SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

SURFACE VEHICLE STANDARD

SAE J2040

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Superseding J2040 MAR2000

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

1. ***Scope—***This SAE Standard provides test procedures, requirements, and guidelines for tail lamps intended for use on vehicles 2032 mm or more in overall width. Tail lamps conforming to the requirements of this document may also be used on vehicles less than 2032 mm in overall width.

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.

SAEJ576—Plastic Material for Use in Optical Parts Such as Lenses and Reflectors of Motor Vehicle Lighting Devices
SAE J578—Color Specification
SAE J759—Lighting Identification Code
SAEJ2139—Tests for Lighting Devices, Reflective Devices and Components Used on Vehicles 2032 mm or More in Overall Width

2.2 Related Publications—The following publications are provided for information purposes only and are not a required part of this document.

Attention is called to the following documents for additional information on lamp design and installation requirements.

2.2.1 SAE PUBLICATION—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J387—Terminology Motor Vehicle Lighting
SAE J567—Lamp Bulb Retention System for Requirements and Gages used in Retention System Design
SAE J1330—Laboratory Accuracy Guidelines
SAE J1889—L.E.D. Lighting Devices
SAE830566—Motor Vehicle Conspicuity, R. L. Henderson, K. Ziedman, W.J. Burger, and K.E. Cavey, National Highway Traffic Safety Administration

TO PLACE A DOCUMENT ORDER: +1 (724) 776-4970 FAX: +1 (724) 776-0790
SAE WEB ADDRESS http://www.sae.org

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

Federal Motor Vehicle Safety Standard 49CFR 571.108
Federal Highway Administration 49CFR part 393 Subpart B

2.2.3 TMC AND TTMA PUBLICATIONS—Available from The Maintenance Council, American Trucking Associations, 2200 Mill Road, Alexandria, VA 22314-5388.

TTMA #RP-9—Location of Lighting Devices for Trailers
TMC #RP-702A—Trailer Lamp and Reflector Placement
TMC #RP-704B—Heavy Duty Lighting Systems for Trailers
TMC #AV 7-1—Heavy Duty Lighting Systems for Trailers

3. Definitions

3.1 Tail Lamp—A lamp used to designate the rear of a vehicle by a steady burning low-intensity light.

3.2 Stop Lamp—A lamp giving a steady light to the rear of a vehicle to indicate the intention of the operator of the vehicle to stop or diminish speed by the application of the service brakes.

3.3 Turn Signal Lamp—The signaling element of a turn signal system which indicates intent to change vehicle direction by giving a flashing light on the side toward which the turn or lane change will be made.

3.4 Clearance Lamp—Lamps mounted on the permanent structure of the vehicle as near as practicable to the upper left and right extreme edges that provide light to the front or rear to indicate the overall width and height of the vehicle.

4. Lighting Identification Code—Tail lamps for use on vehicles 2032 mm or more in overall width may be identified by the code “T2” in accordance with SAE J759.

5. Tests

5.1 Tests for Lighting Devices, Reflective Devices, and Components Used on Vehicles 2032 mm or More in Overall Width—SAE J2139 is a part of this document. The following tests are applicable with modification as indicated.

5.1.1 VIBRATION

5.1.2 MOISTURE

5.1.3 DUST

5.1.4 CORROSION

5.1.5 PHOTOMETRY—Photometric measurements shall be made with the light source of the device at least 3 m from the photometer.

5.1.5.1 The H-V axis of the device shall be taken to be parallel to the longitudinal axis of the vehicle, when the device is mounted in its design position.

5.1.5.2 Photometric measurements shall be made with the light source steadily burning. Photometric measurements of multiple lamp arrangements may be made by either of the following methods.

5.1.5.2.1 All lamps shall be photometered together provided that a line from the light source of each lamp to the center of the photometer sensing device does not make an angle of more than 0.6 degrees with the photometer H-V axis. When lamps are photometered together, the H-V axis shall intersect the midpoint between the extreme light sources.

5.1.5.2.2 Each lamp shall be photometered separately by aligning the axis of each lamp with the axis of the photometer. The photometric measurement for the entire multiple lamp arrangement shall be determined by adding the photometric outputs from each individual lamp at its corresponding test point.

5.1.6 WARPAGE TEST ON DEVICES WITH PLASTIC COMPONENTS

5.2 Color—SAE J578 is a part of this document.

5.3 Plastic Materials—SAE J576 is a part of this document.

6. Requirements

6.1 Performance Requirements—The device when tested in accordance with the test procedures of this document shall meet the requirements of SAE J2139 or as indicated.

6.1.1 VIBRATION

6.1.2 MOISTURE

6.1.3 DUST

6.1.4 CORROSION

6.1.5 The lamp shall be designed to conform to the zone total photometric requirements of Table 1 and its footnotes. The summation of the luminous intensity measurements at the test points in a zone shall be at least the value shown.

6.1.5.1 An arrangement of lamps may be used to meet the photometric requirements of Table 1 provided the distance between adjacent light source does not exceed 560 m for two lamp arrangements or does not exceed 410 mm for multiple lamp arrangements. If the distance between light sources exceeds those distances detailed previously then, each lamp shall individually comply with the photometric requirements of Table 1.

6.1.5.2 When a tail lamp is combined with the stop lamp or turn signal lamp, the stop lamp or turn signal lamp intensity shall be not less than three times the luminous intensity of the tail lamp at any test point, except that at H-V, H-5°L, H-5°R, and 5°U-V, the stop lamp or turn signal lamp intensity shall be not less than five times the luminous intensity of the tail lamp. When a tail lamp is combined with the stop lamp or turn signal lamp, and the maximum luminous intensity of the tail lamp is located below the horizontal and is within an area generated by a 1.0 degree radius around the test point, the ratio for the test point may be computed using the lowest value of the tail lamp intensity within the generated area.

TABLE 1—PHOTOMETRIC REQUIREMENTS[1][2]

Zone	Test Point (Degrees)	Minimum Luminous Intensity (cd)[3]	Zone Total Luminous Intensity (cd)[4]
I	10U 5L	0.4	1.4
	5U 20L	0.3	
	5D 20L	0.3	
	10D 5L	0.4	
II	5U 10L	0.8	2.4
	H 10L	0.8	
	5D 10L	0.8	
III	5U V	1.8	9.6
	H 5L	2.0	
	H V	2.0	
	H 5R	2.0	
	5D V	1.8	
IV	5U 10R	0.8	2.4
	H 10R	0.8	
	5D 10R	0.8	
V	10U 5R	0.4	1.4
	5U 20R	0.3	
	5D 20R	0.3	
	10D 5R	0.4	
Maximum Luminous Intensity (cd)[5]			18

1. Ratio requirements of 6.1.5.2 apply.
2. Multiple lamp arrangements requirements of 6.1.5.1 apply.
3. The measured values at each individual test point shall not be less than 60% of the required minimum value shown for that individual test point location.
4. The sum of the luminous intensity measurements at each test point within a zone shall not be less than the Zone Total Luminous Intensity shown.
5. The listed maximum shall not be exceeded over any area larger than that generated by a 0.5 degree radius within the solid angle defined by the test points.

6.1.6 WARPAGE

6.2 Color—The color of the light measured from the tail lamp shall meet red as specified in SAE J578.

6.3 Plastic Materials—The plastic materials used in the optical parts shall meet the requirements of SAE J576.

6.4 Design Requirements

6.4.1 If a tail lamp is optically combined with a stop lamp or a turn signal lamp and a replaceable multiple light source is used, the light source retention system shall be designed with an indexing means so that the light source is properly indexed. Removable light source retention systems shall have an indexing feature so that they cannot be reinserted into the lamp housing in a random position, unless the lamp will perform its intended function with random light source orientation.

6.4.2 The effective projected luminous lighted lens area of a single lamp shall be at least 75 cm^2.

6.4.3 A tail lamp shall not be optically combined with a clearance lamp.

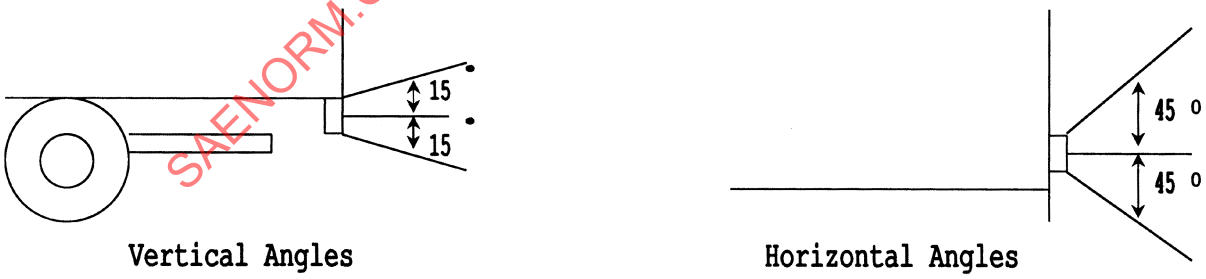
6.5 Installation Requirements—The tail lamp shall meet the following requirements as installed on the vehicle.

6.5.1 The tail lamps shall be mounted on the permanent structure of the vehicle, facing rearward, at the same height and spaced as far apart laterally as practicable, so that the signal will be clearly visible.

6.5.2 Each tail lamp shall be designed to comply with all photometric requirements of Table 1 with all vehicular obstructions considered.

6.5.3 Each tail lamp installed shall comply with one of the following visibility requirements. (Left hand shown, right hand symmetrically opposite)

6.5.3.1 Each tail lamp must provide a minimum of 13 cm^2 of unobstructed projected area when the light emitting surface area of the lens, excluding reflex reflector area, is projected parallel to a horizontal plane in any direction from 45 degrees outboard to 45 degrees inboard of the vehicle longitudinal axis, and parallel to a longitudinal vertical plane from 15 degrees above to 15 degrees below the horizontal; (see Figure 1).



Vertical Angles

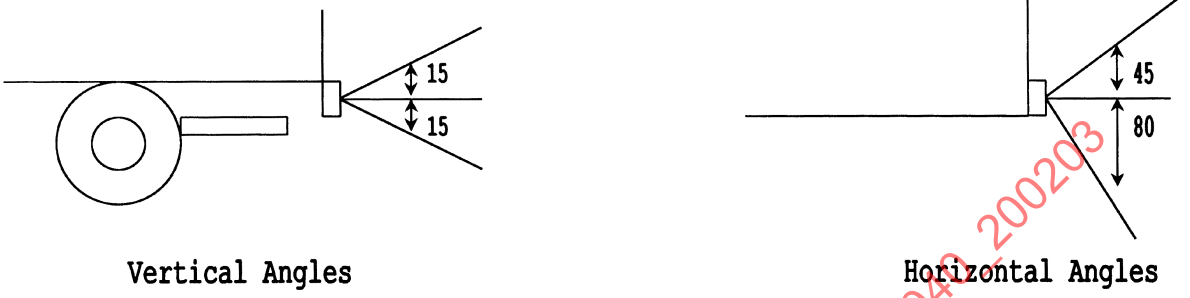
Horizontal Angles

* The downward angle may be reduced to 5 degrees if the lower lighted edge of the lamp is less than 750 mm above the ground.

FIGURE 1—TAIL LAMP VISIBILITY REQUIREMENTS—UNOBSTRUCTED PROJECTED AREA

6.5.3.2 The lamp must provide a minimum luminous intensity of 0.05 cd throughout the photometric pattern defined by the corner points specified as follows:

15 degrees above horizontal: 45 degrees inboard and 80 degrees outboard.
15 degrees below * horizontal: 45 degrees inboard and 80 degrees outboard (see Figure 2)



* The downward angle may be reduced to 5 degrees if the lower lighted edge of the lamp is less than 750 mm above the ground.

FIGURE 2—TAIL LAMP VISIBILITY REQUIREMENTS—LUMINOUS INTENSITY

7. Guidelines

7.1 Installation Guidelines

7.1.1 Performance of lamps may deteriorate significantly as a result of dirt, grime, snow, and ice accumulation on the optical surfaces, therefore installation of the device on the vehicle should be considered to minimize the effects of these factors.

7.1.2 When determined that the device must perform in extremely severe environments, or when it is expected to be totally immersed in water, the user should specify devices specifically designed for such use.

7.1.3 The luminous intensity of the light source may vary with applied voltage, therefore consideration of the electrical wiring design should be to supply adequate lamp voltage.

8. Notes

8.1 Marginal Indicia—The change bar (l) located in the left margin is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. An (R) symbol to the left of the document title indicates a complete revision of the report.

PREPARED BY THE SAE HEAVY-DUTY LIGHTING STANDARDS COMMITTEE