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SAE J887 AUG87

School Bus Warning Lamps

SAE Standard
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Submitted for Recognition as an American National Standard

The Engineering Society For Advancing Mobility Land Sea Air and Space®

400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

HIGHWAY VEHICLE STANDARD

Submitted for recognition as an American National Standard

SAE J887

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Ø SCHOOL BUS WARNING LAMPS

1. SCOPE: This SAE technical report provides test procedures, requirements and guidelines for red and yellow school bus warning lamps.

2. DEFINITIONS:

2.1 School bus red warning lamps are lights alternately flashing at 1 to 2 Hz per lamp, mounted horizontally both front and rear, intended to inform other users of the highway that such vehicle is stopped on highway to take on or discharge school children.

2.2 School bus yellow warning lamps are lights alternately flashing at 1 to 2 Hz per lamp, mounted horizontally both front and rear, intended to inform other users of the highway that such vehicle is about to stop to take on or discharge school children.

3. LIGHTING IDENTIFICATION CODE: Lamps conforming to this technical report may be identified with the code W2 in accordance with SAE J759.

4. TESTS:

4.1 SAE J575, Tests for Motor Vehicle Lighting Devices and Components is part of this report. The following tests are applicable with the modifications as indicated:

4.1.1 Vibration Test

4.1.2 Moisture Test

4.1.3 Dust Test

4.1.4 Corrosion Test

4.1.5 Photometry Test

4.1.5.1 All photometric measurements shall be made with the filament of the lamp at a distance of at least 3 m from the photometric screen. The lamp axis shall be taken as the horizontal line through the light source parallel to what would be the longitudinal axis of the vehicle, if the lamp were mounted in its normal position on the vehicle.

4.1.5.2 The school bus warning lamp shall be operated at design voltage.

4.1.5.3 An optional alternate measure of photometric performance can be made using flash energy.

4.1.5.3.1 The device shall be allowed to operate for 15 min prior to making photometric measurements. In all instances where a device is required to be operated during a test specified in this report, the voltage applied to the input wires or terminals of the device shall be 12.8 V for nominal 12 V electrical systems and 25.6 V for nominal 24 V electrical systems.

4.1.5.3.2 Photometric luminous intensity measurements (candela seconds) shall be taken as the average of ten consecutive flash cycles. There shall be an off time before each flash of at least 50% of the total flash cycle time.

4.1.6 Warpage test on devices with plastic components.

4.2 SAE J578: Color specification, is a part of this report.

4.3 Sealed Units as described in SAE J571 - Dimensional Specifications for Sealed Beam Headlamp Units and SAE J760 - Dimensional Specifications for General Service Sealed Lighting Units and SAE J1132 - 142 mm X 200 mm Sealed Beam Headlamp Unit, designed for use as school bus warning lamps, when tested without the other parts of the lamp assembly, need only be tested to paragraphs 4.1.1 and 4.1.5 above.

5. REQUIREMENTS:

5.1 Performance Requirements: A device, when tested in accordance with the test procedures specified in Section 4, shall meet the following requirements. Sealed units, as described in SAE J571, SAE J760, and SAE J1132, when tested without the other parts of the lamp assembly, need only comply with paragraphs 5.1.1, 5.1.5 and 5.1.6.

5.1.1 Vibration: SAE J575

5.1.2 Moisture: SAE J575

5.1.3 Dust: SAE J575

5.1.4 Corrosion: SAE J575

5.1.5 Photometry: SAE J575

5.1.5.1 The lamp under test shall meet the photometric performance requirements contained in Table 1, Photometric Performance Requirements and their footnotes. The summation of the luminous intensity measurements at the specified test points in a zone shall be at least the value shown.

5.1.5.2 Alternate Method: The lamp under test shall meet the photometric performance requirements contained in Table 3, Photometric Performance Requirements and their footnotes. The summation of the flash energy measurements at the specified test points in a zone shall be at least the value shown.

5.1.6 Warpage: SAE J575

5.1.7 Color: The lamp shall comply with the red or yellow requirements specified in SAE J578.

5.2 Material Requirements: Any plastic materials used in optical parts shall comply with the requirements in SAE J576, Plastic Materials for Use in Optical Parts Such as Lenses and Reflectors of Motor Vehicle Lighting Devices.

5.3 Design Requirements:

5.3.1 The functional lighted lens area of a school bus warning lamp shall not be less than 120 cm^2.

5.3.2 Sealed units if used shall comply dimensionally with SAE J571, SAE J760, or SAE J1132 for sealed beam lamps.

5.3.3 Aiming Provisions: The lamp shall be equipped with aiming pads, as described in SAE J571, SAE J760, or SAE J1132, on the lens face suitable for use with mechanical headlamp aimers as described in SAE J602. The lamp shall be designed so that with the aiming plane normal to the photometric axis, the beam shall meet the photometric specifications of Table 1.

6. GUIDELINES: The mounting and use of school bus warning lamps are specified by various legal agencies. The following guidelines, if followed, will enhance performance of the system and uniformity in use throughout the various jurisdictional agencies. They are not part of the test provisions, specifications, requirements, or procedures.

6.1 Photometric Design Guidelines for School Bus Warning Lamps, when tested in accordance with section 4.1.5 of this report, are contained in Tables 2 and 4.

6.2 The yellow lamps should be automatically deactivated and the red lamps activated when the vehicle is stopped to take on or discharge school children.

6.3 For circuit interupted incandescent filament devices, see SAE J1104, Service Performance Requirements for Warning Lamp Alternating Flashers. The "on" period of the flasher should be long enough to permit a bulb filament to approach full brightness.

6.4 There should be a visible or an audible means of giving a clear and unmistakable indication to the driver when the warning lamps are activated.

6.5 Front and rear warning lamps should be spaced as far apart laterally as practical with the yellow lamps mounted inboard of the red lamps. In no case should the spacing between the inboard lamps be less than 1000 mm, as measured from the nearest edge of the lens.

6.6 The warning lamps should be mounted on the same horizontal centerline as high as practical at the front above the windshield and on the same horizontal centerline as high as practical at the rear so that the lower edge of the lenses is not lower than the top line of the side window openings.

6.7 The visibility of the front warning lamps to the front and of the rear warning lamps to the rear should be unobstructed by any part of the vehicle from 10 deg above to 10 deg below horizontal and from 30 deg to the right to 30 deg to the left of the centerline of the lamps.

6.8 To improve the effectiveness of the signal, the area of the vehicle immediately surrounding the warning lamp extending outward approximately 70 mm should be painted black.

6.9 The lamps should be mounted on the school bus with their aiming plane vertical and normal to the vehicle longitudinal axis. If lamps are aimed or inspected with a mechanical headlamp aimer, the graduation settings for aim should be 0 down and 0 sideways. The limits for inspection should be from 5 up to 5 down and from 10 right to 10 left.

7. TEST EQUIPMENT GUIDELINES: The following guidelines apply to photometric test equipment and are not part of the technical requirements for the lamps:

7.1 A pulse integrating photometer or other accepted means of measuring pulsed light signals should have the following:

Response Time - 1μ s or less

Sensor Response - Sensor should be corrected to that of the 1931 C.I.E. standard observer (2 deg) photopic response curve. Sensor should be calibrated for the color of the light being measured.

Range Linearity - Linearity of the sensor and photometer system should be verified over the range of the luminous intensities being tested. Linearity deviation should not deviate more than 2.5% from the calibration level to the extreme luminous intensity values measured.

7.2 The regulated D.C. power supply should have the following minimum requirement:

Line regulations	±0.1%
Load regulation	±0.1%
Ripple voltage	±1.4%
Stability	±0.1% during test

TABLE 1 - PHOTOMETRIC PERFORMANCE REQUIREMENTS
SCHOOL BUS WARNING LAMPS

ZONE	TEST POINT DEGREE	TOTAL ZONAL LUMINOUS INTENSITY (CANDELA) RED	YELLOW
1	H 30L 5D 30L 5U 20L H 20L 5D 20L	590	1475
2	10U 5L 10U V 10U 5R	90	225
3	5U 10L 5U 5L 5U V 5U 5R 5U 10R	1500	3750
4	H 10L H 5L H V H 5R H 10R	2400	6000
5	5D 10L 5D 5L 5D V 5D 5R 5D 10R	1950	4875
6	10D 5L 10D V 10D 5R	120	300
7	5U 20R H 20R 5D 20R H 30R 5D 30R	590	1475

FOOTNOTES:

1. For the lamp to conform to the photometric zonal performance requirements, the summation of the candela measurements at the specific test points in a zone shall meet or exceed the value specified for that zone in Table 1.
2. The measured candela at each test point shall not be less than 60% of the requirements specified in Table 2.
3. An adjustment in lamp aim from design position may be made, provided that such adjustment does not exceed 3 degrees. All zones shall comply after final re-aim.
4. See Appendix, Fig. 1 for a graphical description of the zonal boundaries.

TABLE 2 - PHOTOMETRIC DESIGN GUIDELINES
SCHOOL BUS WARNING LAMPS

TEST POINT DEGREE		LUMINOUS INTENSITY (CANDELA) RED	YELLOW
10U	5L	20	50
	V	50	125
	5R	20	50
5U	20L	150	375
	10L	300	750
	5L	300	750
	V	300	750
	5R	300	750
	10R	300	750
	20R	150	375
H	30L	30	75
	20L	180	450
	10L	400	1000
	5L	500	1250
	V	600	1500
	5R	500	1250
	10R	400	1000
	20R	180	450
	30R	30	75
5D	30L	30	75
	20L	200	500
	10L	300	750
	5L	450	1125
	V	450	1125
	5R	450	1125
	10R	300	750
	20R	200	500
	30R	30	75
10D	5L	40	100
	V	40	100
	5R	40	100

FOOTNOTES:

1. An adjustment in lamp aim from design position may be made provided that such adjustment does not exceed 3 degrees. The lamp should meet or exceed the values specified in Table 2 after final re-aim.
2. See Appendix, Fig. 2 for a graphical description of photometric design guidelines.

TABLE 3 - PHOTOMETRIC PERFORMANCE REQUIREMENTS (ALTERNATE METHOD)
SCHOOL BUS WARNING LAMPS

ZONE	TEST POINT DEGREE	TOTAL ZONAL FLASH ENERGY (CANDELA SECONDS) RED	YELLOW
1	H 30L 5D 30L 5U 20L H 20L 5D 20L	141	351
2	10U 5L 10U V 10U 5R	22	54
3	5U 10L 5U 5L 5U V 5U 5R 5U 10R	360	890
4	H 10L H 5L H V H 5R H 10R	571	1426
5	5D 10L 5D 5L 5D V 5D 5R 5D 10R	465	1157
6	10D 5L 10D V 10D 5R	30	72
7	5U 20R H 20R 5D 20R H 30R 5D 30R	141	351

FOOTNOTES:

1. For the lamp to conform to the photometric zonal performance requirements, the summation of the flash energy measurements at the specific test points in a zone shall meet or exceed the value specified for that zone in Table 3.
2. The measured flash energy at each test point shall not be less than 60% of the requirements specified in Table 4.
3. An adjustment in lamp aim from design position may be made, provided that such adjustment does not exceed 3 degrees. All zones shall comply after final re-aim.
4. See Appendix, Fig. 1 for a graphical description of the zonal boundaries.

TABLE 4 - PHOTOMETRIC DESIGN GUIDELINES
SCHOOL BUS WARNING LAMPS

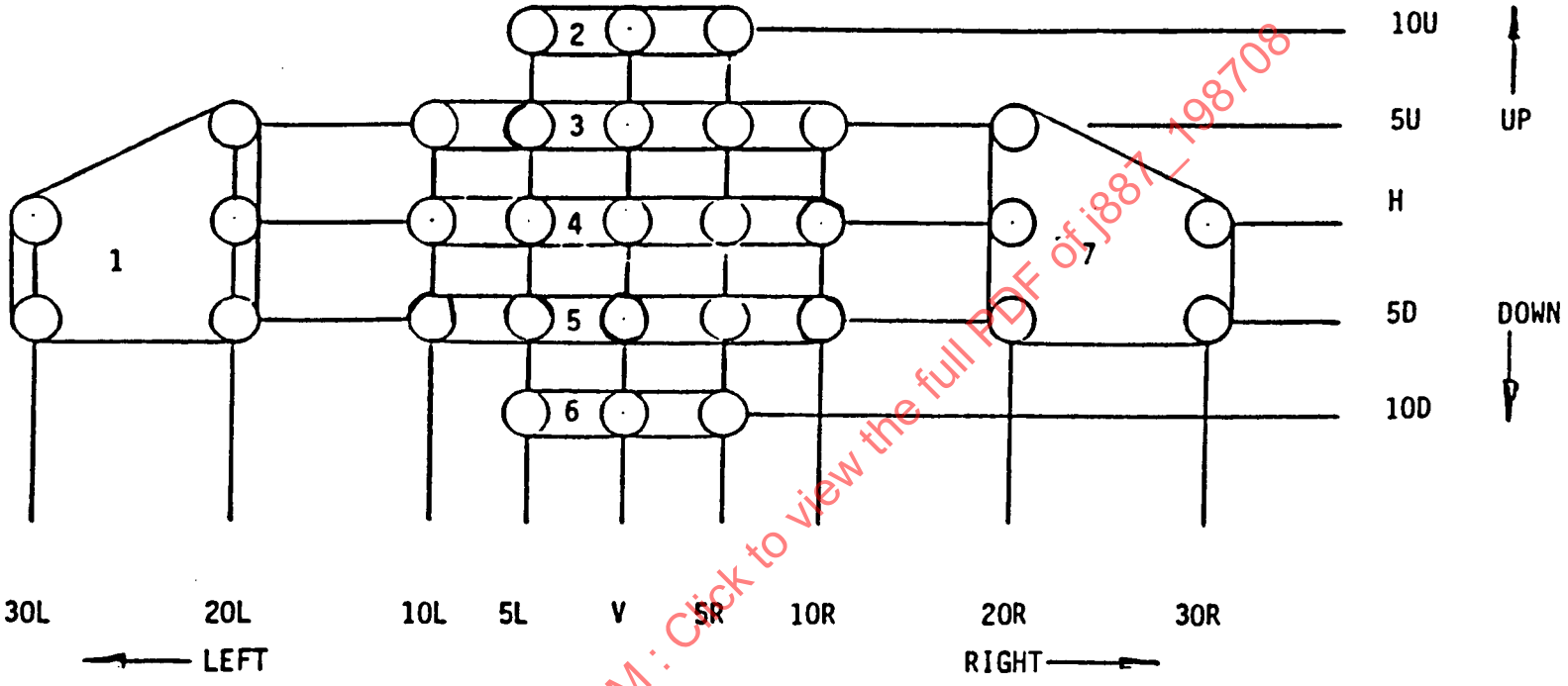
TEST POINT DEGREE		FLASH ENERGY (CANDELA SECONDS) RED	YELLOW
10U	5L	5	12
	V	12	30
	5R	5	12
5U	20L	36	89
	10L	72	178
	5L	72	178
	V	72	178
	5R	72	178
	10R	72	178
	20R	36	89
H	30L	7	18
	20L	43	107
	10L	95	238
	5L	119	297
	V	143	356
	5R	119	297
	10R	95	238
	20R	43	107
	30R	7	18
5D	30L	7	18
	20L	48	119
	10L	72	178
	5L	107	267
	V	107	267
	5R	107	267
	10R	72	178
	20R	48	119
	30R	7	18
10D	5L	10	24
	V	10	24
	5R	10	24

FOOTNOTES:

1. An adjustment in lamp aim from design position may be made provided that such adjustment does not exceed 3 degrees. The lamp should meet or exceed the values specified in Table 2 after final re-aim.
2. See Appendix, Fig. 2 for a graphical description of photometric design guidelines.

FIG. 1 - GRAPHICAL DESCRIPTION OF THE ZONAL BOUNDARIES

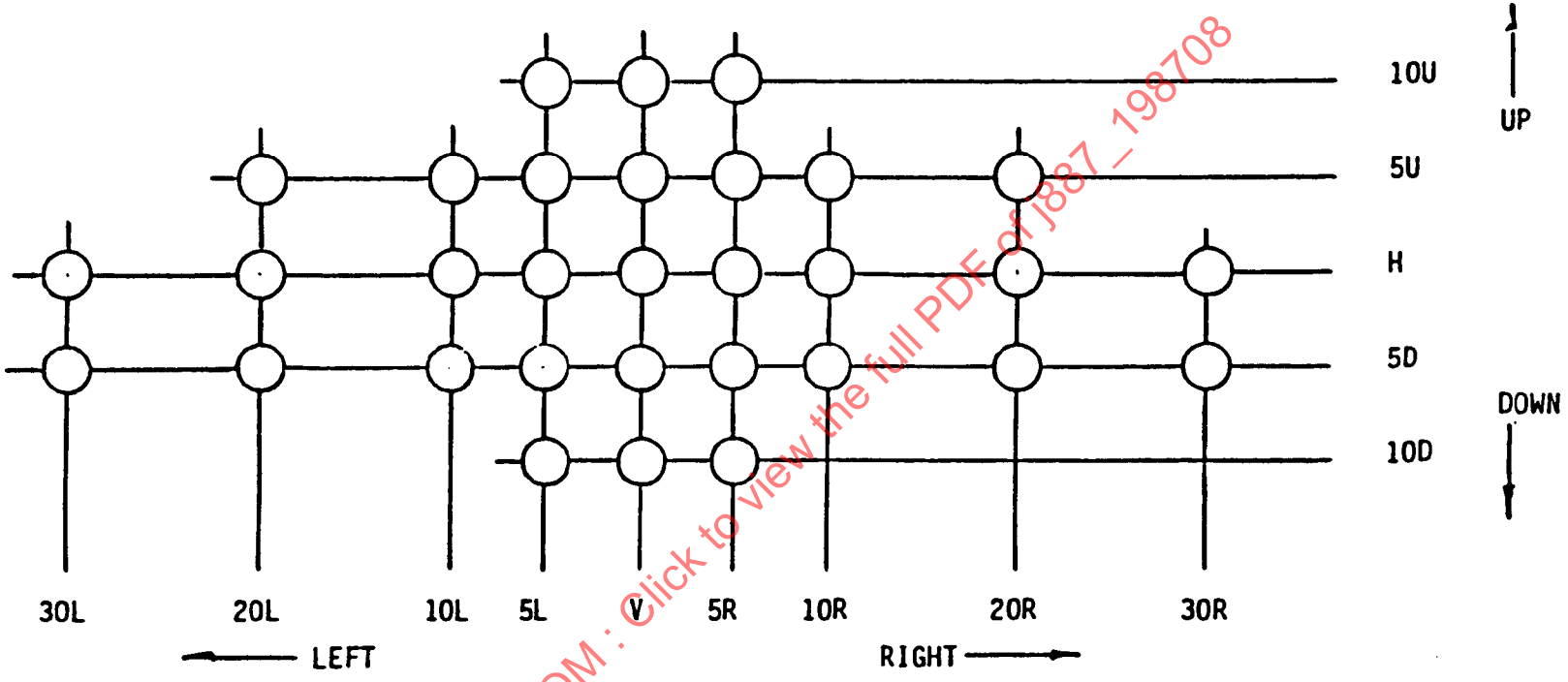
See Table 1 or 3 for Zone Values



The line formed by the intersection of a vertical plane through the light source of the device and normal to the test screen is designated V. The line formed by the intersection of a horizontal plane through the light source and normal to the test screen is designated H. The point of intersection of these two lines is designated H-V. The other points on the test screen are measured in terms of degree from these two lines. Degrees to the right (R) and to the left (L) are regarded as being to the right and left of the vertical line when the observer stands behind the lighting device and looks in the direction of the emanating light beam when the device is properly aimed for photometry with respect to the H-V point. Similarly, the upward angles designated as U and the downward angles designated D, refer to light emanating at angles above and below the horizontal line, respectively.

FIG. 2 - GRAPHICAL DESCRIPTION OF THE PHOTOMETRIC GUIDELINES

The Circles Indicate the Test Points for Distribution of Light. See Table 2 or 4 for Photometric Values



The line formed by the intersection of a vertical plane through the light source of the device and normal to the test screen is designated V. The line formed by the intersection of a horizontal plane through the light source and normal to the test screen is designated H. The point of intersection of these two lines is designated H-V. The other points on the test screen are measured in terms of degree from these two lines. Degrees to the right (R) and to the left (L) are regarded as being to the right and left of the vertical line when the observer stands behind the lighting device and looks in the direction of the emanating light beam when the device is properly aimed for photometry with respect to the H-V point. Similarly, the upward angles designated as U and the downward angles designated D, refer to light emanating at angles above and below the horizontal line, respectively.

RATIONALE:

This technical report contains general editorial changes to conform to the most recent format recommended by the Lighting Committee.

In addition, an alternate method for photometric evaluation using flash energy has been included, based upon development and testing done to establish similar methods as used in SAE J1318 APR86 - Gaseous Discharge Warning Lamp for Authorized Emergency, Maintenance and Service Vehicles, and in SAE J845 JAN84 - 360 Degree Warning Lamp for Authorized Emergency, Maintenance and Service Vehicles. This alternate method is typically used for short-pulse lamps (such as gaseous-discharge "strobe" lamps) or other devices which cannot effectively be used or measured as a steady burning light source, and helps remove design or technological restrictions from this technical report.

Tables 1, 2, 3 and 4 also reflect an increase in the red:yellow ratio from 1:2 to 1:2.5, as this ratio has been used for years by Federal Motor Vehicle Safety Standard 108, S4.1.4b, as well as local jurisdictions and industry groups. This increase is also consistent with the use of the yellow warning lamps as a long-range pre-warning system in most states.

CHANGES AND ADDITIONS:

2.1 and 2.2 Flash rate added to definition, as the relatively slow alternate flash rate of these devices (as compared with similar lamps used on emergency vehicles) is considered an important part of the recognition of a school bus by the public. Flash rate deleted from Guidelines section.

4.1.5 Added sections to deal with the alternate evaluation method.

4.3 and 5.1 Added reference to SAE J1132, as another configuration of sealed beam that may be used in these devices.

5.1.5 Added sections to deal with the alternate evaluation method.

5.1.6 Warpage test is included, as in previous versions of this technical report. It was not included in the publication of SAE J887 MAY82 in the SAE Handbook due to printer's error.

5.3.1 Adopted "functional lighted lens area" in place of earlier "effective projected luminous area" to conform with other SAE technical reports.

5.3.2 and 5.3.3 Added reference to SAE J1132, as another configuration of sealed beam that may be used in these devices.

6.1 Reference for Photometric Design Guidelines and the respective tables added.

6.4 Added reference to SAE J1104 for the appropriate type devices.

7. Added Test Equipment Guidelines for the alternate evaluation method, as used in SAE J1318 APR86.