

TP131E-01  
June 21, 1999

U.S. DEPARTMENT OF TRANSPORTATION

NATIONAL HIGHWAY TRAFFIC SAFETY  
ADMINISTRATION

LABORATORY TEST PROCEDURE

FOR

FMVSS 131

**School Bus Pedestrian Safety Devices – Equipment Test**



SAFETY ASSURANCE  
Office of Vehicle Safety Compliance  
Room 6111, NSA-30  
400 Seventh Street, SW  
Washington, DC 20590

OVSC LABORATORY TEST PROCEDURE NO. 131E  
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**REVISION CONTROL LOG**  
**FOR OVSC LABORATORY**  
**TEST PROCEDURES**

TP131E  
**SCHOOL BUS PEDESTRIAN SAFETY DEVICES**  
**EQUIPMENT TEST**

TEST PROCEDURE		FMVSS 131		DESCRIPTION
REV. No.	DATE	AMENDMENT	EFFECTIVE DATE	
01	6/21/99	63FR29143 5/28/98	5/28/98	Permits additional light sources on retro-reflective stop signal arms and makes minor clarifications.
02				
03				
04				
05				
06				
07				
08				
09				

## 1. PURPOSE AND APPLICATION

The Office of Vehicle Safety Compliance (OVSC) provides contractor laboratories with Laboratory Test Procedures as guidelines for obtaining compliance test data. The data are used to determine if a specific vehicle or item of motor vehicle equipment meets the minimum performance requirements of the subject Federal Motor Vehicle Safety Standard (FMVSS). The purpose of the OVSC Laboratory Test Procedures is to present a uniform testing and data recording format, and provide suggestions for the use of specific equipment and procedures. If any contractor views any part of an OVSC Laboratory Test Procedure to be in conflict with a Federal Motor Vehicle Safety Standard (FMVSS) or observes deficiencies in a Laboratory Test Procedure, the contractor is required to advise the Contracting Officer's Technical Representative (COTR) and resolve the discrepancy prior to the start of compliance testing.

Every contractor is required to submit a detailed test procedure to the COTR before initiating the compliance test program. The procedure must include a step-by-step description of the methodology to be used. The contractor's test procedure shall contain a complete listing of test equipment with make and model number and a detailed check-off sheet. The list of test equipment shall include instrument accuracy and calibration dates. All equipment shall be calibrated in accordance with the manufacturer's instructions. There shall be no contradictions between the Laboratory Test Procedure and the contractor's in-house test procedure. Written approval of the in-house test procedures shall be obtained from the COTR before initiating the compliance test program. The OVSC Laboratory Test Procedures are not intended to limit or restrain a contractor from developing or utilizing any testing techniques or equipment which will assist in procuring the required compliance test data. These Laboratory Test Procedures do not constitute an endorsement or recommendation for use of any product or method. However, the application of any such testing technique or equipment is subject to prior approval of the COTR.

**NOTE:** The OVSC Laboratory Test Procedures, prepared for the limited purpose of use by independent laboratories under contract to conduct compliance tests for the OVSC, are not rules, regulations or NHTSA interpretations regarding the meaning of a FMVSS. The Laboratory Test Procedures are not intended to limit the requirements of the applicable FMVSS(s). In some cases, the OVSC Laboratory Test Procedures do not include all of the various FMVSS minimum performance requirements. Recognizing applicable test tolerances, the Laboratory Test Procedures may specify test conditions that are less severe than the minimum requirements of the standard. In addition, the Laboratory Test Procedures may be modified by the OVSC at any time without notice, and the COTR may direct or authorize contractors to deviate from these procedures, as

## 1. **PURPOSE AND APPLICATION....Continued**

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long as the tests are performed in a manner consistent with the standard itself and within the scope of the contract. Laboratory Test Procedures may not be relied upon to create any right or benefit in any person. Therefore, compliance of a vehicle or item of motor vehicle equipment is not necessarily guaranteed if the manufacturer limits its certification tests to those described in the OVSC Laboratory Test Procedures.

## 2. **GENERAL REQUIREMENTS**

School buses must be equipped with one or two regular octagonal shaped stop signal arms that automatically extend perpendicular to the left side of the bus. The stop signal arm must be reflectorized, reflectorized with illuminated legend, and/or have at least two flashing red lamps on each side. This test procedure provides performance tests for stop signal arm and flasher equipment which are not assembled to a bus. Refer to TP-131V for testing a bus with such equipment installed.

### **TEST DATA LOSS**

A compliance test is not to be conducted unless all of the various test conditions specified in the applicable OVSC Laboratory Test Procedure have been met. Failure of a contractor to obtain the required test data and to maintain acceptable limits on test parameters in the manner outlined in the applicable OVSC Laboratory Test Procedure may require a retest at the expense of the contractor. The retest costs may include the cost of leasing replacement stop signal arm equipment and all costs associated with conducting the retest. The original test specimen used for the invalid test shall remain the property of OVSC, and the retest specimen shall remain the property of the contractor. If there is a test failure, the contractor shall retain the retest specimen for a period not exceeding 180 days. If there is no test failure, the Contractor may dispose of the test specimen upon notification from the COTR that the final test report has been accepted.

The Contracting Officer of NHTSA is the only NHTSA official authorized to notify the contractor that a retest is required. The retest shall be completed within two (2) weeks after receipt of notification by the Contracting Officer that a retest is required. If a retest is conducted, no test report is required for the original test.

### **3. SECURITY**

The contractor shall provide appropriate security measures to protect the OVSC Government Furnished Property (GFP) such as items of school bus equipment, from unauthorized personnel during the entire compliance testing program. The contractor is financially responsible for any acts of theft and/or vandalism which occur during the storage of items of school bus equipment. Any security problems which arise shall be reported by telephone to the Industrial Property Manager (IPM), Office of Contracts and Procurement, within two working days after the incident. A letter containing specific details of the security problem will be sent to the IPM (with copy to the COTR) within 48 hours. The contractor shall protect and segregate the data that evolves from compliance testing before and after each test. No information concerning the compliance testing program shall be released to anyone except the COTR, unless specifically authorized by the COTR or the COTR's Branch or Division Chief.

**NOTE:** NO INDIVIDUALS, OTHER THAN CONTRACTOR PERSONNEL DIRECTLY INVOLVED IN THE COMPLIANCE TESTING PROGRAM, SHALL BE ALLOWED TO WITNESS ANY COMPLIANCE TEST UNLESS SPECIFICALLY AUTHORIZED BY THE COTR.

### **4. GOOD HOUSEKEEPING**

Contractors shall maintain the compliance testing area, test fixtures and instrumentation in a neat, clean and painted condition with test instruments arranged in an orderly manner consistent with good test laboratory housekeeping practices.

### **5. TEST SCHEDULING AND MONITORING**

The contractor shall submit a test schedule to the COTR prior to testing. Tests shall be completed as required in the contract. All testing shall be coordinated to allow monitoring by the FMVSS 131 COTR.

### **6. TEST DATA DISPOSITION**

The contractor shall make all preliminary compliance test data available to the COTR on location within four hours after the test. Final test data, including digital printouts and computer generated plots (if applicable), shall be furnished to the COTR within five working days. Additionally, the contractor shall analyze the preliminary test results as directed by the COTR.

## **6. TEST DATA DISPOSITION....Continued**

All backup data sheets, strip charts, recordings, plots, technician's notes, etc., shall be either sent to the COTR or destroyed at the conclusion of each delivery order, purchase order, etc.

## **7. GOVERNMENT FURNISHED PROPERTY (GFP)**

### **ACCEPTANCE OF EQUIPMENT**

All equipment items will be inventoried upon receipt and checked against the shipping documents. Any missing, broken or incorrect parts will be reported immediately to the COTR. A running inventory list will be maintained until the complete matrix list of test samples is received.

### **NOTIFICATION OF COTR**

The COTR must be notified within 24 hours after all equipment items have been delivered.

## **8. CALIBRATION OF TEST INSTRUMENTS**

Before the contractor initiates the safety compliance test program, a test instrumentation calibration system will be implemented and maintained in accordance with established calibration practices. The calibration system shall be set up and maintained as follows:

- A. Standards for calibrating the measuring and test equipment will be stored and used under appropriate environmental conditions to assure their accuracy and stability.
- B. All measuring instruments and standards shall be calibrated by the contractor, or a commercial facility, against a higher order standard at periodic intervals NOT TO EXCEED TWELVE (12) MONTHS! Records, showing the calibration traceability to the National Institute of Standards and Technology (NIST), shall be maintained for all measuring and test equipment.
- C. All measuring and test equipment and measuring standards will be labeled with the following information:
  - (1) Date of calibration

**8. CALIBRATION OF TEST INSTRUMENTS....Continued**

- (2) Date of next scheduled calibration
- (3) Name of the technician who calibrated the equipment

D. A written calibration procedure shall be provided by the contractor which includes as a minimum the following information for all measurement and test equipment:

- (1) Type of equipment, manufacturer, model number, etc.
- (2) Measurement range
- (3) Accuracy
- (4) Calibration interval
- (5) Type of standard used to calibrate the equipment (calibration traceability of the standard must be evident)

E. Records of calibration for all test instrumentation shall be kept by the contractor in a manner which assures the maintenance of established calibration schedules. All such records shall be readily available for inspection when requested by the COTR. The calibration system will need the acceptance of the COTR before the test program commences.

Further guidance is provided in the International Standard ISO 10012-1, "Quality Assurance Requirements for Measuring Equipment" and American National Standard ANSI/NCSL Z540-1, "Calibration Laboratories and Measuring and Test Equipment – General Requirements".



## 9. PHOTOGRAPHIC COVERAGE

Photographs shall be black and white, 8 x 10 inches, and legible. A tag, label, or placard identifying the test samples shall appear in each photograph and be legible. Each photograph shall be labeled as to subject matter. As a minimum, the following photographs shall be included when applicable:

- A. Close-up views of stop signal arm(s) (front and back).
- B. Close-up view of the flasher.
- C. Close-up view(s) of the red lamp lens showing the DOT certification symbol and other markings. Photograph each such lens having unique markings.
- D. View of the legend illuminated by light from the surface each letter of the area immediately surrounding each letter.
- E. Stop signal arm undergoing reflectivity test.
- F. Stop signal arm undergoing color test.
- G. Stop signal arm undergoing photometry test.
- H. Test equipment set-up for each different additional test procedure.
- I. Test failure or other noteworthy condition.

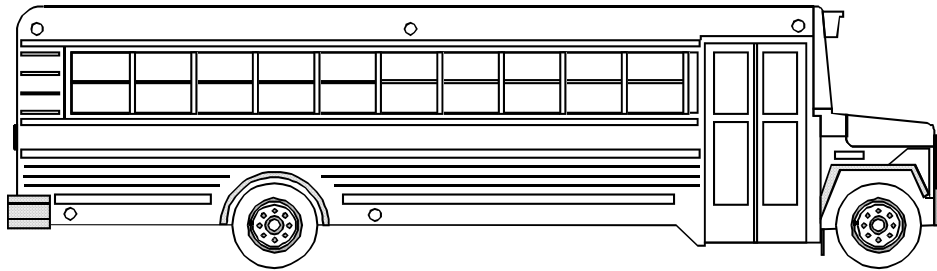
## 10. DEFINITIONS

### BUS

A motor vehicle with motive power, except a trailer, designed for carrying more than 10 persons.

### SCHOOL BUS

A bus that is sold, or introduced in interstate commerce, for purposes that include carrying students to and from school or related events, but does not include a bus designed and sold for operation as a common carrier in urban transportation.



### STOP SIGNAL ARM

A device that can be extended outward from the side of a school bus to provide a signal to other motorists not to pass the bus because it has stopped to load or discharge school children.

### FLASHER

A device installed on the stop signal arm which has the primary function of causing lamps to alternately flash when the arm is activated.

### NET STROKE WIDTH

Stroke width minus the width of the lamp(s) in a letter of the legend.

## **11. PRETEST REQUIREMENTS**

Prior to conducting a compliance test, the contractor shall:

- A. Verify COTR approval of contractor's in-house Test Procedure,
- B. Verify the training of technicians for performance of this test,
- C. Verify the calibration status of test equipment,
- D. Review applicable revision of FMVSS 131, and
- E. If the stop signal arm and/or flasher do not have a serial number assigned by the manufacturer, a substitute serial number shall be assigned and affixed as directed by the COTR.

### **PERMANENT RECORDING OF DATA**

Where permanent trace recording is not required, data shall be recorded on standard report forms. Changes or corrections shall be made by drawing a line through the original entry, which must remain legible, adding the change above or alongside, and initialed.

## 12. COMPLIANCE TEST EXECUTION

- 12.1 Visual and dimensional characteristics (S5.1 and S5.2) shall comply with Figure 1. Mounting brackets, clips, bolts or other components necessary to the operation of the stop signal arm may not obscure more than 15 percent of the border on each side. Check both sides of the stop signal arm. When two stop signal arms are installed, the rearmost arm shall not contain any lettering, symbols, or markings on its forward side. Enter results on Data Sheet 1.

### CHARACTERISTICS OF STOP SIGNAL DEVICE

STROKE WIDTH OF LETTERS = 20 mm (0.79") Minimum

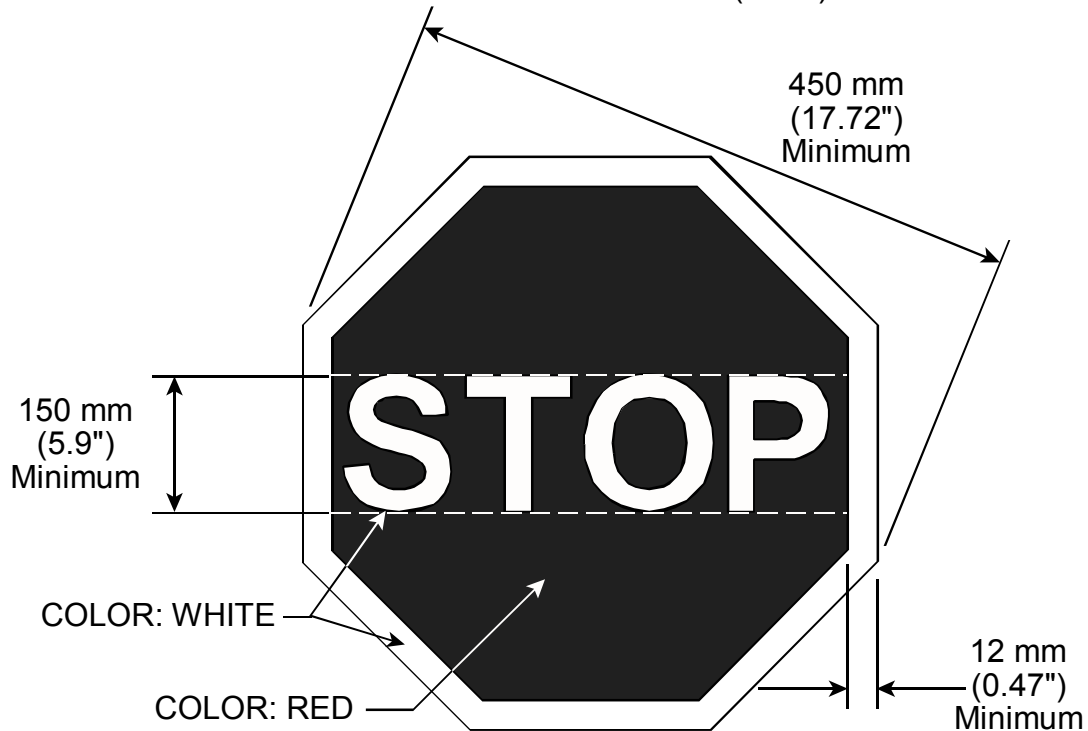


FIGURE 1

## 12. COMPLIANCE TEST EXECUTION....Continued

### 12.2 Conspicuity (S5.3) shall comply with either S5.3.1 or S5.3.2, or both.

S5.3.1 The entire surface of both sides shall be reflectorized except when two stop signal arms are installed the rearmost arm shall not be reflectorized on its forward side. If reflectorized, enter results on Data Sheet 2.

S5.3.1.1 If reflectorized, the stop signal arm may be illuminated by red light emitted from the surface of, or immediately surrounding, each letter. If so illuminated, enter results on Data Sheet 2.

S5.3.1.2 Non reflectorized mounting brackets, clips, bolts, or other components necessary to the mechanical or electrical operation of the stop signal arm shall not obscure more than 7.5 % of the total surface area of either side of the stop signal arm. Enter percent of total reflectorized surface which is obscured on Data Sheet 2.

S5.3.2 Each side of the stop signal arm shall have at least two (2) red lamps centered on the vertical centerline. One of the lamps shall be located at the extreme top of the stop arm and the other at its extreme bottom. If so equipped, enter results on Data Sheet 2.

### 12.3 RETROREFLECTIVE MATERIAL PERFORMANCE TEST (S6.1)

If the surfaces are reflectorized as specified by the S5.3.1 requirement option, test the material on both sides in accordance with S6.1. This test is performed under the conditions specified in FMVSS 125, WARNING DEVICES, S6.2 (b), (c), and (d). Identify the retroreflective material (glass bead or prismatic).

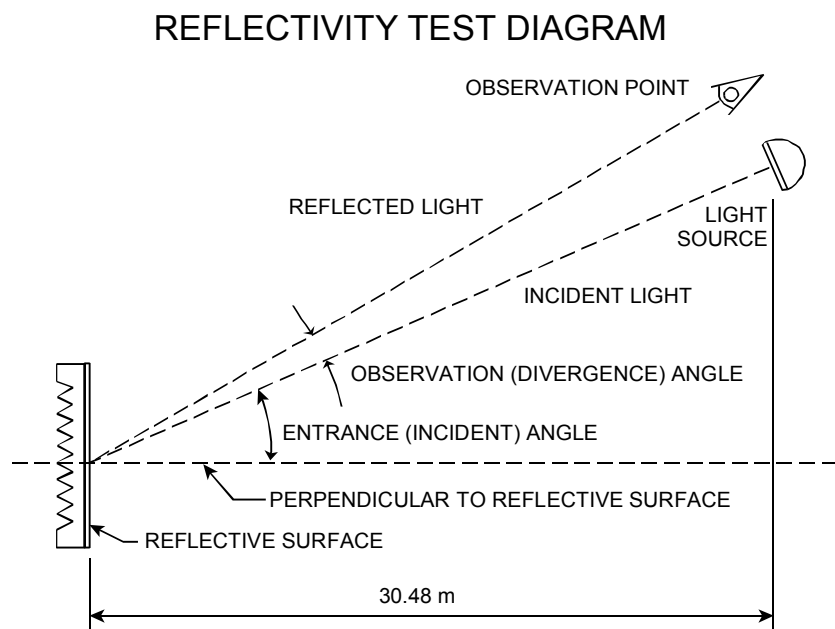
Procedure:

- A. The stop signal arm should be wiped clean with a soft lint free cloth and handled by the edges as much as possible during all color measurements.
- B. Mask the white portion of the reflective surface.
- C. The directed light source for illumination is to be a tungsten filament lamp operating at 2,854° Kelvin (K) color temperature.

## 12. COMPLIANCE TEST EXECUTION....Continued

- D. Set up the Stop Signal Arm in a dark area 30.48 meters from the illumination source. Use a black drop cloth behind the Stop Signal Arm. The directed light source and the observation point should be at the angles identified in Table 1. All incidence angle measurements shall be made with an accuracy of  $\pm 1^\circ$ . The zero ( $0^\circ$ ) position will be with the face of the reflective surface perpendicular to the light source as shown in Figure 2.
- E. The observation point shall be located above the illumination source at the distances required for observation angles of  $0.2^\circ \pm 0.02^\circ$  and  $0.5^\circ \pm 0.05^\circ$ .
- F. Measure the reflectivity of the Stop Signal Arm with a calibrated sensitive foot candle meter or a light sensitive cell that can be traced to a National Institute of Standards and Technology (NIST) calibrated foot candle rating. Measure the total candlepower per incident foot candle at each observation point. The results measured at each position must equal or exceed the required values listed on Data Sheet 3.
- G. Unmask the white portion of the Stop Signal Arm. Mask the red portion of the Stop Signal Arm. Repeat the items A and C through F.

Enter results on Data Sheet 3.



**FIGURE 2**

## 12. COMPLIANCE TEST EXECUTION....Continued

**NOTE:** The same test set-up may be used to check the colors of the retroreflective material.

### 12.2.2 COLOR TESTS (S6.2.1)

The color test procedure shall be done in accordance with SAE J578 (May 1988).

#### RED LAMPS

If the stop signal arm has 4 (or more) red lamps as specified by the S5.3.2 requirement option, one lamp shall be selected at random for purposes of the color test. Make a note of it on Data Sheet 4. A spectrophotometer may be used to determine the X and Y chromaticity coordinates or a visual color comparator as shown in Figure 3 may be used as follows:

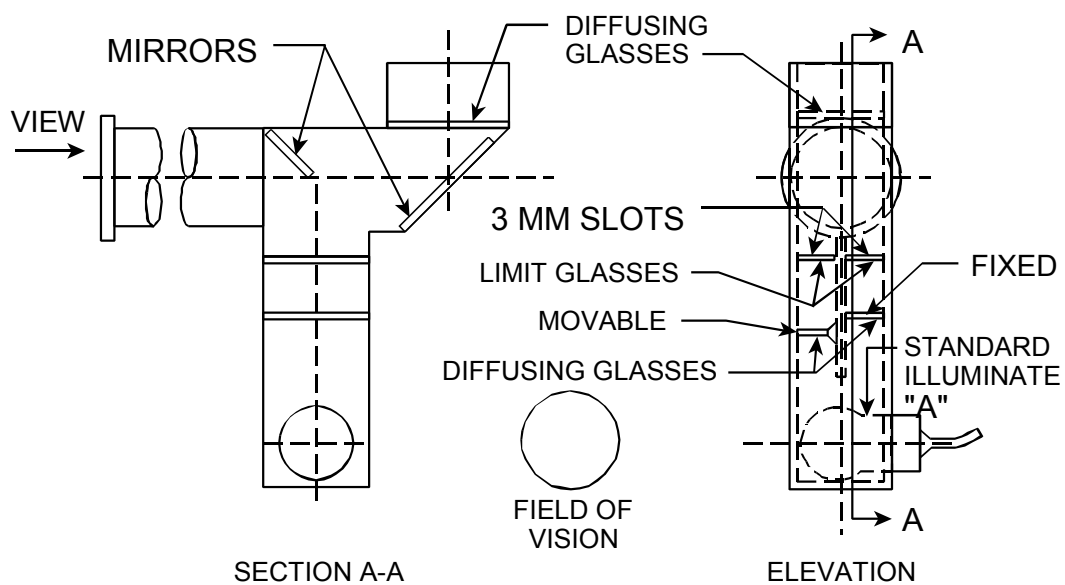
- A. Install the calibrated bulbs, caps, or lenses in or on the specimen in a manner which simulates the intended application.
- B. Operate the lamp at its design rated voltage.
- C. Evaluate all reference color measurements with the appropriate filter with a Standard Illuminant Source "A" operating at a filament color temperature of 2,854 degrees Kelvin.
- D. Mount the lamp and equipment in the proper positions.
- E. Adjust the voltage of the signal lamp to the specified rating.
- F. Adjust the visual comparator's lamp voltage level to obtain a color temperature of 2,854 degrees Kelvin.
- G. Insert the  $Y = 0.33$  limit filter (yellow boundary) for evaluating apparent red color lenses into the visual comparator, and adjust the moveable diffusion glass to equalize the intensity of the reference standard and the signal lamp. Repeat this with two equally spaced  $Y = 0.98$  - X limit filters (purple boundary). Choice of the limit filters can be found from examining the CIE Chromaticity Diagram in Figure 4.

## 12. COMPLIANCE TEST EXECUTION....Continued

- H. Determine whether or not the color of the red signal lamp is within the specification limits of S6.2.1. To make a valid visual comparison, the two fields to be viewed shall be of near equal luminance.

Enter the results on Data Sheet 4.

### VISUAL COLOR COMPARATOR



**FIGURE 3**



12. COMPLIANCE TEST EXECUTION....Continued

# CIE CHROMATICITY DIAGRAM

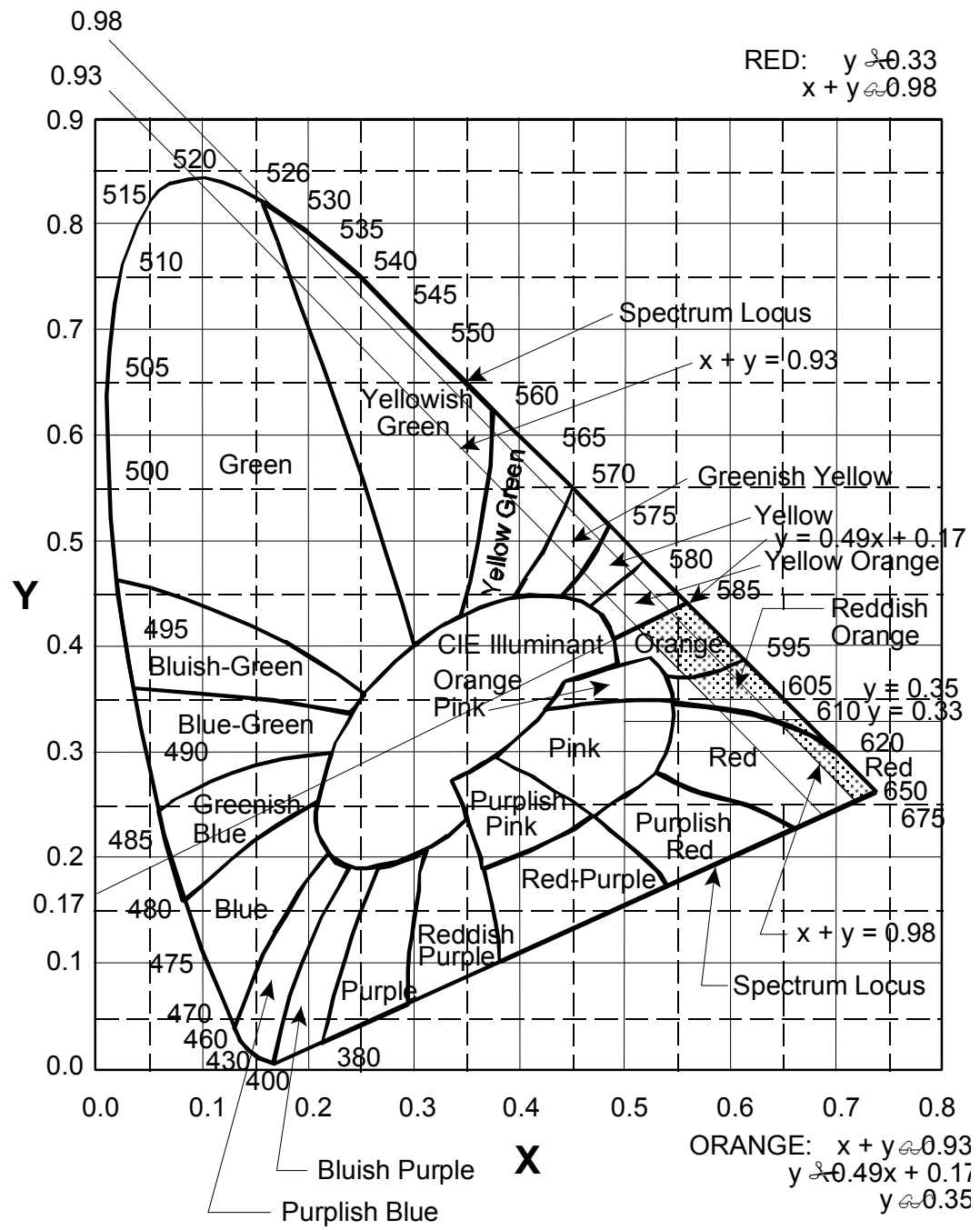


FIGURE 4

## 12. COMPLIANCE TEST EXECUTION....Continued

### RETROREFLECTIVE MATERIAL COLOR

If the stop signal arm is reflectorized as specified by the S5.3.1 requirement option, evaluate the reflected light color from the reflectivity test for information (both sides). This is not a criterion of compliance.

- A. Use the test system shown in Figure 3, or spectrophotometer equipment.
- B. Evaluate all reference color measurements with the appropriate filter with a Standard Illuminant Source "A" operating at a filament color temperature of 2,854°K.
- C. Adjust the visual comparator's lamp voltage level to obtain a color temperature of 2,854°K.
- D. Where the Reflex Reflective Material is WHITE:

No filters are required for this test. Adjust the moveable diffusing glass to equalize the intensity of the reference standard. The white color should be within the chromaticity boundaries:

$$\begin{array}{ll} X = 0.31 \text{ (Blue boundary)} & Y = 0.44 \text{ (Green boundary)} \\ X = 0.50 \text{ (Yellow boundary)} & Y = 0.38 \text{ (Red boundary)} \\ X = 0.31 + 0.64*X \text{ (Green boundary)} & \\ Y = 0.05 + 0.76*X \text{ (Purple boundary)} & \end{array}$$

Evaluate the color of the light by determining that the color does not differ materially from that of CIE Source A.

Where the Reflex Reflective Material is RED:

Insert the  $Y = 0.33$  limit filter (yellow boundary) for evaluating apparent red color lenses into the visual comparator, and adjust the moveable diffusion glass to equalize the intensity of the reference standard and the signal lamp. Repeat this with two equally spaced  $Y = 0.98 - X$  limit filters (purple boundary). Choice of the limit filters can be found from examining the CIE Chromaticity Diagram in Figure 4. The red color should be within the chromaticity boundaries:

$$\begin{array}{l} Y = 0.33 \text{ (Yellow boundary)} \\ Y = 0.98 - X \text{ (Purple boundary)} \end{array}$$

## 12. COMPLIANCE TEST EXECUTION....Continued

Evaluate the color of the light by determining that the color is not less saturated (paler), yellower or purpler than the limit filters standard.

Enter the results on Data Sheet 4.

### LAMP COLOR IN OR SURROUNDING LEGEND

If the stop signal arm is reflectorized and red light is emitted from the surface of each letter or from the area immediately surrounding each letter as specified in the S5.3.1.1 requirement option, evaluate the color of such lamps for information. Check one letter at random on each side. This is not a criterion of compliance.

Either a photospectrometer or visual color comparator may be used. Evaluate the color of the red lamps by determining that the color is not less saturated (paler), yellower, or purpler than the limit filters standard.

Enter the results on Data Sheet 4.

### 12.2.3 FLASH RATE PERFORMANCE TESTS (S6.2.2)

Optional red flashing lamps may be installed on a stop signal arm as specified in S5.3.1.1 or S5.3.2. The lamps on each side of the stop signal arm, when operated at the manufacturer's design load, shall flash at a rate of 60 to 120 flashes per minute. The lamps shall have a current "on" time or "off" time as specified in S6.2.2.1 or S6.2.2.2 respectively.

The standard test circuit is shown in Figure 5. Measure the circuit resistance at "A-B" with the signal lamp and bulb load shorted-out with a shunt resistance not to exceed 0.005 ohms. This resistance shall be 0.10 ohms  $\pm$  0.01 ohms.

Adjust the voltage at the bulbs to 12.8V (6.4V or 25.6V) as required for testing, at "C-D" and "E-F" with the flasher shorted out by an effective shunt resistance not to exceed 0.005 ohms. The load current shall be held to the rated value for the total flasher design load within 0.5 percent at 12.8V (6.4V or 25.6V) by simultaneously adjusting trimmer resistor R. The power supply shall be adjusted to provide other required test voltages, at required temperatures, at "C-D," without readjustment of trimmer resistor. The required voltage tests with the maximum bulb load shall be conducted without readjusting each corresponding power supply voltage, previously set with minimum bulb load. With a high

## 12. COMPLIANCE TEST EXECUTION....Continued

impedance voltage recorder connected to points "X-Y" measure the data required for the tests. The measurement of these quantities shall not disturb the circuit.

- A. Starting Time Test — Normally closed type signal lamps shall open (turn off) within 1.5 seconds (average) and 2.0 seconds (maximum). Normally open type signal lamps shall complete the first cycle (close the contacts and then open the contacts) within 2.0 seconds (maximum) and 1.5 seconds (average). The time measurement will start when the voltage is initially applied. The test shall be made in an ambient temperature of  $24^{\circ}\text{C} \pm 5^{\circ}\text{C}$  with minimum and maximum load connected. Record the results on Data Sheet 5 and 5A).

### STANDARD TEST CIRCUIT - ALTERNATING FLASHERS

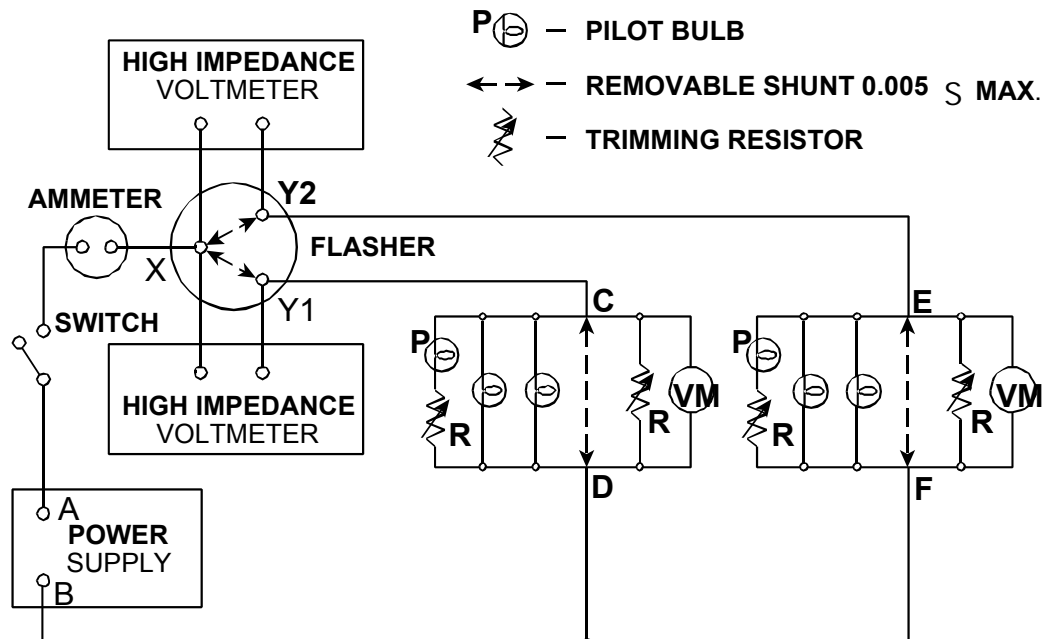


FIGURE 5

## 12. COMPLIANCE TEST EXECUTION....Continued

- B. Voltage Drop Test (Incandescent Lamp Only) — Voltage drop shall be measured between the input and load terminals at the flasher during the "ON" period. The test shall be conducted at an ambient temperature of  $24^{\circ}\text{C} \pm 5^{\circ}\text{C}$  with maximum load connected, and the power source for the test circuit adjusted to apply design voltage at the bulbs. After the signal lamps have completed minimum of five consecutive cycles, the lowest voltage drop during three consecutive cycles shall be measured. Test shall be repeated twice with a 5 minute cooling down period between tests.

The lowest average voltage drop across the signal lamp for 3 consecutive cycles shall NOT exceed 0.8 volts. Record the results on Data Sheets 5 and 5A.

- C. Flash Rate and Percent Current "ON" or "OFF" Time — Allow the signal lamp to flash for five consecutive cycles. For incandescent lamps, determine the flash rate and percent "on" time by taking the average of the next three consecutive cycles (one cycle is the energizing and de-energizing of both load circuits). Perform the test at each of the following bulb voltages and ambient temperature conditions.

VOLTAGE (+0.1V)	TEMPERATURE
12.8V (or 6.4V or 25.6V)	$+24^{\circ}\text{C} \pm 5^{\circ}\text{C}$
12.0V (or 6.0V or 24.0V)	$-17^{\circ}\text{C} \pm 3^{\circ}\text{C}$
15.0V (or 7.5V or 30.0V)	$-17^{\circ}\text{C} \pm 3^{\circ}\text{C}$
11.0V (or 5.5V or 22.0V)	$+50^{\circ}\text{C} \pm 3^{\circ}\text{C}$
14.0V (or 7.0V or 28.0V)	$+50^{\circ}\text{C} \pm 3^{\circ}\text{C}$

For gaseous discharge lamps, determine the flash rate and percent "off" time by taking the average of the next three consecutive cycles at each of the above flasher voltages and ambient temperature conditions.

Allow the flasher to reach equilibrium temperature before each test. The test shall be made with the specific ampere design load connected for each circuit.

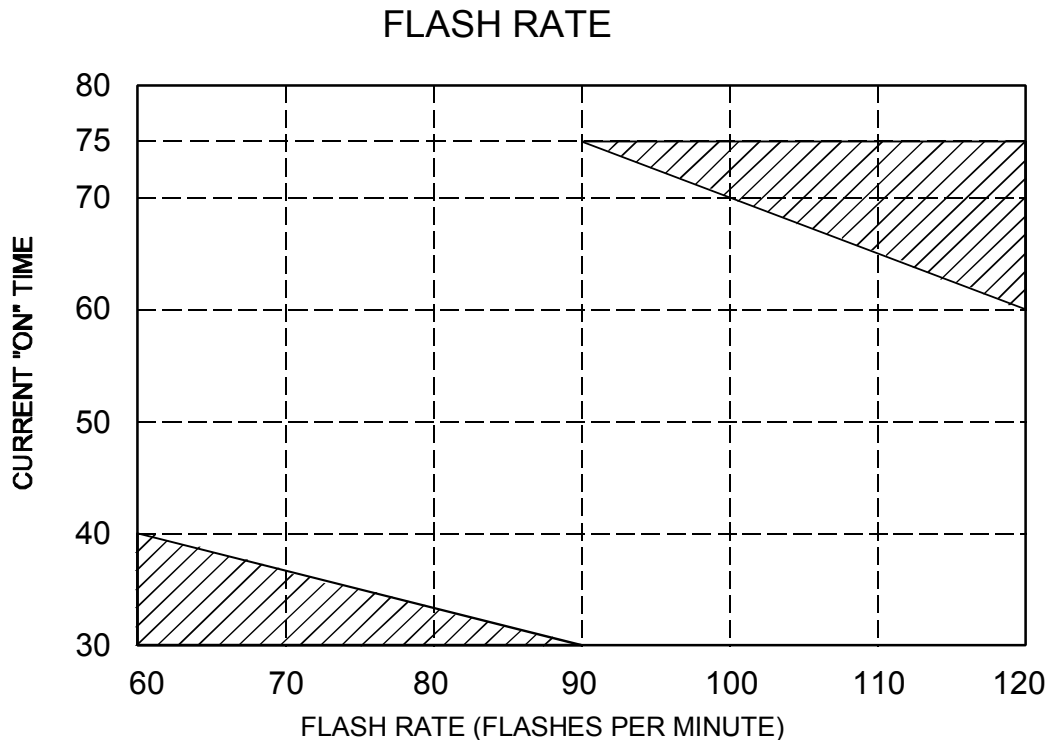
## 12. COMPLIANCE TEST EXECUTION....Continued

The flash rate shall be between 60-120 flashes per minute on each side of the stop signal arm.

For incandescent lamps, the current "ON" time shall be 30 to 75 percent of the total flash cycle, depending on the flash rate, as shown in Figure 6. Normally closed type flashers shall be within the unshaded portion in Figure 6. Normally open type flashers shall be within the entire rectangle of Figure 6. The total current "ON" time for the two flasher output terminals, as shown in Figure 5, shall be between 90 and 110 percent of the total flash cycle (both sides of the stop signal arm).

For xenon short-arc gaseous discharge lamps, the flash rate shall be between 60 and 120 flashes per minute with an "OFF" time before each flash of at least 50 percent of the total flash cycle.

Record the results on Data Sheets 5 and 5A.



**Figure 6**

## 12. COMPLIANCE TEST EXECUTION....Continued

### VIBRATION, MOISTURE, DUST, CORROSION, PHOTOMETRY, AND WARPAGE TESTS (S6.2.3)

Optional red signal lamps subject to requirement S5.3.2 shall be tested in accordance with SAE J575 (July 1983) and SAE J1133 (April 1984) and shall meet the criteria specified therein.

#### VIBRATION TEST PROCEDURE

Obtain a vibration testing machine such as a vibration test table.

Install the signal lamp in the manufacturer's supplied mounting bracket, and securely bolt to the table of the vibration test machine. Vary the frequency from 10 Hz to 55 Hz and return to 10 Hz at a linear sweep period of 2 min/complete sweep cycle. The vibration should be applied to the vertical axis of the device as it is mounted on the vehicle. Test the signal lamp for a period of 60 minutes, + 1 minute, - 0.

Remove the signal lamp from the vibration machine, and visually inspect for any lens and/or reflector rotation, displacement, cracking, or rupture of parts (does not apply to bulb(s)). If damage is observed that could result in failure of the Moisture, Dust, Corrosion, Photometric, or Warpage tests, these tests shall be performed on the vibration test sample to determine if requirements are met.

Record the results of the visual inspection on Data Sheet 6.

#### Test Equipment:

The Vibration Test Machine shall be capable of linear frequency variation at a constant uni-directional excursion. The vibrator table shall be of sufficient size to completely contain the test fixture base with no overhang. If this is not possible, a transition table shall be used to mechanically interface the large test fixture base to the smaller vibrator table. Precautions shall be taken to minimize the introduction of extraneous responses in the test setup. The vibration machine output wave form shall be sinusoidal with a maximum permissible harmonic distortion as shown in Figure 7, when measured as follows:

- A. The test machine output wave form shall be measured with an accelerometer, having a flat frequency response ( $\pm 5\%$ ) from 5 Hz to 2,200 Hz, attached to the unloaded vibrator table or to the transition table, if used. The acceleration component measured shall be in the direction of table travel.

**12. COMPLIANCE TEST EXECUTION....Continued**

- B. The percent distortion shall be measured directly or shall be computed by taking the ratio (x 100) of the rms voltage of the total signal (distortion plus fundamental) of the accelerometer.

The vibration test equipment shall have minimum range and accuracy capabilities identified below:

- A. Frequency – The frequency is variable from 10 Hz to 55 Hz at a linear sweep period of 2 minutes per complete cycle.
- B. Excursion – Over the specified frequency range the peak to peak excursion is 1.0 mm with an error of + 0.1 mm and - 0.0 mm.
- C. Direction of Vibration – The vertical axis of the device as it is mounted on the vehicle.
- D. Test Duration – The test should last 60 minutes with an error of + 1 minute and - 0.0 minute.



12. COMPLIANCE TEST EXECUTION....Continued

MAXIMUM PERMISSIBLE VIBRATION WAVE FORM  
HARMONIC DISTORTION

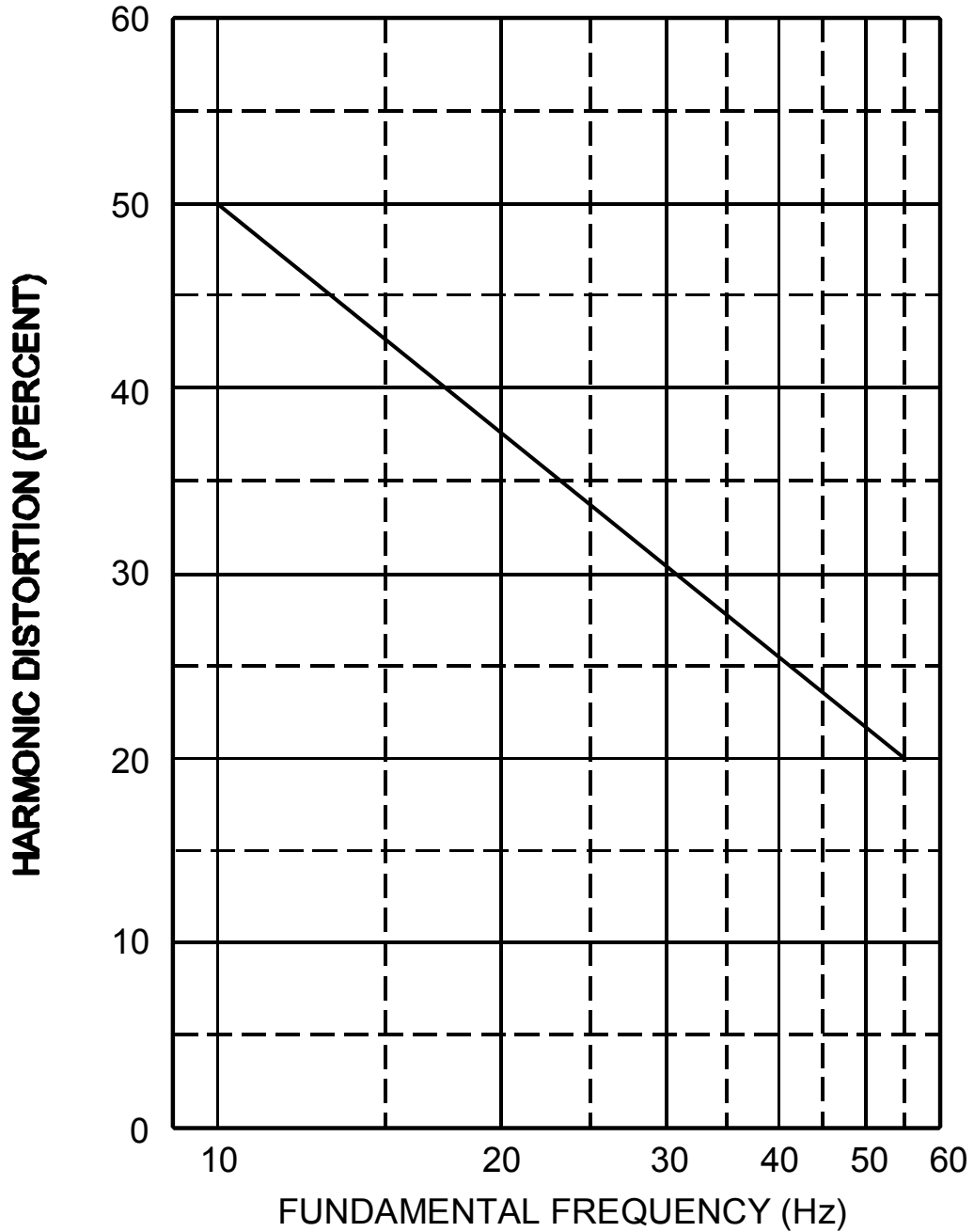


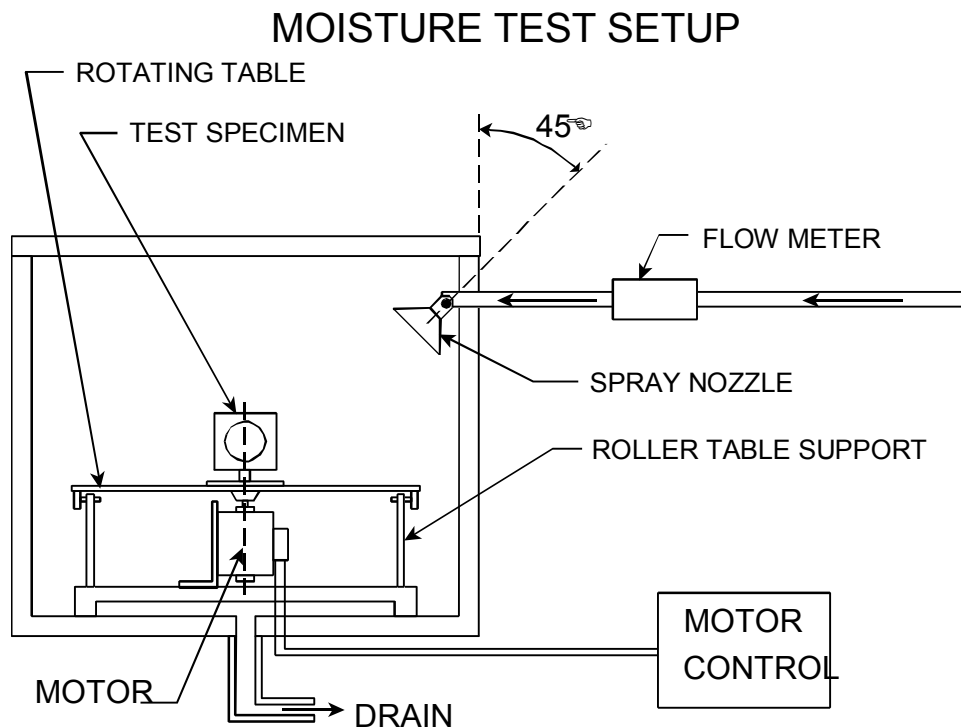
FIGURE 7

## 12. COMPLIANCE TEST EXECUTION....Continued

### MOISTURE TEST PROCEDURE (S6.2.3 continued)

The Moisture Test consists of either the Water Spray Test or the Water Submersion Test, or both.

- A. Water Spray Test — Install the signal lamp in its supplied support frame with socket and any covering normally part of the assembly, in the moisture test chamber as shown in Figure 8.



**FIGURE 8**

Verify that all drain holes are open. Then verify that the precipitation rate of the water spray is 2.5 mm per minute to 4.1 mm per minute as measured with a vertical, cylindrical collector centered on the vertical axis of the rotating test platform, and the signal lamp rotates about a vertical axis at a rate of 4.0 rpm  $\pm$  0.5 rpm. Subject the signal lamp to the water spray for 12 hours. Determine that water flow is at required delivery rate and record every 3 hours during test. After 12 hours, turn off the rotation and the water spray and allow the signal lamp to drain for 1 hour without moving the specimen. The cabinet door must remain closed.

**12. COMPLIANCE TEST EXECUTION....Continued**

Upon completion of the drain period, remove the signal lamp from the chamber and collect the accumulated water in a graduated cylinder.

Moisture accumulation in excess of 2 ml constitutes a failure. Record the results on Data Sheet 6.

Test Equipment:

Moisture Test Chamber shall be equipped with a nozzle which provides a solid cone of water spray of a sufficient angle to completely cover the lamp. The centerline of the nozzle shall be directed downward at an angle of 45 degrees  $\pm$  5 degrees to the vertical axis of the rotating test platform.

- B. Water Submersion Test — (Note: This test procedure is applicable only to test samples without drain holes, vents, or other openings. If such openings exist in any part of the test device, it shall be subjected to the Water Spray Test.) The device shall be completely submerged under laboratory ambient temperature ( $\pm$  5°C) water at a depth of 150 mm to 175 mm as measured from the top of the device.

The device shall be submerged for 1 hour. Immediately after the device is removed from submersion, the interior of the test device shall be observed for water accumulation. If a standing pool of water has formed, or can be formed by tapping or tilting the device, the accumulated moisture shall be extracted and measured in a graduated cylinder. Moisture accumulation in the test device of more than 1 ml constitutes a failure. Record the results on Data Sheet 6.

## 12. COMPLIANCE TEST EXECUTION....Continued

Test Equipment:

Water submersion test equipment shall have the range and accuracy identified below:

ITEM	RANGE	ACCURACY
Collector	Height = 100 mm	N/A
	Diameter = 140 mm	N/A
Graduated Cylinder	0 - 10 ml	± 0.5 ml
Timer	0 - 24 hours	± 0.1 minute
Stop watch	0 - 60 seconds	± 0.1 seconds
Flow Meter or Equivalent		± 5%

### DUST TEST PROCEDURE (S6.2.3 continued)

The dust test is not required for sealed beam units.

Place the signal lamp with the socket and any covering normally part of the assembly mounted on its supplied support frame, no closer than 150 mm from the walls, in the test chamber as shown in Figure 9, with all drain holes closed.

Subject the signal lamp to a 2 second to 15 second air blast at 15 minute intervals for 5 hours.

Remove the signal lamp from the chamber at the completion of the test and completely clean the exterior surfaces with dry soft cloth.

Inspect the signal lamp for dust on interior surfaces. If any is found, subject the signal lamp to a photometric test to determine if maximum candle power is within 10 percent of that recorded prior to the dust test. A loss of more than 10 percent in candle power at the point of maximum candle power is a failure. Record the results on Data Sheet 7.

## 12. COMPLIANCE TEST EXECUTION....Continued

### Test Equipment:

Dust Test Chamber shall have an interior that is essentially cubical in shape with measurements of 0.9 meters to 1.5 meters on a side. The bottom of the chamber may be "hopper shaped" to aid in collecting the dust. The internal chamber volume, not including a "hopper shaped" lower section, shall be 2 m<sup>3</sup> maximum and shall be charged with 3 kg to 5 kg of the test dust, fine powder cement in accordance with ASTM C 150-77, Specification for Portland Cement and have the capability of agitating the test dust by means of compressed air or fan blower(s) in such a way that the dust is diffused throughout the test chamber.

Dust test equipment shall have the minimum range and accuracy identified below:

ITEM	RANGE	ACCURACY
Timer	0 - 10 hours	± 1.0 seconds
Stop Watch	0 - 60 seconds	± 0.1 seconds

## 12. COMPLIANCE TEST EXECUTION....Continued

## DUST TEST SETUP

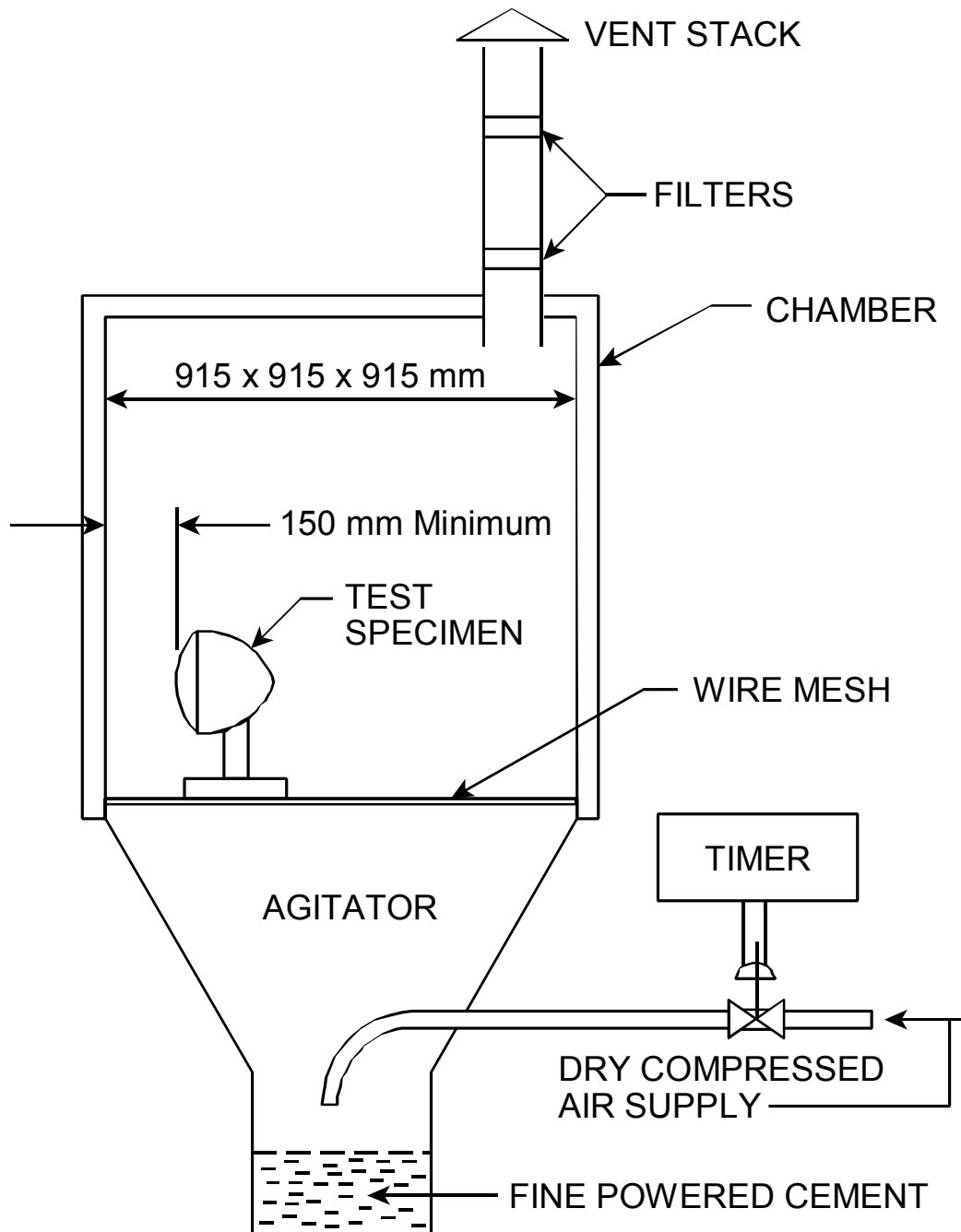


FIGURE 9

## 12. COMPLIANCE TEST EXECUTION....Continued

### CORROSION TEST PROCEDURE (6.2.3 continued)

The analysis and calibration aspects of the salt spray shall be in accordance with ASTM B 117-73, Method of Salt Spray (Fog) Testings.

Prepare a salt solution by dissolving 5 parts  $\pm$  1 part of salt by weight in 95 parts of distilled water or water containing not more than 200 PPM of total solids. Use dry salt which does not contain, on a dry basis, more than 0.1 percent of sodium iodide and not more than 0.3 percent of total impurities. After the solution has completely dissolved and stabilized at  $35^{\circ}\text{C} + 1.5^{\circ}\text{C}$  in the salt spray chamber, collect a suitable amount of solution, and ensure that the Ph range is within 6.5 and 7.2.

Verify that the solution utilized in the salt spray chamber is free of solids in suspension and that the compressed air supply to the nozzle utilized for vaporizing the salt solution is maintained between 69 KPa and 172 Kpa.

Clean the external surfaces of the signal lamp with a soft damp rag to remove fingerprints and any foreign matter which may influence the test results.

Position the signal lamp with socket and any cover normally supplied with the assembly in the test chamber, as shown in Figure 10, at the vehicle vertical orientation and parallel to the principal direction of the horizontal flow of salt fog through the chamber based upon the largest plane surface of the signal lamp. Subject the signal lamp to 48 hours of salt exposure.

Remove the signal lamp from the test chamber and allow the signal lamp to dry for 1 hour after the exposure.

Wash off the salt residue with tap water that is not hotter than  $38^{\circ}\text{C}$ .

Visually inspect the signal lamp for corrosion. If the signal lamp is corroded in any way, then the signal lamp shall be subjected to a Photometric Test to determine if the Corrosion Test has impaired the proper functioning of the signal lamp.

Record the results of the Corrosion Test on Data Sheet 7.

## 12. COMPLIANCE TEST EXECUTION....Continued

## CORROSION TEST SETUP

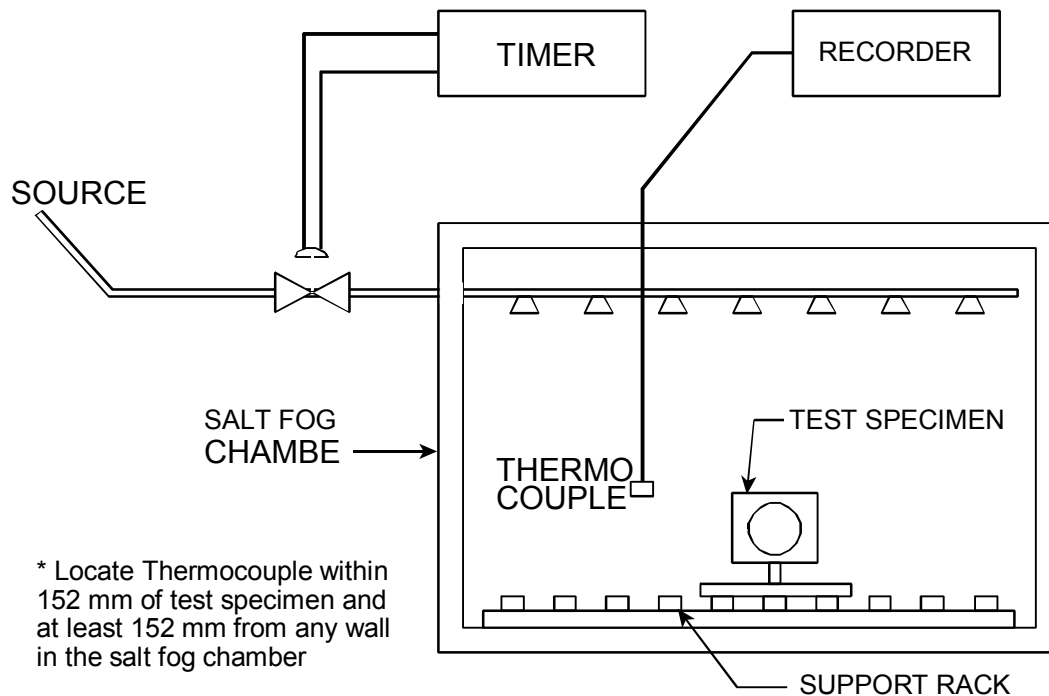


FIGURE 10

## Test Equipment:

Salt Spray Test Chamber consists of a fog chamber, a salt solution reservoir, a supply of suitably conditioned compressed air, one or more atomizing nozzles, specimen supports, provision for heating the chamber, and necessary means of control. The size and detailed construction of the apparatus are optional, provided the conditions obtained meet the requirements of this method.



## 12. COMPLIANCE TEST EXECUTION....Continued

Corrosion test equipment shall have the minimum range and accuracy identified below:

ITEM	RANGE	ACCURACY
Temperature Recorder	0°C - 37°C	±0.6°C
Scale	0 Kg - 4.5 Kg	±0.045Kg
Thermometer	0°C - 93°C	±0.3°C
Ph Meter	1 Ph - 14 Ph	±0.3pH
Pressure Gage	0 Kpa - 345 Kpa	±1.0%

### PHOTOMETRY TEST PROCEDURE (S6.2.3 continued)

Photometric measurements shall be made with the light source of the lamp at least 18 meters from the photometer. The lamp axis shall be taken as a horizontal line through the light source parallel to the longitudinal axis of the surface of the stop signal sign with the lamp in its normal position. The lamp should not be flashing during the test.

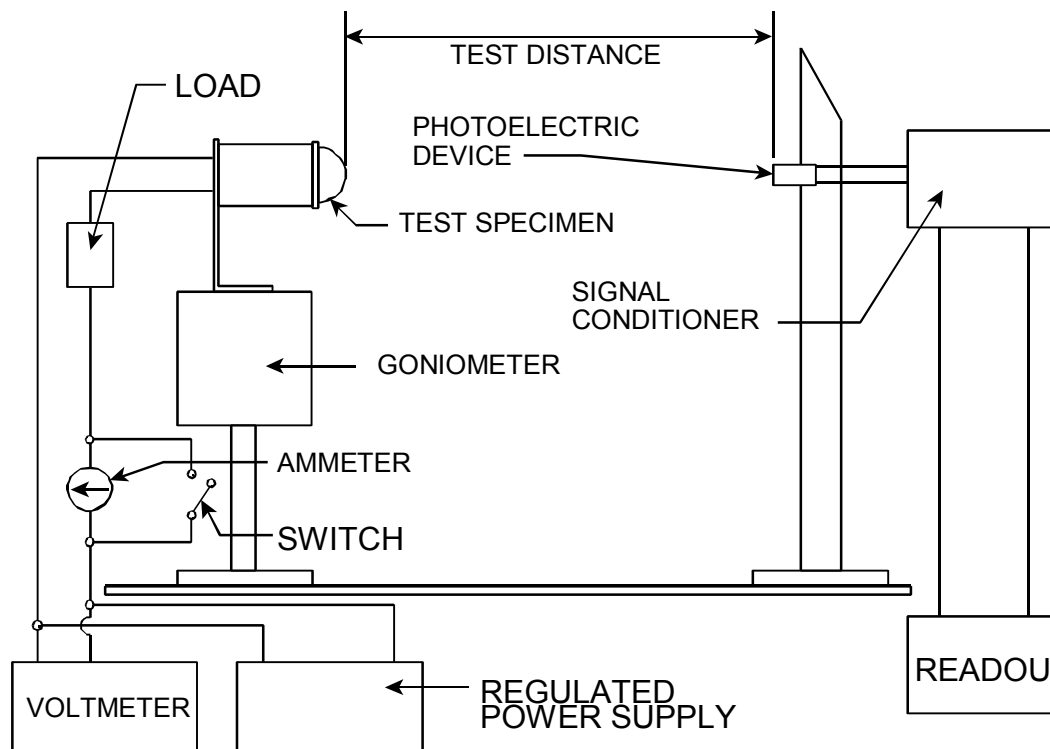
**NOTE:** Test the lamp that appears most likely to fail the test. If all four signal lamps on the signal arm appear equal, choose one at random. Make a note of it on Data Sheet 8.

Prior to each Photometric Test, the complete system shall be single point calibrated with the aid of a Single Illuminant "A." The Standard Illuminant "A" shall be compared with two other standard bulbs prior to the Photometric Test. Any deviation of cp between the three lamps exceeding 2 percent shall be reason to recalibrate all standards.

- A. Mount the signal lamp on the test fixture in its normally installed operating position as shown in Figure 11. The test room shall be completely dark and painted with nonreflective black paint. Prior to testing, the lens shall be cleaned with a soft dry cloth, or with a solution which will not affect the lens surface.

## 12. COMPLIANCE TEST EXECUTION...Continued

### TYPICAL PHOTOMETRIC TEST SETUP FOR LIGHTING DEVICES



**FIGURE 11**

- B. Determine the center of the lamp. Align the center of the lamp with the center of the photometer by means of a transit or equivalent.
- C. Determine the calibrated bulb for the stop signal lamp. Set the power supply to obtain the required mean spherical candlepower (cp) specified for that calibrated bulb by adjusting the voltage until the spherical cp is obtained.
- D. After thermal equilibrium has been reached, photometric readings shall be started at the H-V point and then shall be taken, manually, at other specified points. The points in Zone 3 (5U-V, H-5L, H-V, H-5R and 5D-V) shall be taken after readings for points in Zones 1, 2, 4, and 5 have been taken. After all readings are recorded on Data Sheet 8, the value of the H-V point reading shall be verified by returning to that position. A graphical description of the zonal boundaries is shown in Figure 12.

12. COMPLIANCE TEST EXECUTION....Continued  
 GRAPHICAL DESCRIPTION OF THE ZONAL BOUNDARIES

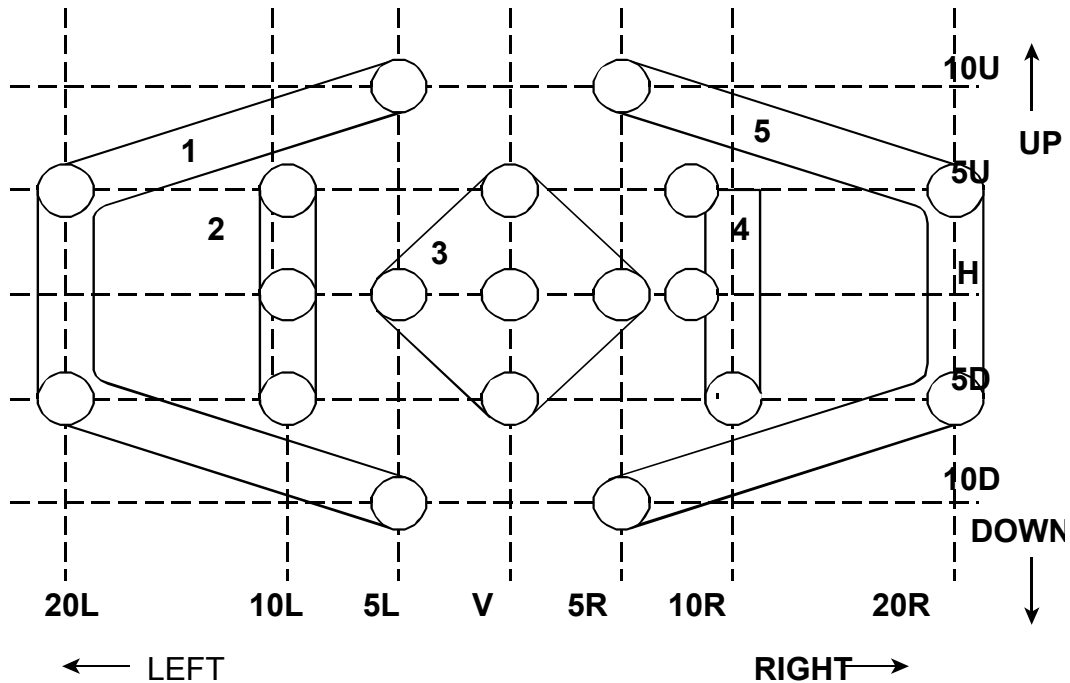


FIGURE 12

- E. Sum the luminous intensity readings of the specific test points in a zone; they shall meet the values in the photometric performance requirements below. However, when calculating the zone total, if the measured luminous intensity for a test point is less than 60% of the value specified for that test point in the photometric design guidelines below, it shall not be used in calculating zone totals.

Enter results on Data Sheet 8.

## 12. COMPLIANCE TEST EXECUTION....Continued

### PHOTOMETRIC PERFORMANCE REQUIREMENTS

ZONE	TEST POINTS (degrees)	TOTAL ZONAL LUMINOUS INTENSITY (cd)
1	10U-5L, 5U-20L, 5D-20L, 10D-5L	52
2	5U-10L, H-10L, 5D-10L	100
3	5U-V, H-5L, H-V, H-5R, 5D-V	380
4	5U-10R, H-10R, 5D-10R	100
5	10U-5R, 5U-20R, 5D-20R, 10D-5R	52

### PHOTOMETRIC DESIGN GUIDELINES

TEST POINTS (degrees)	LUMINOUS INTENSITY (cd)
10U-5L, 10U-5R, 10D-5L, 10D-5R	16
5U-V, 5D-V	70
5U-10L, 5U-10R, 5D-10L, 5D-10R	30
5U-20L, 5U-20R, 5D-20L, 5D-20R	10
H-V	80
H-5L, H-5R	80
H-10L, H-10R	40

#### Photometry Equipment:

The minimum equipment described below shall be utilized for measuring the test parameters.

## 12. COMPLIANCE TEST EXECUTION....Continued

The photoelectric sensing element shall exhibit a minimum sensitivity of 0.003 footcandles. The element shall be color corrected by using a photopic filter such that the system will match the Commission Internationale de l'Eclairage (CIE) photopic relative response curve from 500 to 700 nanometers within 2 percent of the value being measured. The maximum effective area of the photometer sensor shall fit within a circle whose diameter is equal to 0.009 times the actual test distance from the light source of the sample device to the sensor. The sensor effective area is defined as the actual area of intercepted light striking the detector surface of the photometer.

Photometry test equipment shall have the range and accuracy identified below.

ITEM	RANGE	ACCURACY
Goniometer	Vertical $\pm$ 102.0 mm	
	Horizontal $\pm$ 102.0 mm	
	Rotation $\pm$ 90 deg in vertical and horizontal	$\pm$ 0.1 deg
Photoelectric System	0.003 - 10 footcandles	$\pm$ 5% of value being measured
Regulated Power Supply	0 - 20 volts DC	$\pm$ 1.0%
Ammeter	0 - 20 Amps DC	$\pm$ 0.5%
Steel Tape	0 - 30 meters	$\pm$ 3.2 mm
Transit	Vertical $\pm$ 25.4 mm	1/60 degree

### Definition of Photometric Test Points:

The line formed by the intersection of a vertical plane through the light source of the device and normal to a test screen is designated as "V". The line formed by the intersection of a horizontal plane through the light source and normal to the test screen is designated as "H". The point of intersection of these two lines is designated as "H-V".

## 12. COMPLIANCE TEST EXECUTION....Continued

The other points on the test screen are measured in terms of degrees from the "H" and "V" lines. Degrees to the right ("R") and to the left ("L") are regarded as being to the right and left of the vertical line, "V", when the observer stands behind 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 are designated as "U" and the downward angles are designated "D", referring to the light emanating at angles above and below the horizontal line, "H", respectively. See Figure 13.

EXAMPLE: (A) 4D-2L is a point 4 degrees below H and 2 degrees to the left of V.

(B) 1U-V is a point 1 degree above H and on the line V.

### TEST GRID

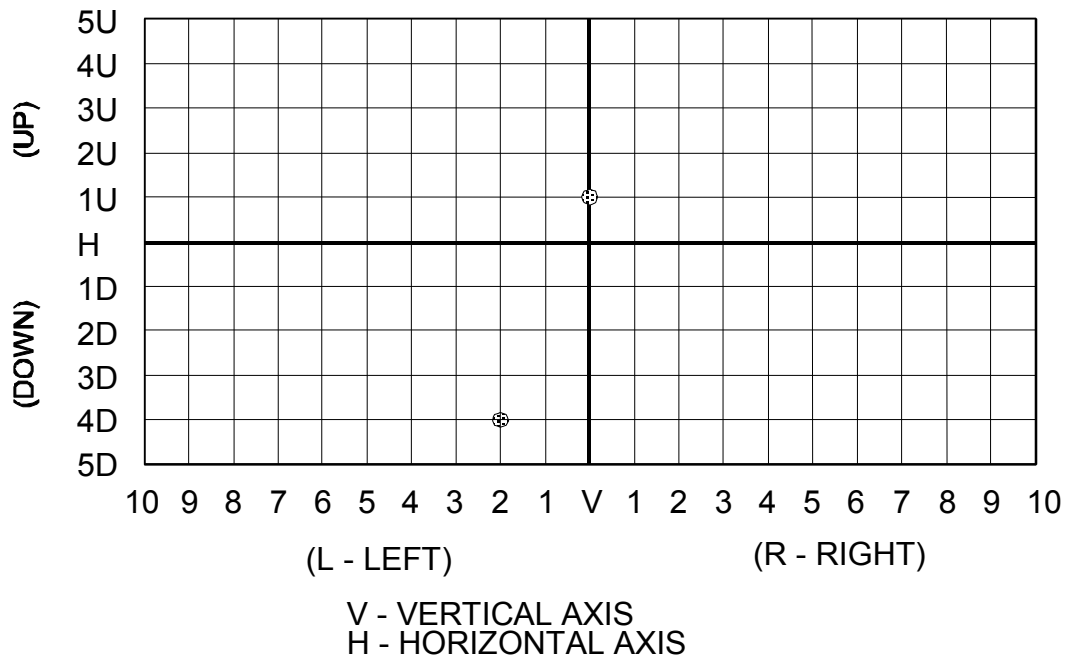


FIGURE 13

## 12. COMPLIANCE TEST EXECUTION....Continued

### WARPAGE TEST PROCEDURE (S6.2.3 continued)

Mount the signal lamp on a test fixture with socket and any covering normally part of the assembly, in the circulating air oven. Position the signal lamp at the center of the oven with the air flowing perpendicular to the axis of the device that is parallel to the vehicle longitudinal axis. The temperature of the circulating air oven shall be controlled between 46°C to 49°C.

Subject the signal lamp to the flowing air for 60 minutes with the signal lamp operating at design voltage and flashing at the stop signal arm's flash rate (between 60 cps and 120 cps).

Upon completion of the 60 minute test, visually examine for warpage of the plastic components and record the results on Data Sheet 9.

Warpage Test Equipment:

A circulating air oven having a predominant air flow direction with the air flow inlet on one side of the interior test chamber and the exhaust air outlet on the opposite side of the chamber.

## 13. POST TEST REQUIREMENTS

After the required tests are completed, the contractor shall:

- A. Verify all instrumentation, data sheets and photographs,
- b. Place the stop signal arm and related equipment in a secure area,  
and
- C. Place all original records in a secure and organized file awaiting test data disposition.

## 14. REPORTS

### 14.1 MONTHLY STATUS REPORTS

The contractor shall submit a monthly Test Status Report and a monthly Equipment Status Report to the COTR. The Equipment Status Report shall be submitted until all stop signal arm and related equipment tested under the contract are disposed of. Samples of the required reports are found in the report forms section.

### 14.2 APPARENT TEST FAILURE

Any indication of a test failure shall be communicated by telephone or to the COTR within 24 hours with written notification mailed within 48 hours (Saturday and Sunday hours excluded). A Notice of Test Failure (see report forms section) with a copy of the particular compliance test data sheet(s) and preliminary data plot(s) shall be included. If possible repeat that portion of the test where the failure was noted to ensure that there is a test failure. In the event of a test failure, a post test calibration check of some critically sensitive test equipment and instrumentation may be required for verification of accuracy. The necessity for the calibration shall be at the COTR's discretion and shall be performed without additional costs to the OVSC.

### 14.3 FINAL TEST REPORTS

#### 14.3.1 COPIES

In the case of an apparent test failure, **SEVEN (7)** copies of the Final Test Report shall be submitted to the COTR for acceptance within 3 weeks of test completion. The Final Test Report format to be used by all contractors can be found in the "Report Section".

Where there has been no indication of an apparent noncompliance, **THREE (3)** copies of each Final Test Report shall be submitted to the COTR for acceptance within 3 weeks of test completion. No payment of contractor's invoices for conducting compliance tests will be made prior to the Final Test Report acceptance by the COTR. Contractors are requested to NOT submit invoices before the COTR is provided with copies of the Final Test Report. Contractors are required to submit the first Final Test Report in draft form within 1 week after the compliance test is conducted. The contractor and the COTR will then be able to discuss the details of both test conduct and report content early in the compliance test program.



## 14. REPORTS....Continued

Contractors are required to PROOF READ all Final Test Reports before submittal to the COTR. The OVSC will not act as a report quality control office for contractors. Reports containing a significant number of errors will be returned to the contractor for correction, and a "hold" will be placed on invoice payment for the particular test.

### 14.3.2 REQUIREMENTS

The Final Test Report, associated documentation (including photographs), are relied upon as the chronicle of the compliance test. The Final Test Report will be released to the public domain after review and acceptance by the COTR. For these reasons, each final report must be a complete document capable of standing by itself.

The contractor should use **detailed** descriptions of all compliance test events. Any events that are not directly associated with the standard but are of technical interest should also be included. The contractor should include as much **detail** as possible in the report.

Instructions for the preparation of the first three pages of the final test report are provided for standardization.

### 14.3.3 FIRST THREE PAGES

#### A. FRONT COVER

A heavy paperback cover (or transparency) shall be provided for the protection of the final report. The information required on the cover is as follows:

(1) Final Report Number such as 131E-ABC-0X-001 where —

131E is the FMVSS tested  
ABC are the initials for the laboratory  
0X is the Fiscal Year of the test program (after year 1999)  
001 is the Group Number (001 for the 1st test,  
002 for the 2nd test, etc.)

**14. REPORTS....Continued**

(2) Final Report Title And Subtitle such as

SAFETY COMPLIANCE TESTING FOR FMVSS 131  
School Bus Pedestrian Safety Devices – Equipment Test  
\*\*\*\*\*

XYZ Stop Signal Arm manufacturer.  
NHTSA No. E-XXX

(3) Contractor's Name and Address such as

ABC Laboratories  
405 Main Street  
Detroit, MI 48070

**NOTE:** DOT symbol will be placed between items (3) and (4)

(4) Date of Final Report completion

(5) The words "FINAL REPORT"

(6) The sponsoring agency's name and address as follows

U. S. DEPARTMENT OF TRANSPORTATION  
National Highway Traffic Safety Administration  
Safety Assurance  
Office of Vehicle Safety Compliance  
400 Seventh Street, SW  
Room 6111 (NSA-30)  
Washington, DC 20590

**14. REPORTS....Continued****B. FIRST PAGE AFTER FRONT COVER**

A disclaimer statement and an acceptance signature block for the COTR shall be provided as follows

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Prepared By: \_\_\_\_\_

Approved By: \_\_\_\_\_

Approval Date: \_\_\_\_\_

FINAL REPORT ACCEPTANCE BY

OVSC:

Accepted By: \_\_\_\_\_

Acceptance Date: \_\_\_\_\_

**14. REPORTS....Continued****C. SECOND PAGE AFTER FRONT COVER**

A completed Technical Report Documentation Page (Form DOT F1700.7) shall be completed for those items that are applicable with the other spaces left blank. Sample data for the applicable block numbers of the title page follows.

**Block 1 — REPORT NUMBER**

131E-ABC-0X-001 (0X after year 1999)

**Block 2 — GOVERNMENT ACCESSION NUMBER**

Leave blank

**Block 3 — RECIPIENT'S CATALOG NUMBER**

Leave blank

**Block 4 — TITLE AND SUBTITLE**

Final Report of FMVSS 131 Compliance Testing of  
School Bus Stop Signal Arm and related equipment,  
NHTSA No. E-XXX

**Block 5 — REPORT DATE**

March 1, 200X (or 199X before year 2000)

**Block 6 — PERFORMING ORGANIZATION CODE**

ABC

**Block 7 — AUTHOR(S)**

John Smith, Project Manager  
Bill Doe, Project Engineer

**Block 8 — PERFORMING ORGANIZATION REPORT NUMBER**

ABC-DOT-XXX-001

**14. REPORTS....Continued**

## Block 9 — PERFORMING ORGANIZATION NAME AND ADDRESS

ABC Laboratories  
405 Main Street  
Detroit, MI 48070

## Block 10 — WORK UNIT NUMBER

Leave blank

## Block 11 — CONTRACT OR GRANT NUMBER

DTNH22-0X-D-12345

## Block 12 — SPONSORING AGENCY NAME AND ADDRESS

US Department of Transportation  
National Highway Traffic Safety Administration  
Safety Assurance  
Office of Vehicle Safety Compliance (NSA-30)  
400 Seventh Street, SW, Room 6111  
Washington, DC 20590

## Block 13 — TYPE OF REPORT AND PERIOD COVERED

Final Test Report  
Feb. 15 to Mar. 15, 200X (or 199X before year 2000)

## Block 14 — SPONSORING AGENCY CODE

NSA-30

## Block 15 — SUPPLEMENTARY NOTES

Leave blank

**14. REPORTS....Continued**

## Block 16 — ABSTRACT

Compliance tests were conducted on the subject school bus stop signal arm manufactured by XYZ in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-131E-0X for the determination of FMVSS 131 school bus pedestrian safety devices compliance.

Test failures identified were as follows:

None

**NOTE:** Above wording must be shown with appropriate changes made for a particular compliance test. Any questions should be resolved with the COTR.

## Block 17 — KEY WORDS

Vehicle Equipment Compliance Testing  
Safety Engineering  
FMVSS 131

## Block 18 — DISTRIBUTION STATEMENT

Copies of this report are available from —

NHTSA Technical Information Services (TIS)  
Room 5108 (NAD-40)  
400 Seventh St., SW  
Washington, DC 20590  
Telephone No.: 202-366-4946

## Block 19 — SECURITY CLASSIFICATION OF REPORT

Unclassified

## Block 20 — SECURITY CLASSIFICATION OF PAGE

Unclassified

**14. REPORTS....Continued**

Block 21 — NUMBER OF PAGES

Add appropriate number

Block 22 — PRICE

Leave blank

**14.3.4 TABLE OF CONTENTS**

Final test report Table of Contents shall include the following:

Section 1 — Purpose of Compliance Test

Section 2 — Test Procedure and Discussion of Results

Section 3 — Compliance Test Data

Section 4 — Test Equipment List and Calibration Information

Section 5 — Photographs

Section 6 — Notice of Test Failure (if applicable)

**15. DATA SHEETS**

**FMVSS 131, SCHOOL BUS PEDESTRIAN SAFETY DEVICES  
EQUIPMENT INFORMATION AND TEST SUMMARY**

Test Laboratory: \_\_\_\_\_ ; Contract No: \_\_\_\_\_

Stop Signal Arm Manufacturer: \_\_\_\_\_ ; Serial No: \_\_\_\_\_

Flasher Manufacturer: \_\_\_\_\_ ; Serial No: \_\_\_\_\_

<b>SUMMARY</b>	<b>PASS</b>	<b>FAIL</b>	<b>N/A</b>
Dimensional Requirements (S5.1)			
Surface content and Labeling (S5.2)			
Conspicuity Requirements (S5.3)			
Reflectivity Test (S6.1)			
Color Test (S6.2.1)			
Flash Rate Test (S6.2.2)			
Vibration, Photometry, etc. Tests (S6.2.3)			

If the stop signal arm and flasher were removed from a bus:

School Bus Make/Model: \_\_\_\_\_

Bus NHTSA NO.: \_\_\_\_\_ ; VIN: \_\_\_\_\_

REMARKS:



**15. DATA SHEETS....Continued**

## FMVSS 131 – DATA SHEET 1 (1 of 2)

Stop Signal Arm Manufacturer: \_\_\_\_\_

Serial No.: \_\_\_\_\_

Test Date: \_\_\_\_\_

## DIMENSIONS OF STOP SIGNAL ARM (S5.1)

"Regular octagon" with diameter of at least 450 mm (point to point)

Diameter 1	
Diameter 2	
Diameter 3	
Diameter 4	
Range (max.- min.)	

Are all octagon diameter values 450 mm? Yes/No: \_\_\_\_\_

Is range of octagon diameter values 12 mm? Yes/No: \_\_\_\_\_

Are all octagon chord dimensions equal within 6 mm? Yes/No: \_\_\_\_\_

REMARKS:

(CONTINUED ON NEXT PAGE)

**15. DATA SHEETS....Continued**

DATA SHEET 1 (2 of 2)

STOP SIGNAL ARM COLOR AND DISPLAY (S5.2)

REQUIREMENT	Front Side	Aft Side
Color RED except for border & legend (Yes/No)		
Color of border is WHITE (Yes/No)		
Color of word "STOP" is WHITE (Yes/No)		
Word "STOP" is in upper case letters (Yes/No)		
Width of border (12 mm minimum)		
Percent of border obscured by mounting brackets, clips, or bolts, or other components (15% maximum) *		
Height of letters (150 mm minimum)		
Stroke width of letters (20 mm minimum)		

\* In addition to area obscured by 2 optional red lamps, if installed.

S5.1 and S5.2 TEST RESULTS (PASS/FAIL: \_\_\_\_\_)

REMARKS:

TESTED BY: \_\_\_\_\_ APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

**15. DATA SHEETS....Continued**

## FMVSS 131 – DATA SHEET 2 (1 of 3)

Stop Signal Arm Manufacturer: \_\_\_\_\_

Serial No.: \_\_\_\_\_

Test Date: \_\_\_\_\_

**CONSPICUITY (S5.3)**

The Stop Signal Arm shall comply with either S5.3.1 or S5.3.2, or both.

**REFLECTORIZED MATERIAL (S5.3.1)**

REQUIREMENT	Front Side	Aft Side
<b>ENTIRE</b> surface of stop signal arm reflectORIZED except for mounting brackets, clips, bolts, or other necessary components (Yes/No)		
Percent of entire surface obscured (7.5 % maximum)		

REMARKS:

(CONTINUED ON NEXT PAGE)

**15. DATA SHEETS....Continued**

## DATA SHEET 2 (2 of 3)

IF OPTIONAL ILLUMINATED LETTERING IS INSTALLED, THE FOLLOWING REQUIREMENTS APPLY IN ADDITION TO REFLECTORIZED SURFACE (S5.3.1.1)

REQUIREMENT	FRONT	AFT
Red lamps form the complete shape of each letter of the legend (Yes/No)		
Red lamps centered within stroke of each letter (Yes/No)		
Red lamps outline each letter in immediately surrounding area (Yes/No)		
Net stroke width . 15 mm (Stroke width minus lamp width)	"S"	
	"T"	
	"O"	
	"P"	
Lamps are filament type (Yes/No)		
Lamps are gaseous discharge type (Yes/No)		

REMARKS:

(CONTINUED ON NEXT PAGE)

**15. DATA SHEETS....Continued**

DATA SHEET 2 (3 of 3)

RED FLASHING LAMPS (S5.3.2)

REQUIREMENT	FRONT	AFT
Red Lamps centered on the vertical centerline (At least 2, enter quantity.)		
One lamp at extreme top and another at extreme bottom (Yes/No)		
Symbol "DOT" on each lamp lens (Yes/No)		
Additional markings on lamp lenses (Copy)		

**S5.3 TEST RESULTS**

COMPLY WITH EITHER S5.3.1 OR S5.3.2, OR BOTH (PASS/FAIL: \_\_\_\_\_)

REMARKS:

TESTED BY: \_\_\_\_\_ APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

**15. DATA SHEETS....Continued**

FMVSS 131 – DATA SHEET 3

Stop Signal Arm Mfg.: \_\_\_\_\_ S/N: \_\_\_\_\_ Test Date: \_\_\_\_\_

REFLECTORIZED MATERIAL PERFORMANCE (S5.3.1) -- The entire surface of both sides of the stop signal arm shall be covered with Type III retroreflectized material that meets minimum specific intensity requirements of S6.1.

REFLECTIVITY TEST (S6.1) – When tested under the conditions specified in FMVSS 125, Warning Devices, the retroreflective materials shall meet the performance criteria below.

SPECIFIC INTENSITY PER UNIT AREA  
(Candelas Per footcandle Per Square Foot)

OBSERVATION ANGLE	ENTRANCE ANGLE	MINIMUM INTENSITY REQUIREMENT		FRONT FACING SIDE		REAR FACING SIDE	
		WHITE	RED	WHITE	RED	WHITE	RED
PART A — GLASS BEAD RETROFLECTIVE MATERIAL							
0.2°	- 4°	250	45				
0.2°	+ 30°	150	25				
0.5°	- 4°	95	15				
0.5°	+ 30°	65	10				
PART B — PRISMATIC RETROFLECTIVE MATERIAL							
0.2°	- 4°	250	45				
0.2°	+ 30°	95	13.3				
0.5°	- 4°	200	28				
0.5°	+ 30°	65	10				

Enter data under Part A or B as applicable.

S5.3.1 REFLECTIVITY TEST RESULTS (PASS/FAIL: \_\_\_\_\_)

TESTED BY: \_\_\_\_\_ APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

**15. DATA SHEETS....Continued**

## FMVSS 131 – DATA SHEET 4 (1 OF 3)

Stop Signal Arm Mfg.: \_\_\_\_\_ S/N: \_\_\_\_\_ Test Date: \_\_\_\_\_

## COLOR OF RED SIGNAL LAMPS (S5.3.2)

COLOR TEST(S6.2.1) – Test procedure and criteria in accordance with Society of Automotive Engineers J578 (May 1988). Specific boundaries:  $y=0.33$  and  $y=0.98 - X$ .

Position of signal lamp tested:     Forward-Top         Forward-Bottom  
   Rear Side-Top      Rear Side-Bottom

Measured CIE Coordinates:    X - \_\_\_\_\_    Y - \_\_\_\_\_

Calibrated Bulb Laboratory Control No: \_\_\_\_\_

S5.3.2 RED SIGNAL LAMP COLOR TEST RESULTS (PASS/FAIL: \_\_\_\_\_)

REMARKS:

TESTED BY: \_\_\_\_\_ APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

**15. DATA SHEETS....Continued**

FMVSS 131 – DATA SHEET 4 (2 of 3)

**RETROREFLECTIVE MATERIAL COLORS**

Evaluate the reflective light from the reflectivity test for information only. This is not a criterion of compliance.

Data for the CIE Chromaticity Diagram X and Y coordinates:

STOP SIGNAL ARM SIDE/COLOR	RED	WHITE
Front Side X Coordinate		
Front Side Y Coordinate		
Rear Side X Coordinate		
Rear Side Y Coordinate		

White reflected light not materially different from that of CIE Source A

Yes/No: \_\_\_\_\_

Red reflected light not materially different from the limit filters standard

Yes/No: \_\_\_\_\_

REMARKS:

TESTED BY: \_\_\_\_\_ APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_



**15. DATA SHEETS....Continued**

DATA SHEET 4 (3 OF 3)

## LAMP COLOR IN OR SURROUNDING LEGEND

If optional lamps emit light from the surface of each letter or area immediately surrounding each letter of the legend, evaluate the red color for information only. This is not a criterion of compliance.

Measured CIE Coordinates:

Front Side: X - \_\_\_\_\_ Y - \_\_\_\_\_

Rear Side: X - \_\_\_\_\_ Y - \_\_\_\_\_

Red emitted light not materially different from the limit filters standard:

Front Side: \_\_\_\_\_ (YES/NO)

Rear Side: \_\_\_\_\_ (YES/NO)

REMARKS:

TESTED BY: \_\_\_\_\_ APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

**15. DATA SHEETS....Continued**

## FMVSS 131 – DATA SHEET 5

Stop Signal Arm Mfg.: \_\_\_\_\_ S/N: \_\_\_\_\_ Test Date: \_\_\_\_\_  
 Flasher Manufacturer: \_\_\_\_\_ S/N: \_\_\_\_\_

NOTE: This Data Sheet is used to enter results of flash rate and current test procedures specified in S6.2.2. These lighting performance tests are required by S5.3.1.1 or S5.3.2 as applicable.

**FLASH RATE PERFORMANCE TEST (S6.2.2)**

Lamps on each side of the signal arm, when operated at the manufacturer's design load, shall flash alternately at a rate of 60 to 120 flashes per minute.

Forward facing side \_\_\_\_\_ Flashes/Minute

Rearward facing side \_\_\_\_\_ Flashes/Minute

**CURRENT "ON" TIME TEST(S6.2.2.1)**

Lamps, except those subject to S6.2.2.2, shall have a current "on" time of 30 to 75 percent of the total flash cycle. The total current "on" time for the two terminals shall be between 90 and 110 percent of the total flash cycle.

Lamp current "on" time: Forward side \_\_\_\_ %, Rearward side \_\_\_\_ %

Total current "on" time: \_\_\_\_ %

**CURRENT "OFF" TIME TEST (S6.2.2.2)**

Xenon short-arc gaseous discharge lamps shall have an "off" time before each flash of at least 50 percent of the total flash cycle.

Current "off" time: Forward side \_\_\_\_%, Rearward side \_\_\_\_ %

S6.2.2 FLASH RATE and CURRENT TEST RESULTS (PASS/FAIL): \_\_\_\_\_

REMARKS:

TESTED BY: \_\_\_\_\_ APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

**15. DATA SHEETS....Continued**

**FMVSS 131 – DATA SHEET 5A**

Design Lamp Load (Incandescent Lamp): \_\_\_\_\_ No. \_\_\_\_ Signalling Bulbs  
 \_\_\_\_\_ No. \_\_\_\_ Indicator Bulbs

Model: \_\_\_\_\_ ; Contact Points (Incandescent Lamp): \_\_\_\_\_

TEST No.	STARTING TIME (Seconds)				VOLTAGE DROP (millivolts)				FLASHING RATE AND BULB "ON" OR "OFF" TIME				
	START NUMBER			AVE	CYCLE NUMBER			AVE	TIME (Seconds)		FLASH RATE (fpm)	CURR "ON" (%)	CURR "OFF" (%)
	1	2	3		6	7	8		Total	On			
FI.No.													
-1													
-2													
-3													
-4													
-5													
-6													
-7													
-8													
-9													
-10													
-11													
-12													
-13													
-14													
-15													
-16													
-17													
-18													
-19													
-20													
SPECIFIED LIMITS —				2.0 sec 1.5 avg				0.8 mv					

Ambient Temperature (24°C ± 5°C): \_\_\_\_\_ °C

**15. DATA SHEETS....Continued**

FMVSS 131 – DATA SHEET 6

VIBRATION TEST (S6.2.3)

		YES	NO	P/F
Device Completed VIBRATION TEST without —				
(a)	Lens or Reflector Rotation			
(b)	Displacement			
(c)	Cracking			
(d)	Rupture of Parts			
Rephotometer Test IS Necessary				
Additional Photometric Test Data Sheet Added To Report				

REMARKS:

TESTED BY: \_\_\_\_\_ APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

MOISTURE TEST (S6.2.3 continued)

Amount of Moisture that Accumulated in the Device: \_\_\_\_\_

		YES	NO	P/F
If WATER SPRAY TEST was conducted —				
Device accumulated < 2 ml of moisture				
If WATER SUBMERSION TEST was conducted —				
Device accumulated < 1 ml of moisture				
A Rephotometer Test IS Necessary				
Additional Photometric Data Sheet added to report				

REMARKS:

TESTED BY: \_\_\_\_\_ APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

**15. DATA SHEETS....Continued**

FMVSS 131 – DATA SHEET 7

DUST TEST (S6.2.3 CONTINUED)

If Dust IS FOUND in the Device:

	YES	NO	P/F
The Maximum cp is within 10% of that recorded prior to DUST TEST			
A Rephotometer Test IS Necessary			
Additional Photometric Data Sheet Added to Report			

NOTE: If dust is not found in the device after the Dust Test it should be assumed that there is no degradation in cp from the Predust Test condition.

REMARKS:

TESTED BY: \_\_\_\_\_ APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

CORROSION TEST (S6.2.3 CONTINUED)

	YES	NO	P/F
The Device Completed the Test WITHOUT Evidence of Corrosion Which Could Impair Proper Functioning of the Device			
A Rephotometer Test IS Necessary			
Additional Photometric Data Sheet Added to Report			

REMARKS:

TESTED BY: \_\_\_\_\_ APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

## 15. DATA SHEETS....Continued

### FMVSS 131 – DATA SHEET 8 (1 OF 2)

Stop Sig. Arm Mfg.: \_\_\_\_\_ S/N: \_\_\_\_\_ Test Date: \_\_\_\_\_

PHOTOMETRY TEST (S6.2.3 CONTINUED) – Test procedure and criteria in accordance with Society of Automotive Engineers J575 (July 1983) and J1133 (April 1984).

#### PHOTOMETRIC PERFORMANCE REQUIREMENTS AND MEASUREMENTS

ZONE	TEST POINTS (Degrees)	TOTAL ZONAL LUMINOUS INTENSITY (cd)	REQUIRED LUMINOUS INTENSITY (cd)	MEASURED (cd)	ZONAL TOTALS P/F
1	10U - 5L	52	16		
	5U - 20L		10		
	5D - 20L		10		
	10D - 5L		16		
2	5U - 10L	100	30		
	H - 10L		40		
	5D - 10L		30		
3	5U - V	380	70		
	H - 5L		80		
	H - V		80		
	H - 5R		80		
	5D - V		70		
4	5U - 10R	100	30		
	H - 10R		40		
	5D - 10R		30		
5	10U - 5R	52	16		
	5U - 20R		10		
	5D - 20R		10		
	10D - 5R		16		

Maximum Luminous Intensity at any Individual Test Point = 300

**15. DATA SHEETS....Continued**

## DATA SHEET 8 – PHOTOMETRY (2 of 2)

Position of signal lamp tested:  Forward-Top,  Forward-Bottom,  
 Rear Side-Top,  Rear Side-Bottom

Calibrated Bulb Laboratory Control No. (Incandescent Lamp): \_\_\_\_\_

Rated Mean Spherical Candlepower (Incandescent Lamp): \_\_\_\_\_

Test Distance: \_\_\_\_\_ ; Test Voltage: \_\_\_\_\_ ; Test Current: \_\_\_\_\_

Lamp met minimum Photometric Values at each test point: (YES/NO) \_\_\_\_\_

Maximum Luminous Intensity of individual test points was NOT exceeded:

(YES/NO) \_\_\_\_\_

## NOTES:

(1) For the lamp to conform to the photometric zonal performance, the sum of the candela measurements in a zone shall meet or exceed the values specified for that zone.

(2) Any photometric measurements that fall below 60% of the test point value shall not be used in the calculation of zone totals.

(3) The bulbs should not be flashing during the test.

S6.2.3 PHOTOMETRY TEST RESULTS (PASS/FAIL): \_\_\_\_\_

## REMARKS:

TESTED BY: \_\_\_\_\_ APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

**15. DATA SHEETS....Continued**

## FMVSS 131 – DATA SHEET 9

## WARPAGE TEST (S6.2.3 CONTINUED)

	YES	NO	P/F
The Device Completed the Test WITHOUT Evidence of Warpage Which Could Impair Proper Functioning of the Device			
A Rephotometer Test IS Necessary			
Additional Photometric Data Sheet Added to Report			

REMARKS:

TESTED BY: \_\_\_\_\_ APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_



**16. FORMS**

LABORATORY NOTICE OF TEST FAILURE TO OVSC

FMVSS NO.: 131 – EQUIPMENT TEST TEST DATE: \_\_\_\_\_

LABORATORY: \_\_\_\_\_

CONTRACT NO.: \_\_\_\_\_ DELV. ORDER NO: \_\_\_\_\_

LABORATORY PROJECT ENGINEER'S NAME: \_\_\_\_\_

EQUIPMENT DESCRIPTION: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

PART NO.: \_\_\_\_\_ MFR: \_\_\_\_\_

SERIAL NO.: \_\_\_\_\_ NHTSA NO: \_\_\_\_\_

TEST FAILURE DESCRIPTION: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

FMVSS 131 REQUIREMENT, PARAGRAPH S \_\_\_\_\_ :

\_\_\_\_\_

\_\_\_\_\_

NOTIFICATION TO NHTSA (COTR): \_\_\_\_\_

DATE: \_\_\_\_\_

BY: \_\_\_\_\_

REMARKS:

**16. FORMS....Continued**

## MONTHLY TEST STATUS REPORT

## FMVSS 131 – EQUIPMENT TEST

DATE OF REPORT: \_\_\_\_\_

NO.	EQUIPMENT NHTSA NO., MAKE & MODEL	COMPLIANCE TEST DATE	PASS/ FAIL	DATE REPORT SUBMITTED	DATE INVOICE SUBMITTED	INVOICE PAYMENT DATE
1						
2						
3						
4						
5						
6						

**16. FORMS....Continued**

## MONTHLY EQUIPMENT STATUS REPORT

## FMVSS 131 – EQUIPMENT

DATE OF REPORT: \_\_\_\_\_

NO.	EQUIPMENT NHTSA NO., MAKE & MODEL	DATE OF DELIVERY	TEST COMPLETE DATE	EQUIPMENT SHIPMENT DATE
1				
2				
3				
4				
5				
6				