fog lamps shall be installed such that correct adjustment of their orientation can readily be carried out according to the requirements in effect where the vehicle will be registered and with the instructions provided with the vehicle by the vehicle manufacturer, without special tools other than those provided with the vehicle by the vehicle manufacturer.

5.9 Lamps and Retro-Reflecting Devices Constituting a Pair

Lamps and retro-reflecting devices constituting a pair shall:

a. Be fitted symmetrically in relation to the vehicle's median longitudinal plane as determined based on the exterior geometrical form of the lamp (i.e., not on the edge of its illuminating surface);

b. Be symmetrical to each other with respect to the lamps' exterior (not interior) structure in relation to the vehicle's median longitudinal plane;

c. Satisfy the same photometric requirements and emit or reflect the same color(s) of light.

On an asymmetrically-shaped vehicle, the foregoing requirements shall be satisfied to the degree practicable.

5.10 Lamps and Retro-Reflecting Devices Obstructed by Equipment Mounted on a Vehicle

If equipment mounted on a vehicle (e.g., mirrors, snow plows wrecker booms, backhoes, winches, etc.) prevents compliance of the lamp or retro-reflecting device with the prescribed requirements, a substitute lamp or retro-reflecting device shall be installed.

5.11 Lamps and Retro-Reflecting Devices Installed on (or obstructed by) Movable Components

Subject to the following constraints, lamps and retro-reflecting devices may be installed on (or obstructed by) movable components.

a. Rear position lamps, rear turn signal lamps, and all required reflex reflectors (reflex reflectors) may be installed on or obstructed by movable components if:

   i. at all fixed design positions of the movable components the lamps and reflex reflectors on or obstructed by the movable components meet all position, geometric visibility, and photometric requirements prescribed for them. Should the above functions be obtained by an assembly of two lamps or reflex reflectors, only one must meet the requirements of this paragraph, **or**

   ii. additional lamps or reflex reflectors for the above functions are fitted and are visible when the movable component is in any fixed design position, provided that these additional devices satisfy all the position, geometric visibility, and photometric requirements applicable to the devices installed on (or obstructed by) the movable component.

b. When the movable components are not in a normal position of use, the devices installed on them shall not cause glare, distraction, or confusion to road users;

c. No movable component, with or without a light signaling device(s) installed on it, shall in any fixed design position hide more than 50 percent of the apparent surface of front and rear position lamps, front and rear turn signal lamps, sidemarker lamps or any reflex reflector when viewed along the reference axis of this specific device. If this requirement is not met, substitute or supplementary device(s) shall be installed to satisfy all requirements of the obstructed device(s).

d. No road illumination device (headlamp, front fog lamp, etc.) shall be mounted on a movable component if that component's movement causes the device's beam pattern to move upward beyond its normal orientation, unless the device is automatically switched OFF while the movable component is moved out of its normal position of use;

e. When a lamp is installed on a movable component and the movable component is in the normal position(s) of use, the lamp shall always return to the position(s) specified by the manufacturer in accordance with this recommended practice. In the case of lower beam headlamps and front fog lamps, this requirement shall be considered satisfied if no value of the angular inclination of such a lamp, relative to its support, measured after each operation of the movable component, differs by more than 0.15 percent from the average of the measured values when the movable components are moved out of and back into the normal position(s) ten times.

f. When multiple-device arrangements are used for rear turn signal lamps, stop lamps, rear position lamps, and/or reflex reflectors, with only a portion of the device installed on a fixed part of the vehicle, the device(s) installed on the non-fixed part of the vehicle shall be considered auxiliary devices.

5.12 Lamps and Retro-Reflecting Devices on Removable Components

No required lamp or retro-reflecting device shall be installed on removable components unless substitute devices are installed.

5.13 Light Visibility Restrictions

No red light shall be emitted from any lamp in a forward direction, other than from a red sidemarker lamp. No white light shall be emitted from any lamp in a rearward direction, other than from the reversing lamp. This prohibition does not apply to lighting devices fitted for the interior or cargo compartment lighting of the vehicle, nor to reflected light originating from the license plate illumination device. In case of doubt, this requirement shall be verified as follows:

   a. There shall be no direct visibility of the light-emitting surface of a red lamp, except the rear sidemarker lamp, when viewed by an observer moving within the front zone in a transverse plane situated 25 m in front of the vehicle;

b. There shall be no direct visibility of the light-emitting surface of a white lamp, except the reversing lamp, reflected light originating from the license plate illumination device, and any white conspicuity markings, when viewed by an observer moving within the rear zone in a transverse plane situated 25 m behind the vehicle;

c. In their respective planes, the front zone and rear zones when viewed by an observer are bounded:

In height, by two horizontal planes 1 m and 2.2 m, respectively, above the ground,

In width, by two vertical planes which form to the front and to the rear, respectively, an angle of 15° outwards from the vehicle's median longitudinal plane, and pass through the point(s) of contact of vertical planes parallel to the vehicle's median longitudinal plane delimiting the vehicle's structural width. If there are several points of contact, the foremost shall correspond to the forward plane and the rearmost to the rearward plane.

5.14 Measurements (refer to Figures 4 & 5)

Where the position, as regards maximum or minimum height, width or length, clearly meets the apparent intent of the requirements of this document, the exact edges of any surface need not be determined. In the absence of specific instructions, the orientation and horizontal and vertical measurement of lamps and retro-reflecting devices shall be verified with the unladen vehicle in its normal condition of use on a flat, horizontal surface.

a. Height: “H” is the distance above the ground measured from the reference axis of the device. The maximum height “H1” above the ground shall be measured from the highest point, and the minimum height “H2” from the lowest point of the apparent surface in the direction of the reference axis. Lower beam headlamps' height in relation to the ground is measured from the lowest point of the effective outlet of the optical system (e.g., reflector, front lens, condensing lens) regardless of whether it is optically active while the lamp is producing the low beam function.

b. Width: the maximum distance “E” of the lamp from the outer edge of the vehicle shall be measured from the outboard edge of the apparent surface in the direction of the reference axis. The minimum distance “D” between two lamps facing the same direction shall be measured between the closest edges of the apparent surface in the direction of the reference axis.

c. Length: the maximum distance “K” between the lamp and the transverse plane which marks the forward or rearward boundary of the vehicle's structural length (i.e., the front or rear of the vehicle) shall be measured from the edge of the apparent surface in the direction of the reference axis closest, respectively, to the front or rear of the vehicle. The minimum distance between two lamps facing the same direction shall be measured between the closest edges of the apparent surface in the direction of the reference axis.

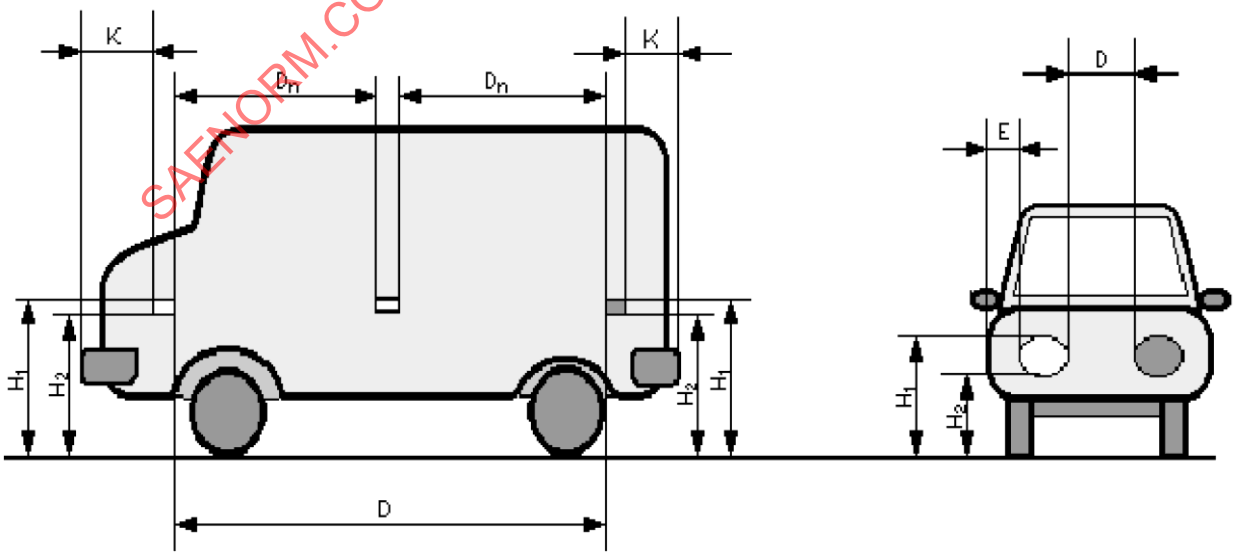


Figure 4 - Measurements describing location of lamps and retro-reflecting devices

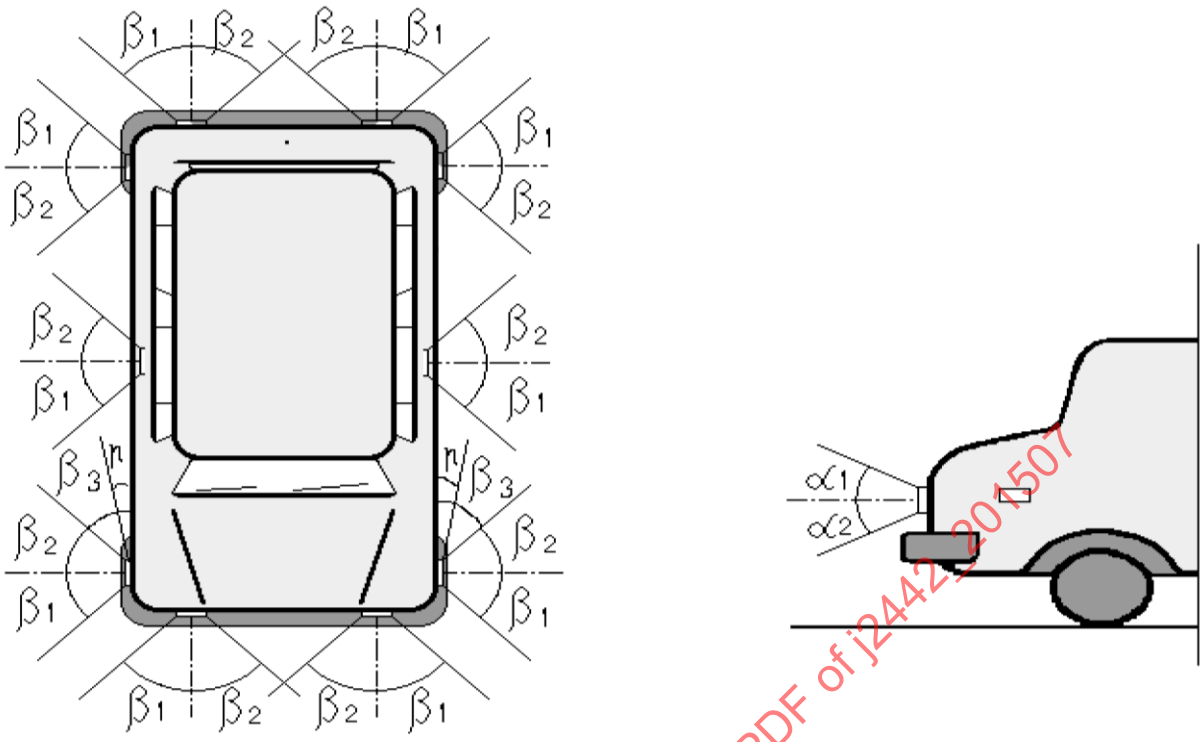


Figure 5 - Angles describing geometric visibility of lamps and retro-reflecting Devices

5.15 Number of lamps

a. When installed on a vehicle, the number of lamps and retro-reflective devices described by this Recommended Practice shall be equal to the number specified in section 6.

b. With the exception of reflex reflectors, a lamp is deemed to be installed on the vehicle if it can be operated after the installation of the required light source. A lamp is deemed not to be installed on the vehicle if additional steps, other than light source installation or switching ON, are necessary to make the lamp operational.

5.16 Substitution of Light-signaling Function

In case of a failure, a light-signaling function can be automatically substituted if the substitute function is identical in color and similar in main intensity and position to the function that has ceased to operate, and if all mandatory functions of the substituting device remain operational. During substitution, a tell-tale visible to the vehicle operator shall indicate the need for repair of the substituted lamp.

5.17 Tell-Tale Requirements

a. Tell-tale symbols shall comply with ISO 2575.

b. Where a circuit-closed tell-tale is indicated in this document it may be replaced by an operating tell-tale.

6. INDIVIDUAL DEVICE REQUIREMENTS

NOTE: The identification of symbols related to location measurements and geometric visibility of lighting and light signaling devices are depicted in Figures 4 and 5.

6.1 Headlamp—High (Upper, Driving, Main) Beam

6.1.1 Functional Purpose

Primarily to illuminate the road and its distant environs ahead of the vehicle under normal condition of use when oncoming and leading other vehicles are not present.

6.1.2 Application

Mandatory on motor vehicles, prohibited on trailers.

6.1.3 Quantity

Two or four.

6.1.4 Tell-Tale

Circuit-closed tell-tale mandatory.

6.1.5 Color

White per SAE J578.

6.1.6 Location

6.1.6.1 Width

If separate from lower beam headlamps no point on the apparent surface in the direction of the reference axis of the upper beam headlamp shall be further outboard than the point on the apparent surface in the direction of reference axis of the lower beam headlamp which is closest to the adjacent outer edge of the vehicle.

6.1.6.2 Height

If separate from lower beam headlamps, no point on the apparent surface in the direction of the reference axis of the upper beam headlamp shall be higher than the highest point on the apparent surface in the direction of reference axis of the lower beam headlamp.

6.1.6.3 Length

Fitted in such a way that the light emitted does not shine into the driver's eyes either directly, or indirectly through the rearview mirrors and/or other reflecting surfaces of the vehicle.

6.1.7 Geometric Visibility

The visibility of the illuminating surface, including its visibility in areas which do not appear to be illuminated in the direction of observation considered, shall be provided within a divergent space defined by generating lines based on the perimeter of the illuminating surface and forming an angle of not less than 5° with the reference axis of the headlamp. The origin of the angles of geometric visibility is the perimeter of the projection of the illuminating surface on a transverse plane tangent to the foremost part of the lens of the headlamp.

6.1.8 Electrical Connections

6.1.8.1 Except when they are used to give intermittent luminous warnings at short intervals, the upper beam headlamps may be switched ON only when:

a. they operate at reduced intensity to provide a daytime running light function where such function is allowed by law, **or**

b. the master light switch is in headlamps ON position, **or**

c. the master light switch is in "AUTO" (automatic) position and the conditions for automatic activation of lower beam exist, in which case the upper beam headlamps shall be switched OFF automatically when the conditions for automatic activation of lower beam cease to exist.

6.1.8.2 When the daytime running lights are in use, it shall not be possible to activate the upper beams except for signaling purposes.

6.1.8.3 The upper beam headlamps may be switched ON either simultaneously or in pairs. For changing over from the lower to the upper beam at least one pair of upper beam headlamps shall be switched ON. For changing over from the upper beam to the lower beam all upper beam headlamps shall be switched OFF simultaneously.

6.1.8.4 Where four concealable headlamps are fitted, in their operating position no additional headlamps fitted to enable brief intermittent flashes intended to signal other drivers shall be operable.

6.1.8.5 Each vehicle subject to this Recommended Practice shall be equipped with a manual on/off switch for the upper beam headlamps, operable by a properly-positioned driver with seat belt fastened.

6.1.8.6 The aggregate maximum intensity of all upper beam headlamps which can be switched ON simultaneously shall not exceed the maximum allowed by the regulations in effect where the vehicle is to be registered.

6.2 Headlamp—Low (Lower, Passing, Dipped) Beam

6.2.1 Functional Purpose

To illuminate the road and its environs ahead of the vehicle under normal condition of use while controlling glare to drivers of oncoming and leading vehicles.

6.2.2 Application

Mandatory on motor vehicles, prohibited on trailers.

6.2.3 Quantity

Two.

6.2.4 Tell-Tale

Optional.

6.2.5 Color

White per SAE J578.

6.2.6 Location

6.2.6.1 Width

Symmetrically about the vehicle's median longitudinal plane, as far apart laterally as practicable and:

a. E ≤ 40 cm

b. D ≥ 60 cm (D ≥ 40 cm if vehicle is less than 130 cm wide)

6.2.6.2 Height

a. H1 ≤ 1200 cm (H1 ≤ 900 cm recommended, per SAE J2584 and J2338)

b. H2 ≥ 50 cm and H ≥ 56 cm

6.2.6.3 Length

On the front of the vehicle facing forward and fitted such that the light emitted does not shine into the eye of the equipped car's driver either directly or indirectly through the rearview mirrors and/or other reflecting surfaces of the vehicle.

6.2.7 Geometric Visibility

α1=15°, α2=10°, β1=45°, β2=10°

Since the photometric values required for lower beam headlamps do not cover the full geometric field of vision, a minimum value of 1 cd in the space remaining is required. The presence of partitions or other items or equipment near the headlamp shall not cause reflections or secondary effects that are likely to distract or cause discomfort to the vehicle operator or to other road users.

6.2.8 Electrical Connections

6.2.8.1 When the lower beam headlamps are activated in a steady-burning state, the front and rear position lamps, license plate lamp, and sidemarker lamps shall also be activated. The control for changing from upper to lower beam shall switch OFF all upper beam headlamps simultaneously.

6.2.8.2 The lower beams may remain switched ON while the upper beams are illuminated.

6.2.8.3 When the ambient light outside a vehicle is of an intensity specified below, then the lower beam headlamps shall meet the corresponding conditions:

6.2.8.3.1 If ambient light is less than 1,000 lux, the lower beams shall be automatically activated in not more than 2 seconds; and

6.2.8.3.2 If ambient light is more than 7,000 lux, the lower beams shall be automatically deactivated after not less than 5 seconds and not more than 300 seconds.

6.2.8.4 The lower beam headlamps do not have to meet the requirements of 6.2.8.3 if:

6.2.8.4.1 The front position lamps, tail lamps, sidemarker lamps, license plate lamps and daytime running lamps are alight simultaneously, **or**

6.2.8.4.2 Means are provided to inform the driver that the tail lamps, sidemarker lamps, license plate lamps and parking lamps are not illuminated.

6.2.8.5 It shall always be possible for a driver of a vehicle to activate and deactivate the lower beam while the vehicle's main electrical system is on.

6.2.8.6 The ambient light outside a vehicle referred to in 6.2.8.3.1 and 6.2.8.3.2 shall be measured on a horizontal surface, with a cosine-corrected ambient light sensor at the same height as the mounting position of this sensor on the vehicle.

6.2.9 Other Requirements

In some jurisdictions, automatic headlamp lens cleaners and automatic or manual headlamp levelling systems may be required under specific conditions. A mechanical headlamp cleaning system (wipers) shall not be used with headlamps having plastic lenses.

6.3 Front Fog Lamp

6.3.1 Functional Purpose

To enhance forward visibility under low ambient light conditions while driving in fog, rain, dust clouds, or snow.

6.3.2 Application

Optional on motor vehicle, prohibited on trailers.

6.3.3 Quantity

Two.

6.3.4 Tell-Tale

Circuit-closed tell-tale mandatory.

6.3.5 Color

White or selective yellow per SAE J578.

6.3.6 Location

6.3.6.1 Width

Mounted symmetrically about the vehicle's median longitudinal plane, as far apart laterally as practicable and not exceeding the following:

a. $E \leq 40$ cm

b. $D \geq 60$ cm. ($D \geq 40$ cm if the overall width of the vehicle is less than 130 cm).

6.3.6.2 Height

No point on the apparent surface in the direction of the reference axis may be higher than the highest point on the apparent surface in the direction of reference axis of the lower beam headlamps, nor exceed the following:

a. $H1 \leq 80$ cm and $H \leq 76.2$ cm

b. $H2 \geq 25$ cm and $H \geq 30.5$ cm

6.3.6.3 Length

On the front of the vehicle, facing forward and fitted in such a way that the light emitted does not shine into the driver's eyes either directly or indirectly through the rearview mirrors and/or other reflecting surfaces of the vehicle.

6.3.7 Geometric Visibility

α1=5°, α2=5°, β1=45°, β2=10°

Since the photometric values required for front fog lamps do not cover the full geometric field of vision, a minimum value of 1 cd in the space remaining is required. The presence of partitions or other items or equipment near the front fog lamp shall not cause reflections or secondary effects distracting or causing discomfort to any vehicle operators.

6.3.8 Electrical Connections

a. Each vehicle fitted with front fog lamps shall be equipped with a manual on/off switch for the front fog lamps;

b. It shall be impossible to activate the front fog lamps unless the front and rear position lamps, registration (license) plate lamps, and sidemarker lamps are operating;

c. It must be possible to switch the front fog lamps ON and OFF independently of the lower beam headlamps;

d. It must be impossible to operate front fog lamps simultaneously with the upper beam headlamps;

e. The front fog-lamps can be switched OFF independently of any lamp;

f. Either of the following shall apply:

1. The front fog lamps may continue to operate until the front position lamps are switched OFF, at which time the front fog lamps shall switch OFF and remain OFF until deliberately switched ON again, **or**

2. A warning that the front fog lamp switch is in the ON position, at least audible and additional to the tell-tale mandatory per 6.3.4, shall be given if the vehicle's propulsion system is deactivated and the driver's door is opened, whether other lamps are ON or OFF.

6.3.9 Other requirements

In some jurisdictions automatic or manual front fog lamp levelling may be required under specific conditions.

6.4 Front Position Lamp

6.4.1 Functional Purpose

To indicate the presence and width of the vehicle when viewed from the front. In addition, these front lamps serve as an indication of vehicle width in the event of lower beam headlamp failure.

6.4.2 Application

Mandatory on motor vehicles and on trailers over 160 cm wide.

6.4.3 Quantity

Two.

6.4.4 Tell-Tale

Circuit-closed tell-tale mandatory. This tell-tale shall be non-flashing and shall not be required if the instrument panel lighting can be turned ON only simultaneously with the front position lamps.

6.4.5 Color

White per SAE J578.

6.4.6 Location

6.4.6.1 Width

Mounted symmetrically about the vehicle's median longitudinal plane, as far apart laterally as practicable, and:

a. E ≥ 40 cm (motor vehicles)

b. E ≥ 15 cm (trailers)

c. D ≥ 60 cm (D ≥ 40 mm if vehicle is less than 130 cm wide)

6.4.6.2 Height

a. H1 ≤ 150 cm (H1 ≤ 183 cm if the vehicle body structure prevents compliance with 150 cm),

b. H2 ≥ 35 cm and H ≥ 38 cm

6.4.6.3 Length

On the front of the vehicle, facing forward.

6.4.7 Geometric Visibility

α1=15°, α2=15°, (5° if H1 ≤ 75 cm), β1=80°, β2=45°.

6.4.7.1 Each lamp shall provide a luminous intensity not less than 0.05 cd throughout the angles of geometric visibility, **or**

6.4.7.2 Each lamp shall provide a minimum unobstructed projected area of 13 cm^2 of the light emitting surface of the lens, excluding reflex reflector area throughout the angles of geometric visibility defined previously except that β_1=45 degrees.

6.4.8 Electrical Connections

The electrical connections shall be such that the front and rear position lamps, the sidemarker lamps, the rear license plate lamps, and any clearance and identification lamps can be switched ON and OFF only simultaneously.

6.5 Front Cornering Lamp

6.5.1 Functional Purpose

Used in conjunction with the turn signal system or activated by steering wheel input or electronics onboard the vehicle, to supplement the headlamps by providing lateral illumination in the direction of a turn or lateral shift in position (e.g., lane change).

6.5.2 Application

Optional on motor vehicles.

6.5.3 Quantity

Two (one on each side).

6.5.4 Tell-Tale

Optional.

6.5.5 Color

White per SAE J578.

6.5.6 Location

6.5.6.1 Width

The point on the apparent surface in the direction of the reference axis which is farthest from the vehicle's median longitudinal plane shall be not more than 40 cm from the extreme outer edge of the vehicle.

6.5.6.2 Height

a. H1 ≤ 90 cm and H ≤ 76 cm

b. H2 ≥ 25 cm and H ≥ 30.5 cm

However, no point on the apparent surface in the direction of the reference axis shall be higher than the highest point on the apparent surface in the direction of the reference axis of the lower-beam headlamp.

6.5.6.3 Length

As close as practicable to the front of the vehicle, facing toward the outboard side:

a. K ≤ 100 cm

6.5.7 Geometric Visibility

α1 = 10°, α2 = 10°, β1 = 30° to 60° outwards.

6.5.8 Electrical Connections

The front cornering lamps cannot be activated unless the lower or upper beam headlamps are operating and the vehicle is travelling at not more than 40 km/h.

The front cornering lamp on one side of the vehicle may be switched ON automatically when the direction indicators on that side of the vehicle are activated and/or when the steering angle is changed from the straight-ahead position towards that side of the vehicle.

The front cornering lamp shall be switched OFF automatically when the direction indicator is switched OFF and/or the steering angle has returned to the straight-ahead position.

When the reversing lamp is switched ON, both front cornering lamps may be switched ON simultaneously, regardless of the steering wheel position or turn signal status. In this case, the cornering lamps shall switch OFF when the reversing lamp is switched OFF.

6.6 Daytime Running Lamp

6.6.1 Functional Purpose

To improve the front and front-side conspicuity of a vehicle under normal condition of use during the daytime when the regular headlamps or front fog lamps are not required for driving.

6.6.2 Application (Not Fully Harmonized)

Mandatory on motor vehicles, prohibited on trailers

NOTE: This function is prohibited on all vehicles in Japan as of the publication date of this Recommended Practice. Discussion is ongoing; consult up-to-date Japanese regulations.

6.6.3 Quantity

Two.

6.6.4 Tell-Tale

Circuit-closed tell-tale required when the daytime running lamps are activated and the instrument panel is illuminated and rear position (tail) lamps, license plate lamps, sidemarker lamps, and front position lamps are OFF, otherwise optional.

6.6.5 Color

White per SAE J578.

6.6.6 Location

6.6.6.1 Width

Mounted symmetrically about the median longitudinal plane, as far apart laterally as practicable, and not exceeding the following:

D ≥ 60 cm (D ≥ 40 cm if vehicle is less than 130 cm wide)

6.6.6.2 Height

1. H1 ≤ 150 cm

2. H2 ≥ 25 cm

6.6.6.3 Length

On the front of the vehicle, facing forward.

6.6.7 Geometric Visibility

α1=10°, α2=10°, β1=20°, β2=20°.

6.6.8 Electrical Connections

6.6.8.1 The daytime running lamps shall be switched ON automatically when the device which starts and/or stops the vehicle propulsion system is in a position which makes it possible for the propulsion system to operate. However; daytime running lamps may remain OFF while:

a. the automatic transmission control is in the Park position;

b. while the parking brake is applied; **or**

c. after the propulsion system is activated but the vehicle has not yet been set in motion.

6.6.8.2 The daytime running lamps shall switch OFF automatically when the front fog lamps or headlamps are switched ON, except when the latter are flashed briefly to communicate with other drivers.

6.6.8.3 While daytime running lamps are switched ON, it shall not be possible to activate the upper beam headlamps except for brief intermittent flashing intended to communicate with other drivers.

6.6.8.4 If the distance between the closest adjacent edges of the light-emitting surfaces of the front turn signal lamp and the daytime running lamp is less than or equal to 4 cm, the daytime running lamp on the signaling side of the vehicle may, during the entire period of activation (both ON and OFF phase) of the adjacent front turn signal lamp, either switch OFF or operate at a reduced luminous intensity.

6.6.8.5 The front and rear position lamps, registration (license) plate lamp, and sidemarker lamps may operate when the daytime running lamps are switched ON.

6.7 Front Reflex Reflector

6.7.1 Functional Purpose

To indicate the presence, position, and width of a vehicle observed from the front or front-lateral angles by reflecting the light from approaching vehicles' headlamps.

6.7.2 Application

Mandatory on trailers and motor vehicles having all forward facing lamps with reflectors concealable; optional on other motor vehicles.

6.7.3 Quantity

Two.

6.7.4 Tell-Tale

Not applicable.

6.7.5 Color

Identical to incident light (colorless, "white").

6.7.6 Location

6.7.6.1 Width

Mounted symmetrically about the vehicle's median longitudinal plane, as far apart laterally as practicable, and not exceeding the following:

a. E ≤ 40 cm for motor vehicles, E ≤ 15 cm for trailers

b. D ≥ 60 cm (D ≥ 40 cm if vehicle is less than 130 cm wide)

6.7.6.2 Height

a. H1 ≤ 90 cm(H1 ≤ 150 cm if the vehicle body structure prevents compliance with 90 cm)

b. H2 ≥ 25 cm

6.7.6.3 Length

On the front of the vehicle, facing forward.

6.7.7 Geometric Visibility

α1=10°, α2=10° (5° if H1 ≤ 75 cm), β1=30°, β2=30 ° (β2=10° for trailers)

If the construction of the trailer prevents this angle being met by the mandatory reflex reflectors, then additional reflex reflectors shall be fitted, without regard to the width limitation in 6.7.6.1, to give the necessary visibility angle in conjunction with the mandatory reflex reflectors.

As installed on the vehicle, with all vehicular obstructions considered, the front reflex reflectors shall be visible throughout all angles required for the device to comply with applicable photometric requirements.

6.8 Turn signal (Direction-Indicator) Lamps, Front and Rear

6.8.1 Functional Purpose

To convey the driver's intent to change direction or move laterally (e.g., to change lanes) by means of a flashing signal on the side of the vehicle toward which the turn or maneuver will be made. These lamps may also be used as the hazard warning system when all turn signal lamps on the vehicle are activated and flash simultaneously to indicate to other drivers the presence of a vehicular hazard.

6.8.2 Application

Mandatory on motor vehicles (front and rear) and trailers (rear only).

6.8.3 Quantity

Two front (motor vehicles only) and two rear (all vehicles).

6.8.4 Tell-Tale

Operating tell-tale mandatory for turn signal lamps. It shall flash in synchronization with the turn signal lamps. In the event of a malfunction of any of the activated turn signal lamps, the tell-tale shall:
a. not illuminate, **or**
b. remain steadily lit without flashing, **or**
c. show a marked change of flash frequency.

If a motor vehicle is equipped to draw a trailer, it shall be fitted with a special tell-tale for the turn signal lamps on the trailer unless the tell-tale of the drawing vehicle detects and displays the failure of any of the turn signal lamps on the vehicle-trailer combination.

6.8.5 Color

Yellow per SAE J578.

6.8.6 Location

NOTE: The distance between the turn signal lamp and lower beam headlamp, front fog lamp, and/or daytime running lamp shall be not less than 10 cm, unless the turn signal lamp meets higher photometric intensity requirements (for specific photometric requirements, see applicable North American and UNECE Regulations).

6.8.6.1 Width

Mounted symmetrically about the vehicle's median longitudinal plane, as far apart laterally as practicable, and not exceeding the following:

a. E ≤ 40 cm

b. D ≥ 60 cm (D ≥ 40 cm if vehicle is less than 130 cm wide)

6.8.6.2 Height

a. H1 ≤ 150 cm (H1 ≤ 210 cm if the vehicle body structure prevents compliance with 150 cm)

b. H2 ≥ 35 cm and H ≥ 38 cm

6.8.6.3 Length

a. Front - On the front of the vehicle, facing forward

b. Rear - On the rear of the vehicle, facing rearward

6.8.7 Geometric Visibility

α1=15°, α2=15° (5° if H1 ≤ 75 cm), β1=80°, β2=45 °.

The area of an unobstructed apparent surface of the lamp in the direction of the reference axis, excluding reflex reflector area, shall be not less than 13 cm^2 when the light emitting surface of the lens is projected throughout the angles of geometric visibility defined above, except that ®$_1$=45°, **and** each lamp shall provide a minimum unobstructed projected area of the apparent surface, excluding retro-reflector (reflex reflector) area, of not less than:

a. 22 cm^2 (front, vehicles less than 203.2 cm in structural width)

b. 50 cm^2 (rear, vehicles less than 203.2 cm in structural width)

c. 75 cm^2 (front and rear, vehicles 203.2 cm or more in structural width)

6.8.8 Electrical Connections

6.8.8.1 The turn signal lamps shall switch ON independently of the other lamps. All turn signal lamps on each side of a vehicle shall be switched ON and OFF by means of one control, and shall flash in synchronous phase at between 60 and 120 flashes per minute with the lit and unlit portions of the flash cycle being approximately equal in duration.

6.8.8.2 The turn signal operating unit on each vehicle less than 203.2 cm in structural width shall be self-canceling by steering wheel rotation and capable of cancellation by a manually operated control.

6.8.8.3 Operation of the turn signal control shall be followed within not more than 1 second by the emission of light and within not more than 1.5 seconds by its first extinction.

6.8.8.4 If a vehicle is equipped to draw a trailer, the control of the turn signal lamps on the drawing vehicle shall also operate the turn signal lamps of the trailer. In the event of failure other than short circuit of one turn signal lamp, the others shall continue to flash, but the frequency in this condition may differ from the normally prescribed value.

6.9 Side Turn Signal Lamps (Side Direction Indicator Lamps)

6.9.1 Functional Purpose

To extend the outboard lateral visibility of the front turn signal lamps. Also these lamps may be used as part of the hazard warning system when all turn signal lamps on the vehicle are activated and flash simultaneously to indicate to other drivers the presence of a vehicular hazard.

6.9.2 Application

Mandatory on motor vehicles.

6.9.3 Quantity

Two (one on each side).

6.9.4 Tell-Tale

Same as turn signal lamps (6.8.4).

6.9.5 Color

Yellow per SAE J578.

6.9.6 Location

6.9.6.1 Width

No requirement.

6.9.6.2 Height

a. Maximum: H1 ≤ 150 cm and H ≤ 122 cm

b. Minimum: H2 ≥ 35 cm and H ≥ 50 cm

6.9.6.3 Length

On the side of the vehicle, facing sideways, as far forward as practicable and K ≤ 180 cm.

6.9.7 Geometric Visibility

α1=15°, α2=15° (5° if H1 ≤ 75 cm), β3=60° and, η=5 ° (angles β3 and η are measured from the plane tangent to the lens of the side turn signal lamp and parallel to the longitudinal plane of the vehicle).

Each lamp shall provide a minimum unobstructed projected area of the apparent surface, excluding reflex reflector area, of 10 cm^2 along the reference axis (20 cm^2 for vehicles longer than 6 m).

6.9.8 Electrical Connections

Same as turn signal lamps (6.8.8).

6.10 Sidemarker (Side Marker) Lamp **(Not Fully Harmonized)**

6.10.1 Functional Purpose

To indicate the presence, position, and length of a vehicle with its lights on, when observed from lateral angles.

6.10.2 Application

Mandatory on all vehicles.

6.10.3 Quantity

Such that the requirements for longitudinal positioning in paragraph 6.10.6.3 are met, and not fewer than one front and one rear on each side of the vehicle.

6.10.4 Tell-Tale

Optional; if provided, its function shall be carried out by the tell-tale required for the front and rear position lamps.

6.10.5 Color

a. Front: Yellow per SAE J578.

b. Rear (Not Fully Harmonized):

Yellow in countries adhering to UNECE Regulation 48.

Red in USA and Canada; also permitted in Australia and in UNECE R48 countries if the rear sidemarker lamp is grouped with, or has part of the light emitting surface in common with, a red rear lamp or non-triangular rear reflex reflector.

6.10.6 Location

6.10.6.1 Width

No requirement.

6.10.6.2 Height

a. H1 ≤ 150 cm (H1 ≤ 210 cm if the vehicle body structure prevents compliance with 150 cm)

b. H2 ≥ 250 mm and H ≥ 38 cm

6.10.6.3 Length

a. Front: Forward of the front axle and as far forward as practicable, facing outboard;

b. Rear: Rearward of the rear axle and as far rearward as practicable, facing outboard;

c. Distance from the front and from the rear K ≤ 40 cm.

d. Front sidemarker lamp on trailers equipped with a draw bar (“K” includes the draw bar): 150 cm ≥ K ≥ 100 cm.

e. Vehicles over 6 m long: D_n ≤ 3 m (D_n ≤ 4 m if the structure of the vehicle prevents compliance with 3 m)

6.10.7 Geometric Visibility

α1=10°, α2=10° (5° if H1 ≤ 75 cm), β1=45°, β2=45 °.

Each lamp shall provide a minimum unobstructed projected area of an apparent surface, excluding reflex reflectorarea, of 10 cm^2 along the reference axis.

6.10.8 Electrical Connections

The electrical connections shall be such that the sidemarker lamps, front and rear position lamps, rear license plate lamps, and any clearance and identification lamps can be switched ON and OFF only simultaneously. Yellow sidemarker lamps may flash in conjunction with the turn signal lamps and may be used as part of the hazard warning system, in which case they shall flash in synchronous phase with the turn signal lamps and hazard warning lamps.

6.11 Side Reflex Reflector (Retro-Reflector) (Not Fully Harmonized)

6.11.1 Functional Purpose

To indicate the presence, position, and length of a vehicle with its lamps switched OFF when viewed from either side.

6.11.2 Application

Mandatory on all vehicles.

6.11.3 Quantity

Such that the requirements for longitudinal positioning in paragraph 6.11.6.3 are met, and not fewer than one front and one rear on each side of the vehicle.

6.11.4 Tell-Tale

Not applicable.

6.11.5 Color

a. Front - Yellow per SAE J578

b. Rear - (Not fully harmonized):

Yellow per SAE J578 in countries adhering to UNECE Regulation 48

Red per SAE J578 in the USA and Canada; also permitted in Australia and in UNECE R48 countries **if** the rear side reflex reflector is grouped with, or has part of the light emitting surface in common with, a red rear lamp or non-triangular rear reflex reflector.

6.11.6 Location

6.11.6.1 Width

No requirements.

6.11.6.2 Height

a. H1 ≤ 90 cm (H1 ≤ 150 cm if the vehicle body structure prevents compliance with 90 cm)

b. H2 ≥ 25 cm and H ≥ 38 cm

6.11.6.3 Length

a. Front: Forward of the front axle and as far forward as practicable, facing outboard;

b. Rear: Rearward of the rear axle and as far rearward as practicable, facing outboard;

c. Distance from the front and from the rear K ≤ 40 cm.

d. Front side reflex reflector on trailers equipped with a draw bar (“K” includes the draw bar): 150 cm ≥ K ≥ 100 cm.

e. Vehicles over 6 m long: D_n ≤ 3 m (D_n ≤ 4 m if the structure of the vehicle prevents compliance with 3 m)

6.11.7 Geometric Visibility

α1=15°, α2=15° (5° if H1 ≤ 75 cm), β1=45°, β2=45 °

Each side reflex reflector shall provide a minimum unobstructed projected area of an apparent surface of 10 cm^2 along its reference axis.

As installed on the vehicle, with all vehicular obstructions considered, each side reflex reflector shall be visible through the entire range of angles required for the device to comply with all applicable photometric requirements.

6.12 Clearance Lamp (End Outline Marker Lamp) (Not Fully Harmonized)

6.12.1 Functional Purpose

To indicate the structural width of the vehicle.

6.12.2 Application

Mandatory on vehicles over 203.2 cm in structural width.

6.12.3 Quantity

Two front and two rear.

NOTE: Clearance lamps may not be optically combined (reciprocally incorporated) with rear position lamps.

6.12.4 Tell-Tale

Optional; if provided, its function shall be carried out by the tell-tale required for the front and rear position lamps.

6.12.5 Color

a. Front - (Not Fully Harmonized):

1. USA, Canada: Yellow per SAE J578, also permitted in Australia.

2. Elsewhere: White per SAE J578, also permitted in Australia.

b. Rear - Red per SAE J578

6.12.6 Location

6.12.6.1 Width

Mounted symmetrically about the median longitudinal plane at the widest point of the vehicle, as close as practicable to the outer edges of the vehicle. This requirement is deemed met if:

a. E ≤ 10 cm (15 cm to the center of the lamp)

6.12.6.2 Height

a. Rear:

1. H1 - as high as practicable, but not greater than 152.5 cm.

2. H2 ≥ 38 cm

b. Front (on motor vehicles):

1. H2 not lower than the uppermost edge of the transparent zone of the windshield.

6.12.6.3 Length

a. Rear - On the rear of the vehicle facing rearward.

b. Front - On the front of the vehicle facing forward.

6.12.7 Geometric Visibility

α1=20°, α2=20°, β1=80°, β2=45°

6.12.8 Electrical Connections

The electrical connections shall be such that the front and rear position lamps, the sidemarker lamps, the rear license plate lamps, and any clearance and identification lamps can be switched ON and OFF only simultaneously. A clearance lamp combined with a turn signal or hazard warning lamp shall be extinguished while the turn signal lamps or hazard warning lamps are operating.

6.13 Identification Lamps, Front and Rear

6.13.1 Functional Purpose

To indicate the presence and position of a wide vehicle.

6.13.2 Application (Not Fully Harmonized)

a. USA, Canada: mandatory on vehicles over 203.2 cm in structural width.

b. UNECE: not recognized, therefore generally not allowed.

c. Japan, Australia: permitted.

6.13.3 Quantity

three front and three rear.

6.13.4 Tell-Tale

Optional. If present, its function shall be provided by the tell-tale required for the front and rear position lamps.

6.13.5 Color (Not Fully Harmonized)

Front - yellow per SAE J578. Would have to be white in UNECE countries.

Rear - red per SAE J578.

6.13.6 Location

6.13.6.1 Width

Mounted symmetrically about the vehicle's median longitudinal plane. Shall form an array of three grouped or independent lamps, with lamp reference axis spaced horizontally 15 to 30 cm apart.

6.13.6.2 Height

a. As high as practicable.

b. Rear identification lamps may be located on or below the door, if the door header is narrower than 2.5 cm.

6.13.6.3 Length

a. On the front facing forward

b. On the rear facing rearward

6.13.7 Geometric Visibility

α1=20°, α2=20°, β1=45°, β2=45°

6.13.8 Electrical Connections

The electrical connections shall be such that the identification lamps, front position lamps, tail lamps, sidemarker lamps, rear license plate lamps, and clearance lamps can be switched ON and OFF only simultaneously.

6.14 Tail (Rear Position) Lamp

6.14.1 Functional Purpose

To indicate the presence, position, width, and direction of travel of a vehicle observed from the rear or rear-lateral angles.

6.14.2 Application

Mandatory on all vehicles. Rear position lamps shall not be optically combined (reciprocally incorporated) with clearance lamps.

6.14.3 Quantity

Two.

6.14.4 Tell-Tale

Circuit-closed tell-tale mandatory. It shall be combined with that of the front position lamps.

6.14.5 Color

Red per SAE J578.

6.14.6 Location

6.14.6.1 Width

Mounted symmetrically about the vehicle's median longitudinal plane, as far apart laterally as practicable, and:

a. E ≤ 40 cm

b. D ≥ 60 cm (D ≥ 40 cm if vehicle is less than 130 cm wide)

6.14.6.2 Height

a. H1 ≤ 150 cm (H1 ≤ 210 cm and H ≤ 183 cm if the vehicle body structure prevents compliance with 150 cm)

b. H2 ≥ 35 cm and H ≥ 38 cm

6.14.6.3 Length

On the rear of the vehicle, facing rearward.

6.14.7 Geometric Visibility

α1=15°, α2=15° (5° if H1 ≤ 75 cm), β1=80°, β2=45 °

6.14.7.1 Each lamp shall provide a luminous intensity not less than 0.05 cd throughout the angles of geometric visibility defined above, **or**

6.14.7.2 Each lamp shall provide a minimum unobstructed projected area of 13 cm^2 when the light emitting surface of the lens, excluding reflex reflector area, is projected throughout the angles of geometric visibility defined above, except that β_1=45°.

6.14.8 Electrical Connections

The electrical connections shall be such that the rear position lamps, sidemarker lamps, rear license plate lamps, and any clearance and identification lamps can be switched ON and OFF only simultaneously.

6.15 Rear Reflex Reflectors, non-triangular

6.15.1 Functional Purpose

To indicate the presence, position, and width of a vehicle observed from the rear or rear-lateral angles by reflecting the light from approaching vehicles' headlamps.

6.15.2 Application

Mandatory on all vehicles.

6.15.3 Quantity

Two.

6.15.4 Tell-Tale

Not applicable.

6.15.5 Color

Red per SAE J578

6.15.6 Location

6.15.6.1 Width

Mounted symmetrically about the vehicle's median longitudinal plane, as far apart laterally as practicable, and:

a. E ≤ 40 cm

b. D ≥ 60 cm (D ≥ 40 cm if vehicle is less than 130 cm wide)

6.15.6.2 Height

a. H1 ≤ 90 cm (H1 ≤ 150 cm if vehicle body structure prevents compliance with 90 cm)

b. H2 ≥ 25 cm and H ≥ 38 cm

6.15.6.3 Length

On the rear of the vehicle, facing rearward.

6.15.7 Geometric Visibility

⟨1=15°, ⟨2=15° (5° ιφ H1 δ 75 χμ), ®1=30°, ®2=30 °

Each reflex reflector shall provide a minimum unobstructed projected area of an apparent surface of 10 cm^2 along its reference axis.

As installed on the vehicle, with all vehicular obstructions considered, rear reflex reflectors shall be visible through the entire range of angles required for the device to comply with all applicable photometric requirements.

6.16 Rear Reflex Reflector (Retro-Reflector), Triangular

6.16.1 Functional Purpose

To identify a trailer and to indicate the presence and width of a trailer with its lights off.

6.16.2 Application

Mandatory on trailers, prohibited on motor vehicles.

6.16.3 Quantity

Two.

6.16.4 Tell-Tale

Not applicable.

6.16.5 Color

Red per SAE J578.

6.16.6 Location

The apex of the triangle shall point upward.

6.16.6.1 Width

Mounted symmetrically about the vehicle's median longitudinal plane, as far apart laterally as practicable, and:

a. E ≤ 40 cm

b. D ≥ 60 cm (D ≥ 40 cm if vehicle is less than 130 cm wide)

6.16.6.2 Height

a. H1 ≤ 90 cm (H1 ≤ 150 cm if vehicle body structure prevents compliance with 90 cm)
b.H2 ≥ 25 cm (H ≥ 38 cm for use in USA/Canada)

6.16.6.3 Length

On the rear of the vehicle, facing rearward.

6.16.7 Geometric Visibility

α1=15°, α2=15° (5° if H1 ≤ 75 cm), β1=30°, β2=30 °

As installed on the vehicle, with all vehicular obstructions considered, triangular reflex reflectors shall be visible through the entire range of angles required for the device to comply with all photometric requirements.

Each side of the triangle shall be not less than 15 cm long.

6.17 Stop Lamp

6.17.1 Functional Purpose

To provide a rearward warning that the vehicle is being deliberately decelerated.

6.17.2 Application

Mandatory on all vehicles.

6.17.3 Quantity

Two.

6.17.4 Tell-Tale

Recommended; if present, this shall be an operating tell-tale providing a steady-burning warning light in the event of a malfunction in one or more of the vehicle's stop lamps.