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

SURFACE VEHICLE STANDARD

SAE J943 | REAF. JUN93

Issued 1966-06
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Superseding J943 JUN88

Submitted for recognition as an American National Standard

SLOW-MOVING VEHICLE IDENTIFICATION EMBLEM

Foreword—This reaffirmed document has been changed only to reflect the new SAE Technical Standards Board format.

1. Scope

1.1 This SAE Standard establishes emblem dimensional specifications, performance requirements, related test procedures, and mounting requirements.

1.2 This unique identification emblem shall be used only on machines which are designed for and travel at rates of speed less than 40 km/h (25 mph).

1.3 The identification emblem shall supplement but not replace warning devices such as tail lamp regulators or flashing lights and shall not be used to identify stationary objects or stopped vehicles and/or machines.

1.4 The dimensions and color patterns of the emblem have been established as a unique identification and shall not be altered to permit advertising or other markings on the face of the emblem, except as permitted in 3.2.

1.5 **Purpose**—The purpose of this document is to establish specifications which define a unique identification emblem to be used only for slow-moving vehicles when operated or traveling on highways.

2. References

2.1 **Applicable Documents**—The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J575—Tests for Motor Vehicle Lighting Devices and Components
SAE J594—Reflex Reflectors

2.1.2 ASAE PUBLICATION—Available from ASAE, 2950 Niles Road, St. Joseph, MI 49085-9659.

ASAE S277—Mounting Brackets and Socket for Warning Lamps and Slow-Moving Vehicle (SMV) Identification Emblem

Printed in U.S.A.
90-1202B EG

2.1.3 ASTM PUBLICATIONS—Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM D 1014—Conducting Exterior Exposure Tests of Paints on Steel
ASTM D 1788—Specifications for Rigid Acrylonitrile-Butadiene Styrene (ABS) Plastics
ASTM D 2794—Test for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)

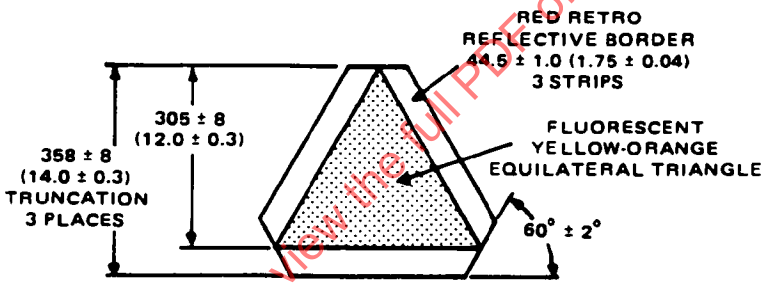
2.1.4 OTHER PUBLICATION

Handbook of Chemistry and Physics, 51st Ed.

2.2 Definitions

2.2.1 HIGHWAY—The entire width between the boundary lines of every way publicly maintained when any part thereof is open to the use of the public for purposes of vehicular travel.

2.2.2 PERMANENT-MOUNTED EMBLEM—A yellow-orange triangle with a dark red border as illustrated in Figure 1 and securely affixed to a machine.

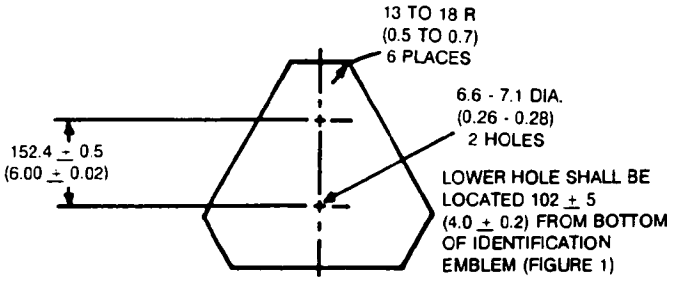


DIMENSIONS ARE IN MILLIMETERS WITH INCH EQUIVALENTS IN PARENTHESES.

NOTE: EMBLEM MUST BE MOUNTED WITH THE POINT UPWARD.

FIGURE 1—SLOW-MOVING VEHICLE IDENTIFICATION EMBLEM

2.2.3 PORTABLE EMBLEM—A yellow-orange triangle with a dark red border as illustrated in Figure 1 securely affixed to a backing material as illustrated in Figure 2 and displayed on a machine.



DIMENSIONS ARE IN MILLIMETERS WITH INCH EQUIVALENTS IN PARENTHESES.
BACKING MATERIAL SHALL BE AS LARGE AS OR LARGER THAN THE IDENTIFICATION EMBLEM (FIGURE 1)

FIGURE 2—BACKING MATERIAL FOR PORTABLE SLOW-MOVING VEHICLE IDENTIFICATION EMBLEM

3. *Description*

3.1 The identification emblem, Figure 1, consists of a fluorescent, yellow-orange equilateral triangle with a dark red retroreflective border positioned with a point of the triangle up. The yellow-orange fluorescent triangle provides for daylight identification. The reflective border defines the shape of the fluorescent color in daylight and appears as a hollow red triangle in the path of motor vehicle headlights at night. The emblem may be permanently mounted or portable as defined in 2.2.2 and 2.2.3.

3.2 The emblem manufacturer shall place his name and address on the emblem, and may state that the emblem meets the requirements of this document. This information shall be clearly and permanently marked on the face of the emblem. It shall appear only in the lower center or lower right-hand corner of the emblem. On portable emblems, the information may be located on the reverse side of the backing material. When the information is located on the face of the emblem, it shall not include trademarks, symbols, or other types of promotional communications, and the total area used for such information on the face of the emblem shall not exceed 6.5 cm^2 (1 in^2).

4. *Performance Requirements*

4.1 **Visibility**—The emblem shall be entirely visible in daylight and at night from all distances between 183 and 30 m (600 and 100 ft) from the rear when directly in front of the lawful upper beam of headlamps.

4.2 **Emblem Dimensional Requirements**—The size of the emblem shall be as shown in Figure 1.

4.3 **Backing Material Dimensional Requirements**—The size of the backing material for portable emblems shall be as shown in Figure 2.

4.4 **Emblem Material**—The reflective and fluorescent materials shall be tough, flexible, and of sufficient thickness and strength to meet the requirements of Sections 4 and 5. After the durability test, 5.2, the fluorescent and reflective materials shall show no appreciable cracking, crazing, blistering, loss of durable bond, or dimensional change, and reflective material shall show no appreciable discoloration.

4.4.1 FLUORESCENT MATERIAL—The yellow-orange color, purity, luminance, and peak reflectance of the fluorescent material shall be within the values shown in Table 1 before and after durability tests specified in 5.2. The test procedure for measuring fluorescent material is specified in 5.6.

TABLE 1—FLUORESCENT VALUES

	Before Exposure Test	After Outdoor Exposure Test
Dominant wavelength, nm	602-610	585 min
Purity, percent	84 min	77 min
Luminance, percent	28 min	50 max
Peak reflectance observable at wavelength nearest dominant, percent	over 100	75 min

4.4.2 REFLECTIVE MATERIAL—The dark red reflective material shall have minimum intensity values at each of the angles listed in Table 2 before and after durability tests specified in 5.2. The test procedure for measuring the reflective intensity values is specified in 5.5.

TABLE 2—MINIMUM REFLECTIVE LUMINANCE VALUES, R

Observation Angle, deg	Entrance Angle, deg (±)	Before Exposure Test	After Exposure Test
0.2	4	12.0	9.5
0.2	15	9.0	7.0
0.2	30	5.0	4.0
0.5	4	6.0	4.5
0.5	15	4.0	3.0
0.5	30	2.0	1.5

4.5 Backing Material for Portable Identification Emblems

4.5.1 Backing material for portable identification emblems shall be equivalent to 1.0 mm (0.04 in) minimum thickness aluminum; 22-gage, 0.8 mm (0.03 in) minimum thickness mill-galvanized or coated sheet steel; or 2.0 mm (0.08 in) minimum thickness ABS plastic as specified in ASTM D 1788.

4.5.2 The backing material shall be weatherable, semi-rigid, and have a surface receptive to a durable bond. The edges of the backing material shall be shaped to minimize personal injury during handling and when mounted on a machine. These backing materials shall withstand a minimum of 14 J (10 ft·lbf) using the falling dart procedure as described in 5.4.

4.6 All of these requirements are minimal and do not preclude the use of materials having superior performance.

5. Test Procedure

5.1 The emblem shall be tested in conformance with the following sections from SAE J575:

Paragraph 2.2—Definitions
Paragraph 3.1—Vibration Test
Paragraph 3.4—Corrosion Test (pertains to face of emblem only)

5.2 Durability Test—Samples mounted on backing material specified in 4.5.1 shall be exposed to the sun at an angle of 45 degrees to horizontal, facing upward and south, in nonmetallic racks, per ASTM D 1014. After the durability test (Table 3), the emblem material shall show no appreciable discoloration, cracking, crazing, blistering, loss of adhesion, or dimensional change, and shall meet the requirements set forth in 4.4.1 for fluorescent material, 4.4.2 for reflective materials, and the visibility requirements of 4.1.

TABLE 3—DURABILITY TEST

Location	Minimum Test Periods, Months Fluorescent Material	Minimum Test Periods, Months Reflective Material
Outside in South Florida	12	12

5.3 Drop Test—A portable emblem shall be dropped from a height of 1.8 m (6 ft) to a smooth hard surface equivalent to rigid metal or concrete. Each portable emblem shall be submitted to three drop tests; corner drop, edge drop, and flat surface drop. Failure shall be considered to have occurred when the emblem or the backing material will no longer meet the requirements of this document. The drop tests shall be conducted at both 24 °C (75 °F) and -23 °C (-10 °F).

5.4 Impact Resistance of Backing Material—This test procedure provides the means of determining the force required to fracture backing materials by a free-falling metal cylinder dropped vertically. The impact hammer shall be 15.88 mm (0.625 in) diameter and have a 15.88 mm (0.625 in) nose radius. The base shall be 31.8 mm (1.25 in) diameter, and the test specimen shall be a minimum of 102 mm (4 in) square. Test conditions shall be at room temperature of 24 °C ± 2 °C (75 °F ± 3 °F), and failure will be any evidence of fracture or rupture of the backing material (see ASTM D 2794).

5.5 Minimum Reflective Luminance Values, R—Measurements shall be conducted in accordance with photometric testing procedures for reflex-reflectors as specified in SAE J594, except reference to area limitations need not be followed as long as area is greater than 6452 mm^2 (10 in^2). The maximum dimension of the test surface shall not be greater than 1.5 times the minimum dimension. The reflective luminance is computed from Equation 1:

$$R = \frac{(Lr)(d^2)}{(Ls)(A)} \qquad \text{(Eq.1)}$$

where:

R = Reflective luminance, candelas per square meter per incident lux (candle power per square foot per incident foot-candle)
Lr = Illumination incident upon the receiver at observation point, lux (foot-candles)
Ls = Illuminance incident upon a plane perpendicular to the incident ray at the test specimen position, lux (foot-candles)
d = Distance from test specimen to observation point, meters (feet)
A = Area of test surface, square meters (square feet)

5.6 Fluorescent Color and Peak Reflectance—The spectrophotometric color values of the fluorescent material shall be determined by using a Signature Model D-1, Color-Eye Spectrophotometer (Instrument Development Laboratories Division of Killmorgan Corporation) per Method "C" of instruction manual #4001-A or an equivalent spectrophotometer. Luminance shall be compared to that of barium sulfate under the International Commission of Illumination CIE Standard source C illuminant.

NOTE—"Vitrolite" standard plate calibrated by the National Bureau of Standards may be substituted for the barium sulfate standard.

If Signature Model D-1 is used, this procedure shall be followed. Barium sulfate standard and the specular insert shall be used. X, X', Y, and Z shall be determined, and the values for x and y shall be calculated as shown in 5.7. The dominant wavelength and purity shall be determined using x and y from CIE diagrams. The values for Y shall be the luminance factor recorded as percent. The peak reflectance obtained shall be recorded as the peak reflectance. If the peak reflectance is too high to be measured with the microdial, reverse the microdial, reverse the positions of the sample and standard so standard is at the rear and sample in front. Then take a new set of readings. The new reciprocal readings may be converted to peak reflectance by using the Reciprocal Table on page F247-1 270 in the "Handbook of Chemistry and Physics" 51st edition. The peak reflectance must be no lower than the values shown in 4.4.1. For other instruments, use the manufacturer's recommended procedures.

5.7 Calculation Procedure for Fluorescent Material

Reflectance measurements: Illuminant C—Barium sulphate as a standard

$$X_{CIE} = 0.783\ (X_{Color\text{-}Eye}) + 0.197\ (X'_{Color\text{-}Eye})$$
$$Y_{CIE} = Y_{Color\text{-}Eye}$$
$$Z_{CIE} = 1.180\ (Z_{Color\text{-}Eye})$$

Transmittance measurements: Illuminant C—Either white Vitrolite or barium sulphate as a standard

$$X_{CIE} = 0.783\ (X_{Color\text{-}Eye}) + 0.197\ (X'_{Color\text{-}Eye})$$
$$Y_{CIE} = Y_{Color\text{-}Eye}$$
$$Z_{CIE} = 1.180\ (Z_{Color\text{-}Eye})$$

The coefficients in the reflective formulae have been integrated from spectrophotometric curves on a General Electric recording spectrophotometer. In the transmittance formulae, the actual values of the glass coefficients do not enter the formula. Having obtained X, Y, Z (CIE), the coordinated x, y, and luminosity Y_{CIE} may be obtained as follows:

$$x = \frac{X}{X+Y+Z_{CIE}} \qquad \text{(Eq.2)}$$

$$y = \frac{Y}{X+Y+Z_{CIE}} \qquad \text{(Eq.3)}$$

$$Y_{CIE} = Y_{CIE}$$

When making measurements on CIE basis, the light source must be operated at calibrated voltage and the sphere must be clean. One method of comparison on the CIE basis is to compute the factors x, y, Y in the CIE system for sample and standard. The values for the standard will give the approximate location in the CIE diagram to determine the size of unit tolerance ellipses.[1]

6. *Mounting*

6.1 Both the permanently mounted emblem and the portable emblem shall be mounted with a point of the triangle upward (see Figure 1).

6.2 Emblems shall be mounted in a plane perpendicular, ± 10 degrees, to the direction of travel and visible from the rear of a machine in accordance with Section 4.

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[1] For CIE color difference work, reference is made to "Handbook of Colorimetry" by A. C. Hardy for descriptive information and CIE graphs, and "Colorimetry" by D. B. Judd for ellipse and other information.